More To Sea
redondo BEACH

Public Works Department
Engineering Services Division

415 Diamond Street, P.O. Box 270
Redondo Beach, California 90277-0270
www.redondo.org

Engineering 310 318-0661
fax 310 374-4828

June 26, 2014

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Via Regional Board website

Attention: Mr. Ivar Ridgeway and Ms. Rebecca Christmann

Beach Cities Watershed Management Group: Enhanced Watershed Management Program (EWMP) Work Plan, Pursuant to the Los Angeles County Municipal Separate Storm Sewer System (MS4) Permit (NPDES No. CAS004001; Order No. R4-2012-0175)

Dear Mr. Unger;

On June 28, 2013 the Beach Cities Watershed Management Group (Beach Cities) submitted the Notice of Intent (NOI) for the development of an Enhanced Watershed Management Program (EWMP) Plan and Coordinated Integrated Monitoring Program (CIMP) Plan. All members of the Beach Cities have agreed to a collaborative approach in meeting the requirements of the MS4 Permit by Order No. R4-2012-0175.

On March 27, 2014 the California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) approved the Beach Cities' NOI.

As noted in the Regional Water Board's March 27, 2014 letter, the work plan for development of the Beach Cities EWMP is due by June 28, 2014. To comply with this requirement, enclosed is the Beach Cities EWMP Work Plan. All agencies have reviewed and approved the work plan for its submission to your Board. Each agency provided an Authorization to Submit letter authorizing the City of Redondo Beach, the lead agency to submit the work plan on their behalf. These authorization letters are also enclosed.

Should you have any questions regarding the EWMP Work Plan, please contact me at tim.shea@redondo.org or via telephone at (310) 318-0686, extension 4110 or Elaine Jeng at elaine.jeng@redondo.org or via telephone at (310) 318-0661, extension 2279.

Sincerely,

Wisam Altowaiji

For Tim Shea
Interim Public Works Director

Attachment

cc:
Ivar Ridgeway, California Regional Water Quality Control Board, LA Region
Rebecca Christmann, California Regional Water Quality Control Board, LA Region
Gail Farber, Los Angeles County Flood Control District
John Jalili, City of Manhattan Beach
Tony Olmos, City of Manhattan Beach
Tom Bakaly, City of Hermosa Beach
Frank Senteno, City of Hermosa Beach
Leroy Jackson, City of Torrance
Robert Beste, City of Torrance

City of Hermosa Beach

Civic Center, 1315 Valley Drive, Hermosa Beach, California 90254-3885

June 10, 2014

Elaine Jeng
City of Redondo Beach
415 Diamond Street
Redondo Beach, CA 90277

Dear Ms. Jeng:

AUTHORIZATION TO SUBMIT- CITY OF HERMOSA BEACH
BEACH CITIES EWMP GROUP
COORDINATED INTEGRATED MONITORING PROGRAM PLAN AND
ENHANCED WATERSHED MANAGEMENT PROGRAM WORKPLAN

As required by Order No. R4-2012-0175 (Municipal Separate Storm Sewer System Permit), the City of Hermosa Beach has been participating in the Beach Cities EWMP Group to develop a Coordinated Integrated Monitoring Program (CIMP) Plan and an Enhanced Watershed Management Program (EWMP) Workplan. These Plans have been developed in partnership with the following agencies: City of Redondo Beach as the coordinating agency, City of Manhattan Beach, City of Torrance, and Los Angeles County Flood Control District.

This letter serves to authorize the City of Redondo Beach to submit the CIMP Plan and the EWMP Workplan to the California Regional Water Quality Control Board – Los Angeles Region on behalf of the City of Hermosa Beach.

If you have any questions, please contact Frank Senteno, Director of Public Works/City Engineer, at (310) 318-0238.

Sincerely,

Tom Bakaly
City Manager

cc: Jeffrey Kidd, City of Torrance
Raul Senz, City of Manhattan Beach
Taejin Moon, Los Angeles County Flood Control District

City Hall 1400 Highland Avenue Manhattan Beach, CA 90266-4795
Telephone (310) 802-5056 Fax (310) 802-5001

June 10, 2014

Elaine Jeng, P.E.
City of Redondo Beach
415 Diamond St
Redondo Beach, CA

Dear Ms. Jeng

AUTHORIZATION TO SUBMIT – City of Manhattan Beach
Beach Cities Watershed Management Group
COORDINATED INTEGRATED MONITORING PROGRAM PLAN AND ENHANCED WATERSHED MANAGEMENT PROGRAM WORKPLAN

As required by Order No. R4-2012-0175 (Municipal Separate Storm Sewer System Permit), the Manhattan Beach has been participating in the Beach Cities Watershed Management Group to develop a Coordinated Integrated Monitoring Program (CIMP) Plan and an Enhanced Watershed Management Program (EWMP) Work plan. These Plans have been developed in partnership with the following agencies: The City of Redondo Beach as the coordinating agency, the Los Angeles County Flood Control and the Cities of Hermosa Beach and Torrance.

This letter serves to authorize the City of Redondo Beach to submit the CIMP Plan and the EWMP Work Plan to the California Regional Water Quality Control Board – Los Angeles Region on behalf of the City of Manhattan Beach

If you have any questions, please contact Raul Saenz at (310) 802-5315.

Very truly yours,

Tony Olmos, P.E
Director of Public Works

cc: City of Torrance
City of Hermosa Beach
Los Angeles County Flood Control

CITY OF
TORRANCE
PUBLIC WORKS DEPARTMENT

Robert J. Beste
Public Works Director

June 9, 2014

Elaine Jeng
City of Redondo Beach
415 Diamond Street
Redondo Beach, CA 90277

Dear Ms. Jeng:

AUTHORIZATION TO SUBMIT – CITY OF TORRANCE
BEACH CITIES EWMP GROUP
COORDINATED INTEGRATED MONITORING PROGRAM PLAN AND ENHANCED WATERSHED MANAGEMENT PROGRAM WORKPLAN

As required by Order No. R4-2012-0175 (Municipal Separate Storm Sewer System Permit), the City of Torrance has been participating in the Beach Cities EWMP Group to develop a Coordinated Integrated Monitoring Program (CIMP) Plan and an Enhanced Watershed Management Program (EWMP) Workplan. These Plans have been developed in partnership with the following agencies: City of Redondo Beach as the coordinating agency, and City of Hermosa Beach, City of Manhattan Beach and Los Angeles County Flood Control District.

This letter serves to authorize the City of Redondo Beach to submit the CIMP Plan and the EWMP Workplan to the California Regional Water Quality Control Board – Los Angeles Region on behalf of the City of Torrance.

If you have any questions, please contact Jeffrey Kidd, Associate Engineer, at (310) 618-3067.

Sincerely,

ROBERT J. BESTE
Public Works Director

cc: Homayoun Behoodi, City of Hermosa Beach
Raul Senz, City of Manhattan Beach
Taejin Moon, Los Angeles County Flood Control District

GAIL FARBER, Director

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
http://dpw.lacounty.gov

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: WM-7

June 25, 2014

Mr. Mike Witzansky
City of Redondo Beach
Department of Public Works
415 Diamond Street
Redondo Beach, CA 90277

Attention Ms. Elaine Jeng

Dear Mr. Witzansky:

**AUTHORIZATION TO SUBMIT
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
BEACH CITIES WATERSHED MANAGEMENT GROUP
COORDINATED INTEGRATED MONITORING PROGRAM PLAN AND
ENHANCED WATERSHED MANAGEMENT PROGRAM WORK PLAN**

In compliance with Order No. R4-2012-0175 (Municipal Separate Storm Sewer System Permit), the Los Angeles County Flood Control District (LACFCD) has been participating in the Beach Cities Watershed Management Group to develop a Coordinated Integrated Monitoring Program (CIMP) Plan and an Enhanced Watershed Management Program (EWMP) Work Plan. These Plans have been developed in partnership with the following agencies: the City of Redondo Beach as the coordinating agency and Cities of Torrance, Hermosa Beach, and Manhattan Beach.

This letter serves to authorize the City of Redondo Beach to submit the CIMP Plan and the EWMP Work Plan to the California Regional Water Quality Control Board – Los Angeles Region on behalf of the LACFCD.

If you have any questions, please contact me at (626) 458-4300 or ghildeb@dpw.lacounty.gov or your staff may contact Ms. Terri Grant at (626) 458-4309 or tgrant@dpw.lacounty.gov.

Very truly yours,

GAIL FARBER
Chief Engineer of
Los Angeles County Flood Control District

Gary Hildebrand

GARY HILDEBRAND
Assistant Deputy Director
Watershed Management Division

TJM:ba
P:\wmpub\Secretarial\2014 Documents\Letter\Beach Cities Commitment Ltr.doc\C14149

cc: City of Hermosa Beach
City of Manhattan Beach
City of Torrance

ENHANCED WATERSHED MANAGEMENT PROGRAM (EWMP) WORK PLAN

FOR THE BEACH CITIES WATERSHED MANAGEMENT GROUP

Submitted to

The Los Angeles Regional Water Quality Control Board

Prepared by

Beach Cities Watershed Management Group

(Cities of Hermosa Beach, Manhattan Beach, Redondo Beach, and Torrance and the Los Angeles County Flood Control District)

June 2014

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LIST OF ACRONYMS

AED	Allowable Exceedance Days
ASCE	American Society of Civil Engineers
BMP	Best Management Practice
CFR	Code of Federal Regulations
CIMP	Coordinated Integrated Monitoring Program
CML	Compliance Monitoring Location
CTR	California Toxic Rules
DDT	Dichloro-diphenyl-trichloroethane
EMC	Event Mean Concentration
EWMP	Enhanced Watershed Management Program
GIS	Geographic Information System
HSPF	Hydrological Simulation Program - Fortran
HUC	Hydrologic Unit Codes
IBD	International BMP Database
LACFCD	Los Angeles County Flood Control District
LID	Low Impact Development
LSPC	Loading Simulation Program in C++
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyl
PLAT	Pollutant Loading and Analysis Tool
RAA	Reasonable Assurance Analysis
RWL	Receiving Water Limitation
SBPAT	Structural BMP Prioritization and Analysis Tool
SMB	Santa Monica Bay
SMBBB	Santa Monica Bay Beaches Bacteria
SWMM	Storm Water Management Model

TAC	Technical Advisory Committee
TLR	Target Load Reduction
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
WBPC	Water Body-Pollutant Combination
WERF	Water Environment Research Foundation
WMA	Watershed Management Area
WMG	Watershed Management Group
WMMS	Watershed Management Modeling System
WQBEL	Water Quality-Based Effluent Limitation
WWE	Wright Water Engineers

EXECUTIVE SUMMARY

On November 8, 2012, the Los Angeles Regional Water Quality Control Board adopted the fourth National Pollutant Discharge Elimination System (NPDES) Permit under the Federal Clean Water Act for discharges from the municipal separate storm sewer system within the coastal watersheds of Los Angeles County (Permit). The Permit became effective on December 28, 2012. The Permit identifies conditions, requirements and programs that municipalities must comply with to protect regional water resources from adverse impacts associated with pollutants in stormwater and urban runoff; these Permit requirements have been significantly expanded over the previous permit which had been in effect since 2001. Most significantly, the Permit incorporates water quality based effluent limitations and receiving water limitations, effectively numeric pollutant limits enforceable through the Permit.

The Cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance, and the Los Angeles County Flood Control District (LACFCD) are collectively pursuing the development and implementation of an Enhanced Watershed Management Program consistent with the Permit. The four cities and LACFCD formed the Beach Cities Watershed Management Group (WMG) to jointly fund the development of the EWMP (and corresponding monitoring plan). As required by the Permit, the Beach Cities WMG will complete the EWMP within 30 months from the effective date of the NPDES MS4 Permit, by June 2015. This Work Plan serves as the basis for the development of the EWMP.

As described in the NPDES MS4 Permit, an Enhanced Water Management Program is "one that comprehensively evaluates opportunities, within the participating Permittees' collective jurisdictional area in a Watershed Management Area, for collaboration among Permittees and other partners on multi-benefit regional projects that, wherever feasible, retain (i) all non-storm water runoff and (ii) all storm water runoff from the 85th percentile, 24-hour storm event for the drainage areas tributary to the projects, while also achieving other benefits including flood control and water supply, among others. In drainage areas within the EWMP area where retention of the 85th percentile, 24-hour storm event is not feasible, the EWMP shall include a Reasonable Assurance Analysis to demonstrate that applicable water quality based effluent limitations and receiving water limitations shall be achieved through implementation of other watershed control measures." Final compliance with numeric pollutant limits is presumed wherever regional projects can be sited that retain the 85th percentile, 24-hour storm event, also known as the design storm which is ¾ inch to 1 inch of rainfall depending on location within the EWMP Area. For areas not served by a regional project, the EWMP must demonstrate with reasonable assurance through quantitative analysis, using a peer-reviewed watershed model in the public domain, that the final numeric pollutant limits will be met through implementation of the EWMP. In the long term, however, the effectiveness of the EWMP will be evaluated through the Coordinated Integrated Monitoring Program.

The Beach Cities EWMP Area is divided into three watersheds: Santa Monica Bay (SMB) Watershed, Dominguez Channel Watershed, and Machado Lake Watershed, as shown in Figure ES-1. Table ES-1 provides a breakdown of the Beach Cities EWMP Area by city and tributary watershed.

Table ES-1. Beach Cities WMG EWMP Area Distribution by Participating City

Participating City	SMB Watershed (acres)	Dominguez Channel Watershed (acres)	Machado Lake Watershed (acres)	Total EWMP Area (acres)
City of Redondo Beach	2,614	1,217	1	3,832 (19%)
City of Manhattan Beach	2,078	350	-	2,428 (12%)
City of Hermosa Beach	832	-	-	832 (4%)
City of Torrance	2,314	5,812	5,181	13,307 (65%)
Total	7,837	7,379	5,182	20,399 (100%)

As shown in Table ES-1, the SMB Watershed receives runoff from all four Beach Cities, while the Dominguez Channel Watershed receives runoff from all Beach Cities with the exception of Hermosa Beach, which is wholly located within the SMB Watershed. The Machado Lake Watershed, on the other hand, primarily receives runoff from only the City of Torrance, which accounts for 99.98% of the watershed within the EWMP Area. The City of Redondo Beach accounts for the remaining 0.02%, although Redondo Beach owns no catch basins or MS4 that are tributary to the Machado Lake Watershed.

This Work Plan utilizes the joint work previously conducted by the agencies of the Beach Cities WMG since 2004 to implement the wet and dry weather Santa Monica Bay Beaches Bacteria Total Maximum Daily Loads (TMDLs) - this work includes a Structural Best Management Practice (BMP) Siting Study and Dry Weather Source Characterization and Control Study for two high priority subwatersheds (including the Manhattan Beach 28th Street storm drain sub-watershed), along with joint development and implementation of public outreach and non-structural control measures targeted at pollutants of concern. Additionally, due to the fact that the City of Torrance is uniquely responsible for runoff to Machado Lake within the Beach Cities EWMP Area, previous work conducted by Torrance for the Machado Lake Watershed will be relied upon to complete the Beach Cities EWMP. Such work includes the Machado Lake Nutrient TMDL Special Study Work Plan (Machado Work Plan), which will support the BMP Implementation Plan for the City of Torrance (and is inclusive of the City of Redondo Beach) to address the Machado Lake Nutrient and Toxics TMDLs.

Water quality priorities for each watershed within the EWMP Area are identified and categorized herein as water body-pollutant combinations with highest, high, and medium priorities, consistent with the Permit requirements and based on existing data sets that meet QA/QC criteria as specified in the Permit. This Work Plan includes a compilation and mapping of existing and planned regional and distributed structural controls identified by City staff and/or in previous work. Regional BMPs will be or have been designed to treat runoff from large drainage areas (for purposes of this EWMP Work Plan). Distributed BMPs are designed to treat runoff from smaller drainage areas and are normally installed to collect runoff close to the source from a limited number of parcels.

This Work Plan describes an approach to performing a Reasonable Assurance Analysis (RAA) to demonstrate that applicable water quality based effluent limitations and receiving water limitations will be achieved through implementation of watershed control measures. This approach uses an updated version of a calibrated GIS-based model (Structural BMP Prioritization and Analysis Tool) employed in the previous Structural BMP Siting Study conducted for the two high priority sub-watersheds. The model will, in some locations, be coupled with a second model, Loading Simulation Model in C++ (LSPC) to simulate hydrology, sediment, and water quality in receiving waters. This approach was presented to the Regional Board on April 9, 2014 on behalf of all Santa Monica Bay EWMP groups and was satisfactorily received by Regional Board staff.

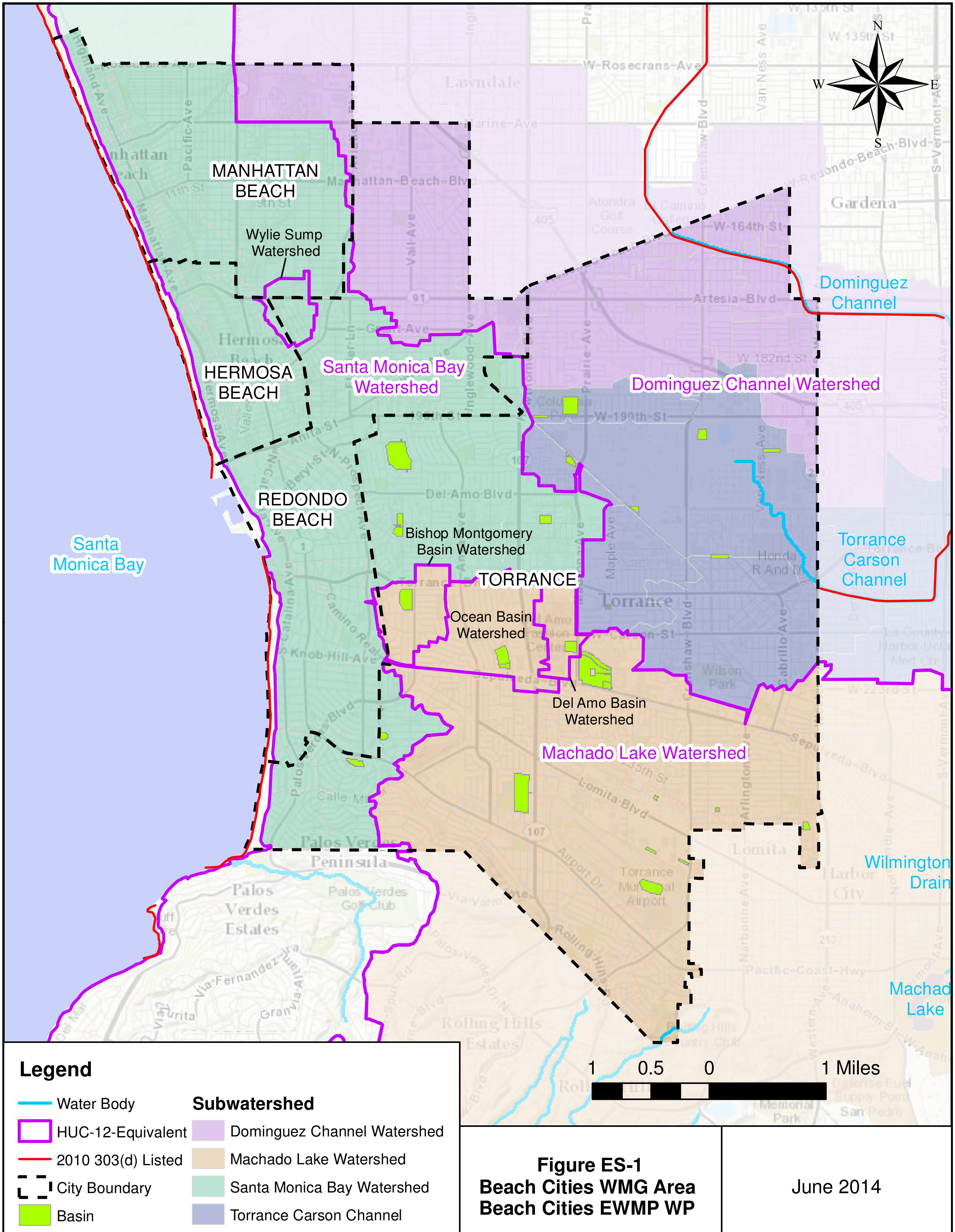

Figure ES-1
Beach Cities WMG Area
Beach Cities EWMP WP

June 2014

1 INTRODUCTION

The 2012 Municipal Separate Storm Sewer System (MS4) Permit [1] (Permit) was adopted on November 8, 2012, by the Los Angeles Regional Water Quality Control Board (Regional Board) and became effective December 28, 2012. The Permit was created for the purpose of protecting the beneficial uses in the receiving waters in the Los Angeles region by ensuring that MS4s in the County of Los Angeles are not causing or contributing to exceedances of applicable water quality objectives. The Permit allows the permittees to customize their stormwater programs through the development and implementation of an Enhanced Watershed Management Program (EWMP) to achieve compliance with certain receiving water limitations (RWLs) and water quality based effluent limits (WQBELs). Following the adoption of the Permit, the cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance, along with the Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an EWMP for both the Santa Monica Bay (SMB) Watershed and Dominguez Channel Watershed areas within their jurisdictions served by the MS4. This group of Permittees is referred to as the Beach Cities Watershed Management Group (Beach Cities WMG).

In compliance with Section VI.C.4.b of the Permit, the Beach Cities WMG submitted a Notice of Intent (NOI) to develop an EWMP on June 27, 2013 with a revised NOI submitted December 17, 2013. On March 27, 2014, the Beach Cities WMG received a letter from the Executive Officer of the Regional Board approving the revised NOI submittal. As a next step in EWMP development, the Beach Cities WMG is required by Section VI.C.4.c.iv of the Permit to submit a work plan for development of the EWMP no later than June 30, 2014. This document has been drafted to serve as the Beach Cities WMG EWMP Work Plan.

The purpose of the Work Plan is to present the basis for, and define the elements of, the methodology that will be utilized by the Beach Cities WMG for the development of their EWMP. This Work Plan includes the following sections that specifically address the major EWMP elements outlined in the Permit:

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[1] Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4.

- **Section 2: Water Body-Pollutant Prioritization.** This section identifies water quality priorities within the Beach Cities EWMP Area (Permit Section VI.C.5.a);
- **Section 3: Stakeholder Process.** This section outlines the process for soliciting meaningful community and stakeholder input (Permit Section VI.C.1.f.v);
- **Section 4: Watershed Control Measures.** This section identifies, selects, and quantifies watershed control measures to achieve Permit compliance (Permit Section VI.C.5.b);
- **Section 5: Reasonable Assurance Analysis Approach.** This section develops an approach to perform a Reasonable Assurance Analysis (RAA) for the water quality priorities within the watershed (Permit Section VI.C.5.b.iv[5]); and
- **Section 6: EWMP Development Schedule and Analysis of Cost.** This section details the timeframe for completion of the EWMP Plan as well as a funding strategy and interim compliance milestones.

The Beach Cities WMG is also in the process of developing a Coordinated Integrated Monitoring Program (CIMP) to meet the monitoring requirements set forth in Attachment E of the Permit. The CIMP is not part of this EWMP Work Plan, but will be submitted to the Regional Board as a separate deliverable.

1.1 Overview of Beach Cities EWMP Area

The agencies of the Beach Cities WMG have been working together since 2004 to implement the previously developed Jurisdictional Groups 5 and 6 Implementation Plan for the Santa Monica Bay Beaches Bacteria (SMBBB) Total Maximum Daily Loads (TMDLs), including a Structural Best Management Practice (BMP) Siting Study and Dry Weather Source Characterization and Control Study for two high priority subwatersheds, along with joint implementation of programmatic solutions. Since 2004 the Beach Cities have also been jointly funding receiving water monitoring consistent with the Coordinated Shoreline Monitoring Plan for the SMBBB TMDLs along the shoreline of the Beach Cities WMG. These ongoing efforts by the Beach Cities WMG to comply with the SMBBB TMDLs provide an effective springboard for the development of an EWMP. Previous work conducted by the City of Torrance will be relied upon to complete the Beach Cities EWMP. Such work includes the Machado Lake Nutrient TMDL Special Study Work Plan (Machado Work Plan), which will support the BMP Implementation Plan for the City of Torrance (and is inclusive of the

City of Redondo Beach)[2] to address the Machado Lake Nutrient and Toxics TMDLs. The Machado Work Plan is included as Appendix D. Previous work also includes the City of Torrance's Stormwater Quality Master Plan, which is included as Appendix E.

The geographic scope of the Beach Cities WMG EWMP encompasses all of the incorporated MS4 areas of the cities of Redondo Beach, Manhattan Beach, Hermosa Beach and Torrance and includes the infrastructure of the LACFCD within those jurisdictions. The beach areas within the geographic area of the Beach Cities WMG do not have any storm drain infrastructure that collects and discharges beach runoff directly to the receiving water and are therefore considered non-point sources and not subject to the MS4 Permit or EWMP requirements. Similarly, the Hermosa Beach and Manhattan Beach piers are not part of the MS4; they are non-point sources excluded from the MS4 Permit scope and therefore the EWMP. The Redondo Beach Pier including the King Harbor Marina are included in the geographic scope of the Beach Cities WMG EWMP as these areas are equipped with MS4 infrastructures.

The Beach Cities EWMP Area is divided into three HUC-12 watersheds[3]: Santa Monica Bay (SMB) Watershed, Dominguez Channel Watershed, and Machado Lake Watershed, as shown in Figure 1.

- The western portion of the Beach Cities EWMP Area consists of approximately 7,840 acres of land that drains to SMB. This accounts for 38.4% of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance, and the entirety of the City of Hermosa Beach. This portion of the study area is hereinafter referred to as the SMB Watershed.
- The northeastern portion of the Beach Cities EWMP Area is tributary to Dominguez Channel[4] (including Torrance Carson Channel) and is comprised of approximately 7,380 acres of land. This watershed accounts for 36.1% of the

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[2] As stated in the executive summary, the City of Redondo Beach accounts for only 0.02% of the Machado Lake Watershed and there are no catch basins within the City of Redondo Beach tributary to Machado Lake – the first catch basin which receives runoff for that area of Redondo Beach is in the City of Torrance. Therefore, the City of Torrance's plans to address the Machado Lake TMDLs are inclusive of the City of Redondo Beach.

[3] A HUC-12 watershed is defined by a 12-digit hydrologic unit code (HUC) delineation, which identifies the watershed area based on six levels of classification: regional, sub-region, hydrologic basin, hydrologic sub-basin, watershed, and subwatershed.

[4] Other portions of the Dominguez Channel Watershed, including LA County Unincorporated areas, are addressed by separate EWMP groups.

total Beach Cities EWMP Area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance. Storm drains from the Cities of Manhattan Beach and Redondo Beach drain through the City of Lawndale before discharging to Dominguez Channel. The City of Torrance's MS4 discharges directly to Dominguez Channel and Torrance Carson Channel (Torrance Lateral). Collectively, this portion of the study area is hereinafter referred to as the Dominguez Channel Watershed.

- The southeastern portion of the Beach Cities EWMP Area is tributary to Machado Lake (including Wilmington Drain) and is comprised of approximately 5,182 acres of land. This watershed accounts for 25.5% of the total Beach Cities EWMP Area. All but 1.2 acres (0.02%) of this area is within the City of Torrance. The City of Redondo Beach owns the remainder of the area, though no Redondo Beach catch basins or MS4 are tributary to Machado Lake.

The Los Angeles County Flood Control District (LACFCD) is not responsible for land within the Beach Cities EWMP Area, but does own and maintain infrastructure within all three watersheds. Background information on the LACFCD is provided in Appendix F. Table 1 provides a breakdown of the Beach Cities EWMP Area by city and tributary watershed.

Table 1. Beach Cities WMG EWMP Area Distribution by Participating City

Participating City	SMB Watershed (acres)	Dominguez Channel Watershed (acres)	Machado Lake Watershed (acres)	Total EWMP Area (acres)
City of Redondo Beach	2,614	1,217	1	3,832 (19%)
City of Manhattan Beach	2,078	350	-	2,428 (12%)
City of Hermosa Beach	832	-	-	832 (4%)
City of Torrance	2,314	5,812	5,181	13,307 (65%)
Total	7,837	7,379	5,182	20,399 (100%)

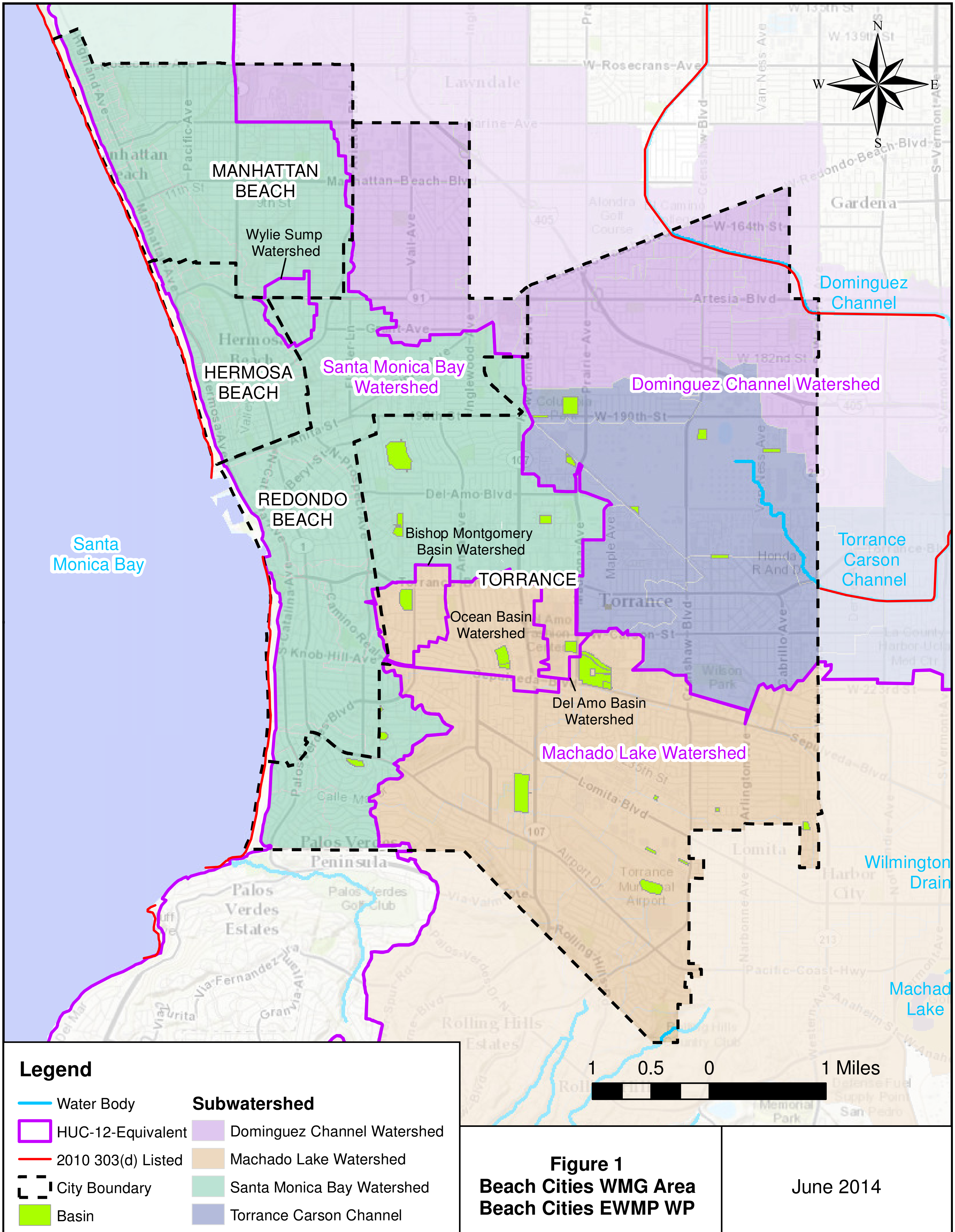


Figure 1
Beach Cities WMG Area
Beach Cities EWMP WP

June 2014

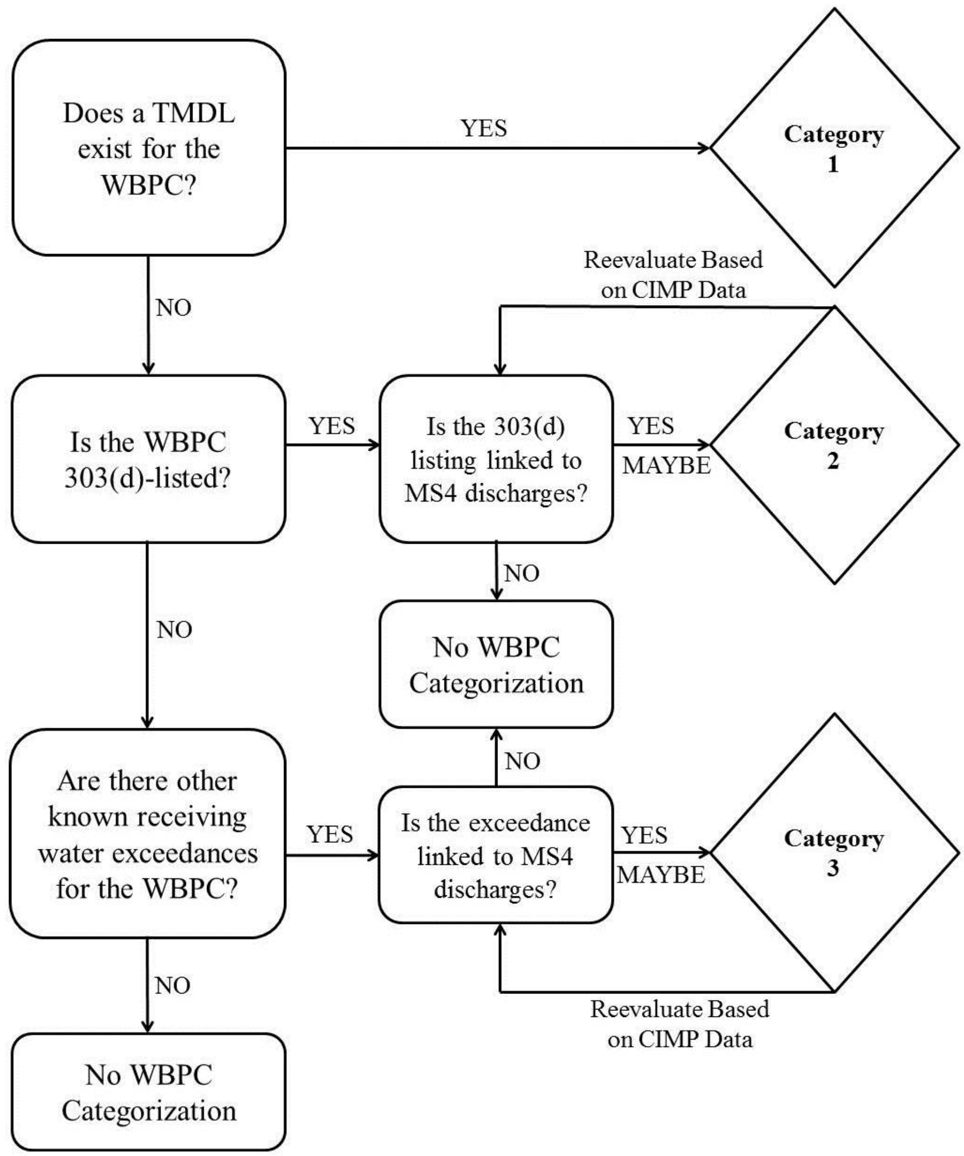
2 Water Body-Pollutant Prioritization

As part of the Work Plan, the Permit requires the Beach Cities WMG to identify water quality priorities within their watershed management area (WMA). To accomplish this, receiving waters for stormwater runoff from the Beach Cities EWMP Area were screened for water quality priorities by reviewing Total Maximum Daily Loads (TMDLs), the State's 303(d) list, and additional water quality data. Each identified water quality priority for a given receiving water body was categorized as a water body-pollutant combination (WBPC). WBPCs were classified into one of three categories, in accordance with Section VI.C.5(a).ii of the Permit:

- Category 1 (Highest Priority): WBPCs for which WQBELs and/or RWLs have been established in an approved TMDL.
- Category 2 (High Priority): Pollutants for which data indicate water quality impairment in the receiving water according to the State's 303(d) list and for which MS4 discharges may be causing or contributing to the impairment.
- Category 3 (Medium Priority): Pollutants for which applicable RWLs contained in the Permit have been exceeded and for which MS4 discharges may be causing or contributing to the exceedances, but which do not have an approved TMDL or are not listed on the 303(d) list.

Figure 2 provides a brief conceptual overview of the process used to identify and categorize the WBPCs within the Beach Cities EWMP Area.

Figure 2. Process for Categorizing Water Body-Pollutant Combinations



In order to categorize and prioritize the WBPCs within the Beach Cities EWMP Area, RWLs from the Water Quality Control Plan, Los Angeles Region (Basin Plan) and the California Ocean Plan were considered, in addition to relevant TMDLs.

With these considerations, the WBPCs within the Beach Cities EWMP Area were categorized. Table 2 presents the prioritized WBPCs within the Beach Cities EWMP Area. WBPCs categorized below are subject to change based on future data collected as part of the CIMP or other monitoring program.

Table 2. Water Body-Pollutant Prioritization for Beach Cities

Category	Water Body	Pollutant	Reason/Justification
1: Highest Priority	SMB Beaches	Dry Weather Bacteria	SMB Beaches Dry Weather Bacteria TMDL
		Wet Weather Bacteria	SMB Beaches Wet Weather Bacteria TMDL
	SMB	Trash/Debris	SMB Debris TMDL
		DDTs	SMB PCBs and DDT TMDL
		PCBs	SMB PCBs and DDT TMDL
	Dominguez Channel (including Torrance Lateral)[c]	Toxicity	Dominguez Channel Toxics TMDL
		Total Copper	Dominguez Channel Toxics TMDL
		Total Lead	Dominguez Channel Toxics TMDL
		Total Zinc	Dominguez Channel Toxics TMDL
	Machado Lake	Trash	Machado Lake Trash TMDL
		Toxics[a]	Machado Lake Pesticides and PCBs TMDL
		Algae	Machado Lake Nutrient TMDL
		Eutrophic[b]	Machado Lake Nutrient TMDL
		Odor	Machado Lake Nutrient TMDL
2: High Priority	Dominguez Channel (including Torrance Lateral)	Indicator Bacteria	303(d) List
	Wilmington Drain	Copper	303(d) List
		Lead	303(d) List
		Coliform Bacteria	303(d) List
3: Medium Priority	Dominguez Channel (including Torrance Lateral)	Cyanide	Historic exeedances of the CTR continuous concentration water quality objective (5.2 ug/L)
		pH	Historic exceedance of the Basin Plan Objective (6.5 – 8.5)
		Selenium	Historic exceedances of the CTR continuous concentration water quality objective (5.0 ug/L)
		Mercury	Historic exceedances of the CTR human health criterion for organisms only (0.051 ug/L)
		Cadmium	Historic exceedances of the CTR continuous concentration water quality objective (2.2 ug/L)

[a] Includes chlordane, dieldrin, PCBs, and DDT. The chem A listing for Machado Lake is a result of chlordane and dieldrin, and so has been left off the Category 2 list.
[b] Includes total nitrogen, total phosphorus, ammonia, chlorophyll a, and dissolved oxygen.

Appendix A (Identification of Water Quality Priorities) characterizes the water quality conditions within the geographical scope of the Beach Cities EWMP Area (excluding the Machado Lake Watershed), identifies water quality priorities, determines WBPCs, and assesses pollutant sources. Appendix D (Machado Work Plan) describes the BMP implementation strategy to address water quality conditions within the Machado Lake Watershed portion of the Beach Cities EWMP Area.

Sections VI.C.2 and VI.C.3 of the Permit describe how compliance with RWLs/WQBELs is attained for the prioritized WBPCs identified. Attachment A of Appendix A sets forth the EWMP framework for evaluating and addressing receiving water exceedances and a brief summary is included below.

Different actions are required to demonstrate compliance for different types of WBPCs. Specifically; the following classifications are addressed by the Permit:

- Water Body-Pollutant Combinations Addressed by a TMDL.
- 303(d)-listed Water Body-Pollutant Combinations: Pollutants in the same class as those identified in a TMDL and for which the water body is 303(d)-listed (Section VI.C.2.a.i), and pollutants not in the same class as those identified in a TMDL, but for which the water body is 303(d)-listed (Section VI.C.2.a.ii).
- Non 303(d)-listed Water Body-Pollutant Combinations: Pollutants for which there are exceedances of receiving water limitations, but for which the water body is not 303(d)-listed (Section VI.C.2.a.iii).

For water body-pollutant combinations already addressed by a TMDL, adherence to all requirements and compliance dates as set forth in the approved EWMP will constitute compliance with applicable interim TMDL-based water quality based effluent limits and interim receiving water limits. 303(d)-listed water body-pollutant combinations are equivalent to the identified Category 2 combinations. With the understanding that water body-pollutant combinations may be added to the Category 2 list based on future monitoring data, an approach to address both types of 303(d)-listed water body-pollutant combinations is outlined in Attachment A of Appendix A. Finally, Permit Section C.2.a.iii discusses the requirements for pollutants for which there are exceedances of receiving water limitations, but for which the water body is *not* 303(d)-listed. At this time, due to inadequate available data, no additional pollutants have been linked to MS4 discharges. As a result, these combinations (along with any potential future WBPCs) will ultimately be identified based on data collected pursuant to the approved CIMP. If and when sufficient CIMP monitoring data suggest that MS4 discharges may[5] have caused or contributed, or have reasonable potential to cause or contribute, to the exceedance of receiving water limitations, then the EWMP will be modified based on the approach in Attachment A of Appendix A.

3 STAKEHOLDER PROCESS

Section VI.C.1.f.v of the Permit requires that an appropriate opportunity be provided for meaningful stakeholder input to the EWMP. The EWMP Group will conduct both public and focused outreach efforts to support EWMP development. The Permit also requires participation in the Permit-wide technical advisory committee (TAC). The Beach Cities WMG has, and will continue to, actively participate in the TAC throughout the EWMP process.

The Beach Cities WMG is conducting EWMP-related outreach meetings with community groups, NGOs, the general public, and/or other potential project partners and stakeholders to solicit input on the scope and content of the EWMP. The first such meetings were held on May 21, 2014 and May 29, 2014 at two separate venues in order to provide an overview of the EWMP Development Process and the CIMP. The Beach Cities WMG technical consultants also briefed the Regional Board to specifically preview the approach to demonstrating with reasonable assurance that water quality targets will be met. This approach is described herein. At least one additional outreach meeting will be held once the EWMP Work Plan has been approved by the Regional Board and progress in such EWMP development is underway. Feedback received will be incorporated into the EWMP (and CIMP), as appropriate.

4 WATERSHED CONTROL MEASURES

The Permit requires the Beach Cities WMG to identify strategies, control measures, and best management practices (BMPs)[6] to implement within their WMA. Existing BMPs are those BMPs that have been constructed or are under construction at the time of drafting this Work Plan. Planned BMPs are those BMPs which have been identified in previous studies and conceptual designs have been initiated. These BMPs are not

[5] Where CIMP monitoring data demonstrate that MS4 discharges may have caused or contributed to the exceedance of receiving water limitations, it should be noted that this does not constitute any admission of known contributions, but reflects uncertainty in linking datasets.

[6] For simplification, the term "BMP" will be used throughout this Work Plan to collectively refer to strategies, control measures, and/or best management practices.

necessarily funded at this time and their future construction depends on a number of factors which have not necessarily been evaluated at this stage of the EWMP development. Such factors include technical feasibility, constructability, cost, and modeled performance during the RAA, among others. Potential BMPs are those BMPs which have been identified for possible implementation, but no design plans have been initiated at this time. Appendix B summarizes existing, planned, and potential BMPs within the Beach Cities EWMP Area.

There are two categories of structural BMPs, largely defined by the runoff area treated by the BMP: regional BMPs and distributed BMPs. Regional BMPs are designed to treat runoff from large drainage areas often including multiple parcels and various land uses. Distributed BMPs are designed to treat runoff from smaller drainage areas and are normally installed to collect runoff close to the source from a limited number of parcels. Additionally, "Regional EWMP projects" are defined from this point forward as regional BMPs that can capture and retain the 85th percentile, 24-hour storm event (based on the Permit definition).

4.1 Existing Regional EWMP Projects

There are four regional EWMP projects within the Beach Cities EWMP Area: the Wylie Sump in Redondo Beach and the Ocean, Bishop, and Del Amo retention basins in Torrance.

According to historic operational experience from the staff of City of Redondo Beach, the Wylie Sump captures and retains more than the 85th percentile design storm from its entire 131 acre tributary area within the SMB Watershed—the basin reportedly has no outlet nor has it overflowed within the past 70 years. Areas tributary to the Wylie Sump include 73 acres from the City of Redondo Beach, 38 form the City of Manhattan Beach, and 20 acres from the City of Hermosa Beach).

The Ocean, Bishop Montgomery, and Del Amo Retention Basins in the Machado Lake Watershed within the City of Torrance capture and retain at least the full 85th percentile design storms for their respective tributary areas, according to city staff. The Ocean Retention Basin receives stormwater runoff from an area of approximately 491 acres consisting primarily of single family residential and commercial developments. With a storage volume of 213 acre-ft, the basin was designed to contain approximately 106% of the 50-year, 24-hour storm event (5.5 inches) for the drainage area. Similarly, the Bishop Montgomery Retention Basin, which has a storage volume of 122 acre-ft, was designed to contain 117% of the runoff produced by the same 50-year, 24-hour storm event. The 292-acre drainage area to the Bishop Montgomery Retention Basin primarily consists of single and multi-family residential development. Historic observations by city staff dating to 1982 show no records of basin overflow for either of these basins. Both basins were recognized by the Regional Board as valid SUSMP treatment controls in October 2003. The Del Amo Retention Basin is privately owned and functions as an infiltration and retention basins for all the Del Amo Mall properties in the City of Torrance. The basin captures runoff from a drainage area of 156 acres, and also was designed with sufficient capacity to retain the runoff from the 50-year, 24-hour storm event.

4.2 Existing, Planned, and Potential Regional and Distributed BMPs

Table 3 provides a summary of the existing, planned, and potential regional and distributed structural BMPs within the Beach Cities EWMP Area. Additional details for these BMPs, including an analysis of BMP effectiveness data and a detailed table including project names, are provided in Appendix B. Figure 3 shows the location of these BMPs based on available data and the following sections provide a brief summary of the existing regional and distributed BMPs.

Table 3. Summary of Existing, Planned, and Potential BMPs within the Beach Cities EWMP Area

Agency	Regional BMPs[1]				Distributed BMPs				Total
	Existing	Planned	Potential	Total	Existing	Planned	Potential	Total	
Hermosa Beach	3	3	1	7	107	1	2	110	**117**
LACFCD	3	-	-	3	-	-	-	0	**3**
Manhattan Beach	7	5	-	12	101	-	4	105	**117**
Redondo Beach	5	2	2	9	127	-	7	134	**143**
Torrance	18	-	-	18	242	-	2	244	**262**
Total	**36**	**10**	**3**	**49**	**577**	**1**	**15**	**593**	**642**

[1]Regional projects shown are not necessarily equivalent to the Permit-specified “regional EWMP projects,” which must retain (i) all non-stormwater runoff and (ii) all stormwater runoff from the 85th percentile, 24-hour storm event for the drainage areas tributary to the projects.

P:\GIS\Projects\LA0298 - SouthbayEWMP\Projects\SBBC EWMP Figure 3 ExistingandPlannedStructBMPs 061014.mxd sl 6/11/2014

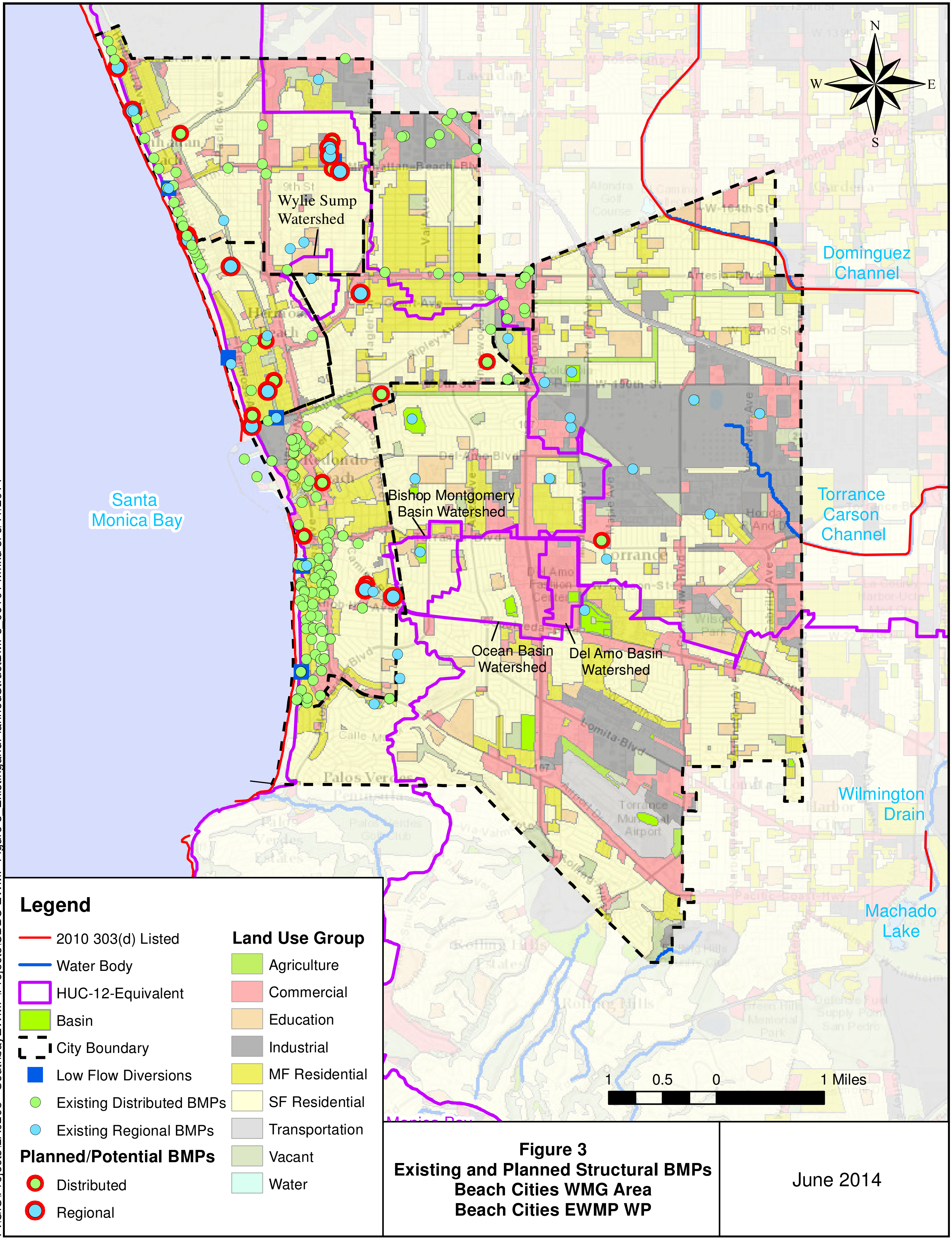


Figure 3
Existing and Planned Structural BMPs
Beach Cities WMG Area
Beach Cities EWMP WP

June 2014

4.2.1 *Existing Regional BMPs*

Table 4 summarizes the number of existing regional BMPs (and BMP types) within the Beach Cities EWMP Area. These numbers reflect BMPs that have been implemented or retrofitted since the applicable TMDL. Although these BMPs do not necessarily meet the Permit's design criterion for a "Regional EWMP project," the BMPs do capture and/or treat runoff from large tributary areas.

Table 4. Summary of Existing Regional/Centralized BMPs by BMP Type

Permittee	Number of Existing Regional BMPs					Total
	Infiltration	Detention	Retention	Low Flow Diversion	Constructed Wetland	
Hermosa Beach	3[a]	-	-	-	-	**3**
Manhattan Beach	1	3	1	1	1[b]	**7**
Redondo Beach	2		1	2	-	**5**
Torrance	-	16	-	1	1	**18**
LACFCD	-	-	-	3	-	**3**
Total	**3**	**19**	**2**	**7**	**2**	**36**

[a]The "Pier Avenue Improvement Infiltration Systems" project actually contains 31 water quality inlets, each with infiltration galleries, and could therefore be considered a distributed BMP; however, it is assumed to be one regional BMP to avoid double counting.
[b] Polliwog Park Wet Pond

4.2.2 *Existing Distributed BMPs*

Table 5 provides a compilation of known existing distributed BMPs for the Beach Cities WMG. Like the existing regional BMPs, these numbers reflect BMPs that have been implemented or retrofitted since the applicable TMDL.

Table 5. Summary of Existing Distributed BMPs by BMP Type

	Existing Distributed BMPs				
BMP Type	**Hermosa Beach**	**Manhattan Beach**	**Redondo Beach**	**Torrance**	**Total**
Biofiltration	-	-	2	-	**2**
Bioswale	-	-	-	1	**1**
Catch Basin Insert	41	11	66	30	**148**
Clarifier	-	5	2	-	**7**
Detention Basin	-	-	2	-	**2**
Green Roof	2	1	-	-	**3**
Hydrodynamic Separator	-	10	7	10	**27**
Infiltration	27	4	39	-	**70**
Low Flow Diversion	-	2	1	-	**3**
Porous Pavement	2	7	7	-	**16**
Rainwater Harvesting	-	-	1	-	**1**
Trash Excluder	35	57	-	201	**293**
Trench Drain Insert	-	4	-	-	**4**
Total	**107**	**101**	**127**	**242**	**577**

4.3 Minimum Control Measures (MCMs)

Participating agencies are continuing to implement the MCMs required under the 2001 MS4 Permit. Applicable new MCMs will be implemented by the time the EWMP is approved by the Regional Board.

The Permit requires the permittees to implement prescribed MCMs in each of six categories/programs: Public Information & Participation, Industrial/Commercial Facilities, Planning & Land Development, Development Construction, Public Agency Activities, and Illicit Connection & Illicit Discharges Elimination. These measures include procedures such as outreach programs, inspections, and reporting requirements designed to reduce runoff-related pollution within each permittees' MS4 area. Although structural BMPs may be implemented as part of MCM programs, the MCMs themselves are considered non-structural BMPs. MCMs in each of these categories are already being implemented by the Beach Cities WMG as prescribed under the previous MS4 Permit (Order 01-182), and in some cases MCM program enhancements have been implemented to address watershed priorities for TMDL implementation. A summary of existing MCMs/non-structural BMPs for each Beach Cities WMG Agency is provided in Attachment E of Appendix B.

The Permit gives permittees that are developing an EWMP the opportunity to customize the MCMs specified in the Permit to focus resources on high priority issues within their watersheds. Modifications to the MCMs must be appropriately justified and still be consistent with 40 CFR § 122.26(d)(2)(iv)(A)-(D). A control measure may only be eliminated based on the justification that it is not applicable to a particular permittee (per Section IV.C.5.b.iv.1(c) of the Permit). Customized measures, once approved as part of the EWMP, will replace in part or in whole the prescribed MCMs in the Permit. The Planning & Land Development Program is not eligible for customization in that it may be no less stringent than the baseline requirements in the Permit. However, it can be enhanced over the baseline permit requirements such as LA County has done in its LID ordinance, thereby yielding additional pollutant and stormwater volume control for the watershed.

The following steps provide a general framework for MCM customization:

- Identify MCMs for potential customization.
- Identify MCMs which are not applicable.
- Assess the effectiveness of the incremental baseline MCM requirements with respect to water quality priorities.
- Quantify the additional resources required to implement the incremental baseline MCMs.
- Assess the effectiveness and resources required to implement the customized MCM.
- Compare the assessed effectiveness and resources required to implement the incremental baseline MCMs and the customized MCMs.
- Document the customized MCM justification.

This customization framework provides a general process to justify customization of MCMs. The Beach Cities WMG will conduct the customization, develop justification, and provide the materials for documentation in the EWMP. These materials may include any of the information outlined in the above framework to modify or eliminate a MCM. The customization of MCMs will be evaluated separately by each Agency and included in the EWMP, although coordination among the Beach Cities WMG Agencies will occur where feasible.

5 Reasonable Assurance Analysis Approach

The Permit-required Reasonable Assurance Analysis (RAA) will identify and evaluate potential BMP implementation scenarios within the Beach Cities EWMP Area. Specifically, the Permit requires that the RAA be conducted for the prioritized WBPCs identified in the EWMP. The RAA must demonstrate that the proposed BMP implementation scenario(s) will reasonably achieve compliance with applicable water quality standards. The approach was developed to conform with the Regional Board RAA Guidance document, while meeting the functional needs of the Beach Cities study area, as well as the specific attributes of the priority pollutants and receiving waters.

In order to leverage previous work conducted by the Beach Cities EWMP WMG agencies for two high priority subdrainages in the Santa Monica Bay and by the City of Torrance through its Machado Work Plan and Stormwater Quality Master Plan, multiple approaches are proposed for the RAA. These different approaches are summarized in the following:

- The Reasonable Assurance Analysis Approach (Appendix C) describes the RAA methodology and modeling approaches for the Beach Cities WMG EWMP in the Cities of Redondo Beach, Manhattan Beach and Hermosa Beach.. This approach was presented to the Regional Board on April 9, 2014 on behalf of all Santa Monica Bay jurisdictions.
- Attachment B of Reasonable Assurance Analysis Approach describes the City of Torrance’s RAA methodology and modeling approach for the Torrance’s EWMP Area for the Dominguez Channel and Santa Monica Bay.
- Appendix D (Machado Work Plan) presents the City of Torrance’s RAA approach methodology for the EWMP Area within the Machado Lake Watershed.

5.1 RAA Process –Dry Weather

The dry weather RAA process will be conducted using a decision tree approach as shown in Figure 4. In summary, the approach is to determine that reasonable assurance is demonstrated if

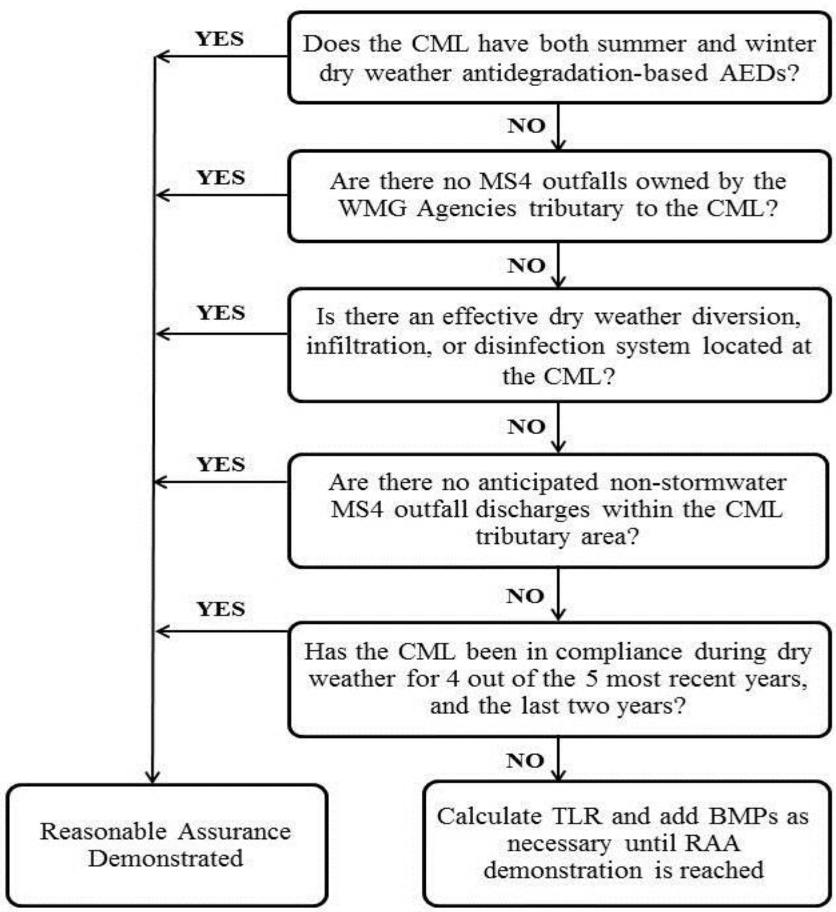
- Coordinated Monitoring Locations (CMLs) indicate that the standard is to ensure no further degradation occurs (anti-degradation),

- there are no MS4 outfalls, there are dry-weather (or low flow) diversions within the storm drains,
- there are no discharges of flow or pollutants from the MS4, or
- the locations is already in compliance the vast majority of time.

If these cannot be demonstrated, the RAA analysis includes establishing Target Load Reductions (TLRs), which will serve as the basis for demonstrating compliance.

Where additional BMPs are found to be necessary to demonstrate reasonable assurance, they will be quantified using manual or spreadsheet-based static methods (e.g., estimation of urban runoff reduction resulting from programs targeting water waste and over-irrigation).

Figure 4. Dry Weather Bacteria TMDL RAA Process Overview

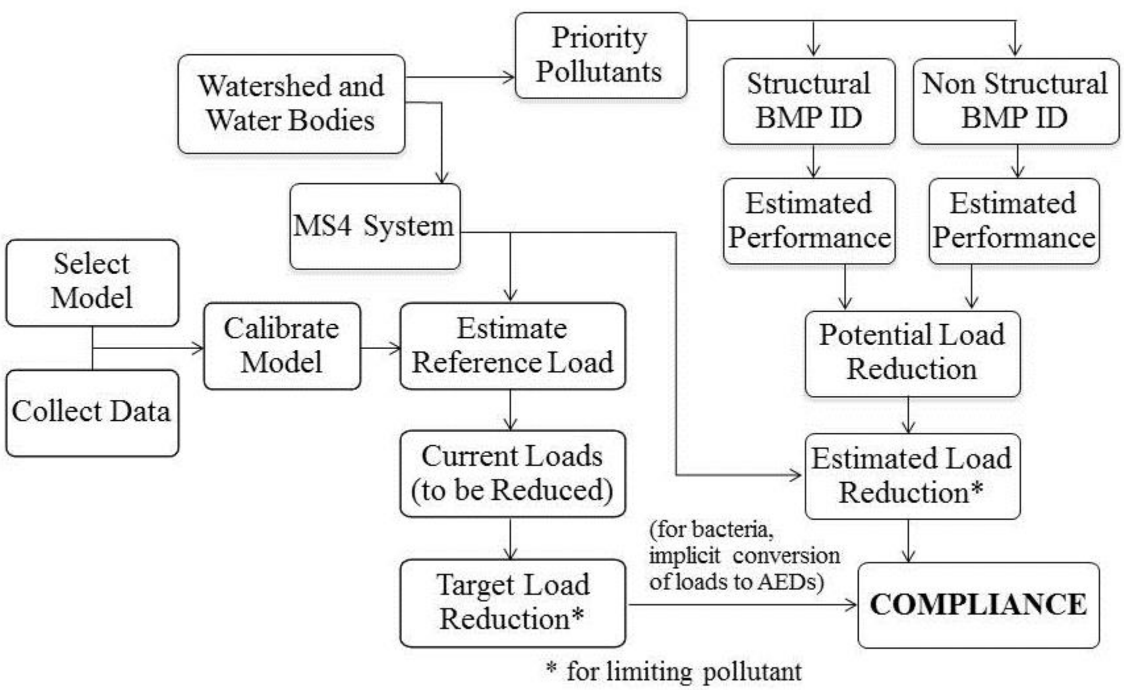


5.2 RAA Process - Wet Weather

The wet weather RAA process, depicted in Figure 5, will generally consist of the following steps:

- Identify WBPCs for which the RAA will be performed;
- Identify the MS4 service area (exclude lands of agencies not party to this EWMP such as Federal land, State land, etc.);
- Determine limiting pollutant and develop target load reductions for at least the 90th percentile year (based on wet days) based on Regional Board guidance;
- Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future;
- Evaluate the performance of these BMPs in terms of annual pollutant load reductions;
- Compare these estimates with the targets; and
- Revise the BMP implementation scenario until targets are met.

Figure 5. Wet Weather RAA Process Overview



Target load reductions represent a numerical expression of the Permit compliance metrics (e.g., bacteria allowable exceedance days (AEDs) for dry and wet weather) that can be modeled and can serve as a basis for confirming that the EWMP is in compliance with the Permit. The efforts described therein, if appropriately implemented, will provide reasonable assurance of Permit compliance.

The RAA modeling process assesses quantifiable non-structural BMPs[7] and structural BMPs to assess water quality improvements (load reductions). The initial analyses will evaluate the BMPs that have been implemented since the effective dates of applicable TMDLs. If compliance is not reasonably assured, planned non-structural and structural BMPs will be modeled with consideration of scheduled completion in the context of the prioritized water body-pollutant combinations and compliance deadlines (including interim milestone dates). If compliance is still not achieved by the combination of both current and planned BMPs, additional BMPs will be selected in order to achieve compliance. These BMPs will be selected based on pollutants targeted, siting options, and maintenance preferences, among other criteria.

5.3 Analysis Tools

The SMB, Dominguez Channel, and Machado Lake Watersheds will utilize analytical tools for performing the RAA. These include the following:

5.3.1 LSPC

Loading Simulation Program in C++ (LSPC) is a publically available watershed model that was developed for the Los Angeles County Flood Control District (LACFCD) in connection with the Watershed Management Modeling System (WMMS). This model uses Hydrologic Simulation Program Fortran (HSPF) algorithms to simulate hydrology, sediment transport, water quality on land, and fate and transport within streams. GIS is used for the spatial component of the analysis in addition to visualization. The LSPC model has been calibrated for the following pollutants in the Dominguez Channel Watershed: fecal coliform, total nitrogen, total phosphorus, copper, lead, and zinc.

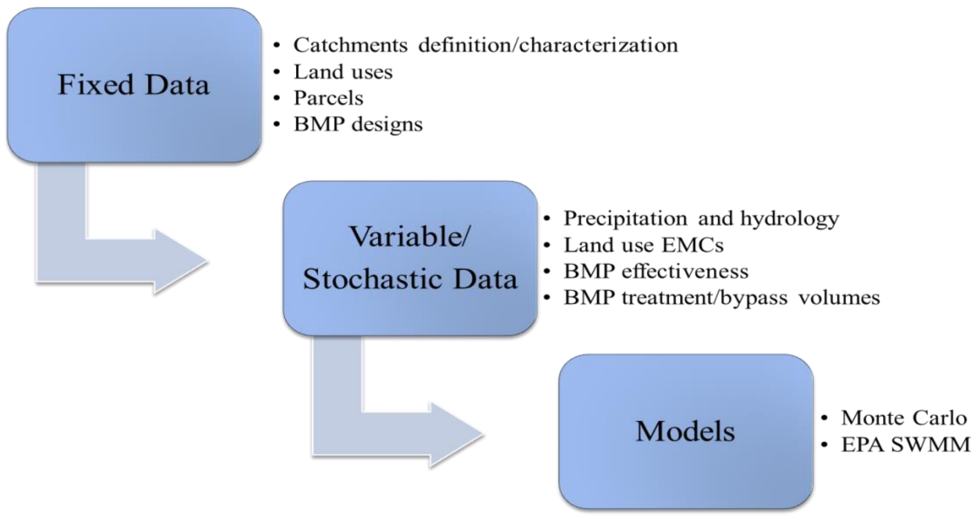
5.3.2 SBPAT

The Permit-cited Structural BMP Prioritization and Analysis Tool (SBPAT) utilizes land use based event mean concentrations (EMCs) available as of 2012, USEPA's Storm Water Management Model (SWMM), USEPA/American Society of Civil Engineers/Water Environment Research Foundation (USEPA/ASCE/WERF)

[7] Non-structural BMPs will be evaluated using available data and best professional judgment. All assumptions and references will be documented.

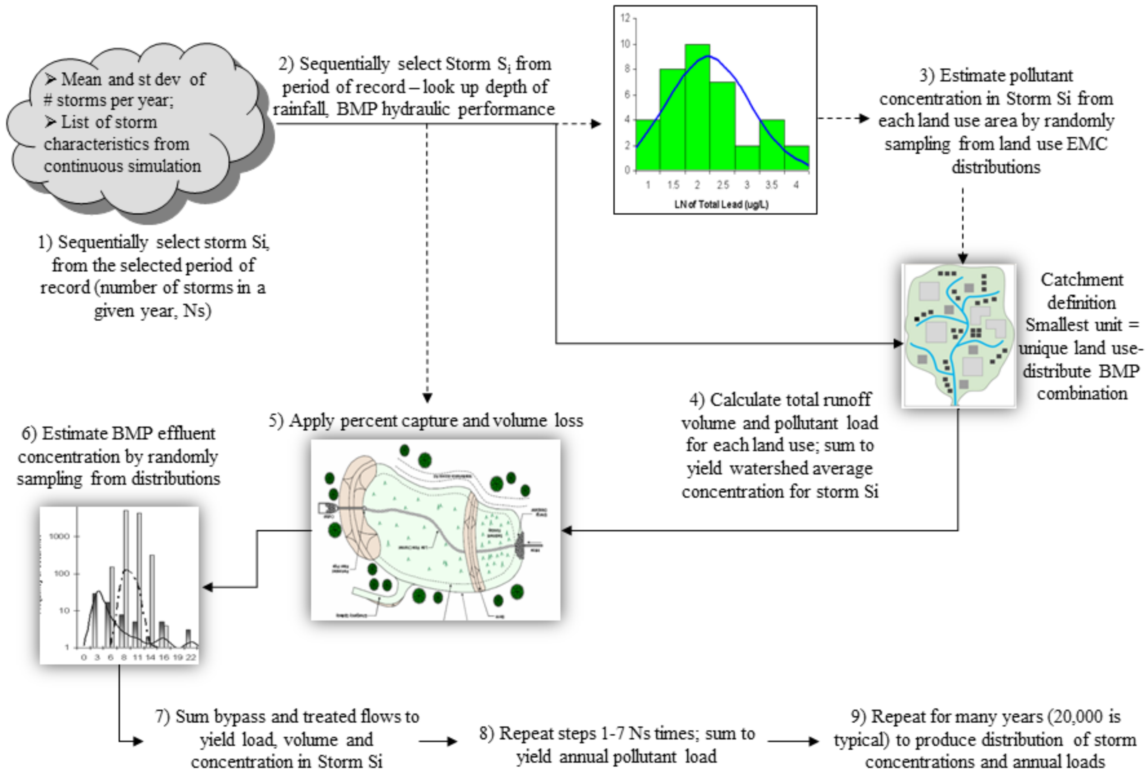
International BMP Database (IBD) water quality concentrations (current as of 2012), current watershed/GIS data, and a Monte Carlo approach to quantify water quality benefits and uncertainties. SBPAT's model data flow is illustrated below in Figure 6.

Figure 6. SBPAT Model Data Flow



Each model simulation integrates Monte Carlo methods that rely on repeated random sampling to obtain numerical results. Model simulations are run 20,000 times to calculate a distribution of outcomes that can support the definition of confidence levels and quantify variability. Consistent with the SBPAT usage, Monte Carlo methods are typically used in physical and mathematical problems and are most suited when it is difficult to obtain a closed-form expression or when a deterministic algorithm is not desired. A schematic of SBPAT's Monte Carlo process is provided in Figure 7.

Figure 7. SBPAT Monte Carlo Method Components



5.3.3 PLAT

The Torrance Pollutant Loading and Analysis Tool (PLAT) is proposed within the Torrance boundaries. PLAT is a model linking various publicly available models including: USEPA's PLOAD, the Program for Predicting Pollution Particle Passage thru Pits, Puddles, & Ponds (P8), and USEPA's SUSTAIN.

5.4 RAA Model Analysis Approach

- Within portions of the Dominguez Channel Watershed WMMS' LSPC will be used to establish a baseline and set target load reductions for the pollutants of concern. In the Manhattan Beach and Redondo Beach portions, SBPAT will be utilized for BMP modeling to meet the established targets.
- The portion of the Dominguez Channel Watershed within the City of Torrance will utilize PLAT to demonstrate compliance.
- In the SMB Watershed, SBPAT will be used for both setting target load reductions and BMP modeling to meet the established targets.

- Modeling in the Machado Lake Watershed portion of the Beach Cities EWMP Area will be conducted in accordance with the Machado Work Plan.

A summary of the approaches used by each area and agency is provided in Table 6.

Table 6. RAA Models Proposed for Various City-Watershed Areas

Watershed	City	Model Selection	
		Set Target Load Reduction	**Perform RAA**
Santa Monica Bay	Manhattan Beach	SBPAT	SBPAT
	Hermosa Beach	SBPAT	SBPAT
	Redondo Beach	SBPAT	SBPAT
	Torrance	SBPAT	SBPAT
Dominguez Channel	Manhattan Beach	LSPC	SBPAT
	Redondo Beach	LSPC	SBPAT
	Torrance	LSPC	PLAT
Machado Lake	Torrance	Machado Work Plan	Machado Work Plan

5.5 Alternative Approaches

The above approach describes one method for demonstrating reasonable assurance. Alternatively, fecal coliform target load reductions can also be estimated using an SBPAT modeling approach where a hypothetical infiltration basin at each subwatershed outlet is sized so that discharge frequency meets the AEDs, with the target load reduction values then set equivalent to the load reduction achieved by the hypothetical outlet infiltration basin. On June 6, 2014, this alternative approach for estimating TLRs for bacteria was presented to the Regional Board, who expressed initial support of the approach.

5.6 Output and Presentation of Results

Quantitative output will be produced for the identified WBPCs in the RAA.[8] Output will include total runoff and pollutant load estimates for pre- and post-BMP scenarios, and will include non-structural and phased structural BMPs so that target load reductions can be expected to be met for the scheduled compliance dates. Ranges of results will also be reported (e.g., load with confidence intervals). Results may be broken down by jurisdiction at the discretion of the EWMP Group.

[8] If monitoring data collected as part of the CIMP demonstrate that additional WBPCs should be identified as Category 2 or 3 due to MS4 contributions, the RAA will be updated accordingly to include these WBPCs.

6 Development of EWMP Schedule and Cost Opinions

6.1 Schedule

The following schedule sets forth the planned timeline that will be met by the Beach Cities WMG to complete their EWMP Plan. The schedule adheres to deliverable dates dictated by the Permit while also setting interim milestones. Dates in bold represent Permit-specified deliverable dates for submittal to the Regional Board. Interim milestones are not Permit-specified. Therefore, interim milestones may be subject to change. The compliance schedule required per Section VI.C.5.c of the Permit will be included in the EWMP.

Table 7. EWMP Compliance Schedule

Item	Date
Final EWMP Work Plan to Regional Board	**June 30, 2014**
Finalize Approach to Addressing Exceedances of Receiving Water Limits	August 2014
Identify and Screen Regional Project(s)	September 2014
Identify Selected BMPs and Conduct RAA	December 2014
Develop Project Schedules and Cost Estimates	February 2015
Complete First Draft of EWMP Plan for Internal Review	April 2015
Submit Draft EWMP Plan to Regional Board	**June 30, 2015**
Comments on Draft EWMP Plan Provided by Regional Board	October 31, 2015[a]
Submit Final EWMP Plan to Regional Board	**January 31, 2016[b]**
Approval or Denial of Final EWMP Plan by Regional Board	April 30, 2016[c]

[a] The date specified in the Permit is 4 months after submittal of the Draft EWMP Plan.
[b] The date specified in the Permit is 3 months after receipt of Regional Water Board comments on the draft Plan. Therefore, this date is subject to change based on receipt of comments from the Regional Board.
[c] The date specified in the Permit is 3 months after submittal of the final EWMP Plan.

The schedule above does not include deliverable dates related to the CIMP. It is understood that the CIMP will be submitted to the Regional Board by June 30, 2014, and that initiation of monitoring under the CIMP will commence within 90 days of approval of the CIMP by the Regional Board.

6.2 Costs

Section VI.C.1.g of the Permit requires that a financial strategy is in place for EWMP implementation and that the effectiveness of EWMP funds is maximized through the analysis of various implementation scenarios.

Based on the RAA, preliminary planning level cost opinions will be developed for implementation of the proposed watershed control measures. The cost analysis will include consideration of planning, design, permits, construction, operation and maintenance, land acquisition, and other factors as appropriate. Potential funding mechanisms will be discussed in the EWMP. BMP phasing will then be based on both interim target compliance (based on the RAA) and the projected availability of funds.

7 References

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City of Redondo Beach, City of Manhattan Beach, City of Hermosa Beach, City of Torrance, Los Angeles County Flood Control District (Beach Cities), 2013. (Revised) Notice of Intent Enhanced Watershed Management Program and Coordinated Integrated Monitoring Program. December 17.

City of Redondo Beach, City of Manhattan Beach, City of Hermosa Beach, City of Torrance, Los Angeles County Flood Control District (Beach Cities), 2013. Notice of Intent Enhanced Watershed Management Program and Coordinated Integrated Monitoring Program. June 28.

APPENDIX A

Identification of Water Quality Priorities

Beach Cities EWMP Work Plan Appendix A
IDENTIFICATION OF WATER QUALITY PRIORITIES

Prepared for

The Los Angeles Regional Water Quality Control Board

Prepared by

Beach Cities Watershed Management Group

(Cities of Hermosa Beach, Manhattan Beach, Redondo Beach, and Torrance and the Los Angeles County Flood Control District)

June 2014

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List of Attachments

1 INTRODUCTION

The 2012 Municipal Separate Storm Sewer System (MS4) Permit[1] (Permit) was adopted on November 8, 2012, by the Los Angeles Regional Water Quality Control Board (Regional Board) and became effective December 28, 2012. The Permit was created for the purpose of protecting the beneficial uses in the receiving waters in the Los Angeles region by ensuring that MS4s in the County of Los Angeles are not causing or contributing to exceedances of applicable water quality objectives. The Permit allows the Permittees to customize their stormwater programs through the development and implementation of an Enhanced Watershed Management Program (EWMP) to achieve compliance with certain Receiving Water Limitations (RWLs) and water quality based effluent limits (WQBELs). Following the adoption of the Permit, the cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance along with the Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an EWMP for both the Santa Monica Bay Watershed and Dominguez Channel Watershed areas within their jurisdictions that are served by an MS4. This group of Permittees is hereinafter referred to as the Beach Cities Watershed Management Group (Beach Cities WMG) and is led by the City of Redondo Beach.

The Beach Cities WMG is required by the Permit to identify water quality priorities within their EWMP Area. This doucment characterizes water quality conditions within the geographical scope of the Beach Cities WMG EWMP Area, identifying water quality priorities, determining water body-pollutant classifications, and assessing pollutant sources. The analysis presented herein conforms to Part VI.C.5.a of the Permit, which states:

> *"Permittees shall identify the water quality priorities within each Watershed Management Area (WMA) that will be addressed by the [EWMP]. At a minimum, these priorities shall include achieving applicable water quality-based effluent limitations and/or receiving water limitations established pursuant to TMDLs, as set forth in Part VI.E and Attachments L through R of [the Permit]."*

[1] Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4.

1.1 Overview of EWMP Area

This document addresses two of the three HUC-12 watersheds within the Beach Cities WMG Area[2,3]: Santa Monica Bay (SMB) Watershed and Dominguez Channel Watershed, as shown in Figure 1.

- The western portion of the Beach Cities WMG Area consists of approximately 7,840 acres of land that drains to SMB. This accounts for 38.4% of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance, and the entirety of the City of Hermosa Beach. This portion of the study area is hereinafter referred to as the SMB Watershed.
- The northeastern portion of the Beach Cities WMG Area is tributary to Dominguez Channel[4] (including Torrance Carson Channel) and is comprised of approximately 7,380 acres of land. This watershed accounts for 36.1% of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance. Storm drains from the Cities of Manhattan Beach and Redondo Beach drain through the City of Lawndale before discharging to Dominguez Channel. The City of Torrance's MS4 discharges directly to Dominguez Channel and Torrance Carson Channel (Torrance Lateral). Collectively, this portion of the study area is hereinafter referred to as the Dominguez Channel Watershed.

The Los Angeles County Flood Control District (LACFCD) is not responsible for land within the Beach Cities WMG, but does own and maintain infrastructure throughout the WMG. Table 2-1 provides a breakdown of the Beach Cities WMG Area by city and tributary watershed.

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[2] A HUC-12 watershed is defined by a 12-digie hydrologic unit code (HUC) delineation, which identifies the watershed area based on six levels of classification: regional, sub-region, hydrologic basin, hydrologic sub-basin, watershed, and subwatershed.

[3] The southeastern portion of the Beach Cities WMG Area is tributary to Machado Lake (including Wilmington Drain) and is comprised of approximately 5,182 acres of land. This watershed accounts for 25.5% of the total Beach Cities WMG area. All but 1.2 acres (0.02%) of this area is within the City of Torrance. A separate BMP Implementation Plan has been submitted to the Regional Board by the Cities of Torrance and Redondo Beach to address this watershed. This BMP Implementation Plan is included as Appendix D of the EWMP Work Plan.

[4] Other portions of the Dominguez Channel Watershed, including LA County Unincorporated areas, are addressed by separate EWMP groups.

Table 1-1. Beach Cities WMG EWMP Area Distribution by Participating City

Participating City	SMB Watershed (acres)	Dominguez Channel Watershed (acres)	Total Area (acres)
City of Redondo Beach	2,614	1,217	3,831 (25%)
City of Manhattan Beach	2,078	350	2,428 (16%)
City of Hermosa Beach	832	-	832 (6%)
City of Torrance	2,314	5,812	8,126 (53%)
Total	7,837	7,379	15,217 (100%)

A separate BMP Implementation Plan has been submitted by the Cities of Torrance and Redondo Beach to address Machado Lake Nutrient and Toxics TMDLs. As a result, the EWMP being developed for the Beach Cities WMG excludes the Machado Lake Watershed. The BMP Implementation Plan for Machado Lake is included as Appendix D of the EWMP Work Plan. The remainder of this document is focused on the SMB Watershed and Dominguez Channel Watershed within the Beach Cities EWMP Area.

2 WATER QUALITY CHARACTERIZATION

The Los Angeles Region Water Quality Control Plan (commonly referred to as the “Basin Plan”) (Regional Board, 1995, updated 2011) identifies inland receiving waters within the Los Angeles region and sets regulatory objectives for these receiving waters. Within the SMB Watershed, identified receiving water bodies include SMB itself as well as coastal beaches within the Beach Cities WMG Area. Regulations set forth in the California Ocean Plan (SWRCB, 2012a) are therefore also applicable to the SMB Watershed. For the greater Dominguez Channel Watershed, the Basin Plan lists Dominguez Channel and Machado Lake as the only receiving water bodies within the Beach Cities WMG Area with designated beneficial uses. In addition, Torrance Carson Channel (Torrance Lateral) and Wilmington Drain, which are tributary to Dominguez Channel and Machado Lake, respectively, are listed as “major surface waters” in the Basin Plan. These receiving water bodies are shown on Figure 1.

Both the Basin Plan and Ocean Plan regulate waste discharges to protect the quality of surface waters for use and enjoyment by the general public. Regulations set forth in the Basin Plan are based on assigned beneficial uses for each receiving water body. Beneficial use designations for receiving waters within the Beach Cities WMG Area include:

- **Municipal and Domestic Supply (MUN)**: Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
- **Industrial Service Supply (IND)**: Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water

supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

- **Navigation (NAV)**: Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.
- **Water Contact Recreation (REC-1)**: Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, what water activities, fishing, or use of natural hot springs.
- **Non-Contact Water Recreation (REC-2)**: Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- **High Flow Suspension (HFS)**: Applies to water contact recreational activities associated with the swimmable goal regulated under the REC-1 use, non-contact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities.
- **Commercial and Sport Fishing (COMM)**: Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
- **Warm Freshwater Habitat (WARM)**: Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
- **Marine Habitat (MAR)**: Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
- **Wildlife Habitat (WILD)**: Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- **Rare, Threatened, or Endangered Species (RARE)**: Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.
- **Migration of Aquatic Organisms (MIGR)**: Uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.
- **Spawning, Reproduction, and/or Early Development (SPWN)**: Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

- **Shellfish Harvesting (SHELL)**: Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sports purposes.
- **Wetland Habitat (WET)**: Uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.

Table 2-2 summarizes the beneficial uses for each water body in the Beach Cities WMG Area, as designated in the Basin Plan. For purposes of this EWMP, beneficial uses designated as "potential" will not be evaluated further.

Table 2-2. Beach Cities WMG Water Bodies and Beneficial Uses

Water Body	MUN	IND	NAV	REC1	REC2	HFS	COMM	WARM	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET[c]
Santa Monica Bay Nearshore + Offshore[a]		E	E	E	E		E		E	E	E	E	E	E	
Manhattan Beach			E	E	E		E		E	E			P	E	
Hermosa Beach			E	E	E		E		E	E			E[d]	E	
King Harbor		E	E	E	E		E		E	E	E				
Redondo Beach		E	E	E	E		E		E	E	E	E	E[d]	E	
Torrance Beach			E	E	E		E		E	E		E	E[d]	E	
Dominguez Channel	P*			P	E	E		P		P	E				
Torrance Lateral[b]	P*			P	E	E		P		P	E				

E = Existing beneficial use
P = Potential beneficial use
[*] Designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date.
[a] The Preservation of Biological Habitats (BIOL) beneficial use is not included since no Areas of Special Biological Significance are present within the Beach Cities WMG Area.
[b] Listed in Basin Plan Table 1 as a "major surface water," tributary to Dominguez Channel Estuary.
[c] Water bodies designated as WET may have wetlands habitat associated with only a portion of the water body. Any regulatory action would require a detailed analysis of the area.
[d] Most frequently used grunion spawning beaches. Other beaches may be used as well.

The high flow suspension beneficial use, which was approved by the United States Environmental Protection Agency (USEPA) as a Basin Plan Amendment in 2004, applies to Dominguez Channel and its tributaries due to their designation as REC2 water bodies. During days on which this beneficial use is in effect, bacteriological objectives applicable to Dominguez

Channel and its tributaries are suspended. The high flow suspension applies on days with rainfall greater than or equal to ½ inch and the 24 hours following the end of such an event.

2.1 Water Quality Objectives/Criteria

When designated beneficial uses of a particular receiving water body are reportedly compromised by poor water quality, Section 303(d) of the federal Clean Water Act (CWA) requires identifying and listing that water body as "impaired".

In California, the State Water Resources Control Board and Regional Water Quality Control Boards conduct a water quality assessment that addresses the condition of its surface waters (required in Section 305(b) of the CWA) and provides a list of impaired waters (required in CWA Section 303(d)) that is then submitted to the USEPA for review and approval. The report integrates the requirements of these two CWA sections and is referred to as the Integrated Report. The 2010 Integrated Report and updated 303(d) list, approved by the State Water Resources Control Board on August 4, 2010 and by the USEPA on October 11, 2011, is the most recent approved list and thus was utilized in the preparation of this planning effort.

The 2010 303(d)-listed water bodies and associated pollutants within the Beach Cities WMG Area, not including the Machado Lake Watershed, are summarized in Table 2-3 below.

Table 2-3. 2010 303(d)-Listed Water Bodies in the Beach Cities WMG Area

<table>
<tr><th colspan="2">Water Body</th><th>Pollutant</th><th>Notes</th></tr>
<tr><td colspan="2" rowspan="3">Santa Monica Bay Beaches[a]</td><td>Coliform Bacteria</td><td>Addressed by Bacteria TMDL</td></tr>
<tr><td>DDT</td><td rowspan="2">Addressed by PCB/DDT TMDL</td></tr>
<tr><td>PCBs</td></tr>
<tr><td colspan="2" rowspan="5">Santa Monica Bay Offshore/Nearshore</td><td>Debris</td><td>Addressed by Debris TMDL</td></tr>
<tr><td>DDT (tissue & sediment)</td><td rowspan="4">Addressed by PCB/DDT TMDL</td></tr>
<tr><td>PCBs (tissue & sediment)</td></tr>
<tr><td>Sediment Toxicity</td></tr>
<tr><td>Fish Consumption Advisory</td></tr>
<tr><td rowspan="10">Dominguez Channel</td><td rowspan="7">Dominguez Channel (lined portion above Vermont Ave)</td><td>Copper</td><td rowspan="5">Addressed by Dominguez Channel Toxics TMDL</td></tr>
<tr><td>Diazinon[b]</td></tr>
<tr><td>Lead</td></tr>
<tr><td>Toxicity</td></tr>
<tr><td>Zinc</td></tr>
<tr><td>Ammonia</td><td>Listed prior to 2006; no listing data available</td></tr>
<tr><td>Indicator Bacteria</td><td>Currently not being addressed by a TMDL</td></tr>
<tr><td rowspan="3">Torrance Carson Channel (Torrance Lateral)</td><td>Copper</td><td rowspan="2">Addressed by Dominguez Channel Toxics TMDL</td></tr>
<tr><td>Lead</td></tr>
<tr><td>Coliform Bacteria</td><td>Listed prior to 2006; no listing data available</td></tr>
</table>

[a] These beach listings include Manhattan Beach, Hermosa Beach, Redondo Beach, and Torrance Beach for bacteria, as well as Redondo Beach for DDT and PCBs.
[b] EPA banned diazinon on December 31, 2005. Data from 2006-2010 show no diazinon exceedances in Dominguez Channel. Based on these results, no diazinon TMDLs have been developed at this time.

Once a water body has been deemed impaired and included on the 303(d) list, a Total Maximum Daily Load (TMDL) must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, non-point, and natural sources that a water body may receive without exceeding applicable water quality standards (with a factor-of-safety included). The TMDL also allocates the loads among current and future pollutant sources to the water body and forms the basis for WQBELs and RWLs assigned in NPDES Permits. There are currently five TMDLs in effect for the water bodies within the Beach Cities WMG EWMP geographical scope as listed in Attachments M and N of the Permit, excluding the Machado Lake Watershed. In addition, the SMB Beaches Bacteria TMDL was recently reconsidered. This reconsideration was approved by the Regional Board on March 13, 2013 but has not yet been approved by the USEPA and is therefore not yet effective. The TMDLs applicable to the Beach Cities WMG are summarized in Table 2-4.

Table 2-4. TMDLs Within the Beach Cities WMG Area

TMDL Name	Agency	Effective Date	Responsible Agencies
SMB Beaches (SMBB) Bacteria TMDL, Reconsideration of Certain Technical Matters of the SMBB Bacteria TMDL, Resolution R12-007[a]	Regional Board	Pending	All
SMB TMDL for DDT and PCBs	USEPA	March 26, 2012	All
Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxics and Metals TMDL, Resolution R11-008 (Dominguez Channel Toxics and Metals TMDL)	Regional Board	March 23, 2012	Manhattan Beach, Redondo Beach, Torrance, LACFCD
SMB Nearshore Debris TMDL, Resolution R10-010	Regional Board	March 20, 2012	All
SMB Beaches (SMBB) Bacteria TMDL, Dry Weather, Resolution 2002-004[b]	Regional Board	July 15, 2003	All
SMB Beaches (SMBB) Bacteria TMDL, Wet Weather, Resolution 2002-022[b]	Regional Board	July 15, 2003	All

[a] This TMDL revision is not yet approved by the USEPA.
[b] This TMDL will be revised pursuant to Resolution R12-2007.

Table 2-5 identifies the applicable Water Quality Based Effluent Limitations (WQBELs) and/or Receiving Water Limitations (RWLs) established pursuant to TMDLs included in Attachments M and N of the Permit. Pollutant-specific compliance deadlines are discussed in Section 3 of this appendix.

Table 2-5. Final Permit WQBELs/RWLs for Beach Cities WMG TMDLs

TMDL	Parameter	WQBEL/RWL
SMB Nearshore Debris	Trash	Zero gallons
	Plastic Pellets	Zero gallons
SMB PCBs/DDT	DDT (3 year average)	27.08 g/yr [c,d]
	PCBs (3 year average)	140.25 g/yr[c,d]
SMB Beaches Bacteria	Total coliform (daily max)	10,000 MPN/100 mL
	Total coliform (daily max), if the ratio of fecal-to-total coliform exceeds 0.1	1,000 MPN/100 mL
	Fecal coliform (daily max)	400 MPN/100 mL
	Enterococcus (daily max)	104 MPN/100 mL
	Total coliform (geometric mean[a])	1,000 MPN/100 mL
	Fecal coliform (geometric mean[a])	200 MPN/100 mL
	Enterococcus (geometric mean[a])	35 MPN/100 mL
Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxics and Metals [b]	Toxicity – Dominguez Channel (monthly median)	1 TUc in wet weather
	Total Cu - Dominguez Channel (water column daily max)	1,300.3 g/day[c] wet weather
	Total Pb - Dominguez Channel (water column daily max)	5,733.7 g/day[c] wet weather
	Total Zn - Dominguez Channel (water column daily max)	9,355.5 g/day[c] wet weather
	Total Cu – Torrance Lateral (water column daily max)	9.7 ug/L wet weather
	Total Pb – Torrance Lateral (water column daily max)	42.7 ug/L wet weather
	Total Zn – Torrance Lateral (water column daily max)	69.7 ug/L wet weather
	Total Cu – Torrance Lateral (sediment daily max)	31.6 mg/kg dry suspended sediment, wet weather
	Total Pb – Torrance Lateral (sediment daily max)	35.8 mg/kg dry suspended sediment, wet weather
	Total Zn – Torrance Lateral (sediment daily max)	121 mg/kg dry suspended sediment, wet weather

[a] The rolling 30-day geometric mean is calculated based on the previous 30 days, with weekly sampling results assigned to the remaining days of the week. The reopened 2012 TMDL, which has not yet been approved by USEPA, modified this to weekly calculation of a rolling six week geometric mean using five or more samples, starting all calculation weeks on Sunday.

[b] The Dominguez Channel and Torrance Lateral WQBELs are for wet weather only (days with 0.1 inch of rain or greater and the three days following the rain event). Effluent limitations are based on a hardness of 50 mg/L. Recalculated mass-based effluent limitations using ambient hardness and flow rate at the same time of sampling are consistent with the assumptions and requirements of the TMDL. In addition to the effluent limitations in the above table, samples collected during flow conditions less than the 90th percentile of annual flow rates (62.7 cfs for Dominguez Channel) must demonstrate that the acute and chronic hardness dependent water quality criteria provided in the California Toxics Rule (CTR) are achieved.

[c] The load-based WQBELs are applicable to the sum of all Phase I MS4 loads within the applicable watershed.

[d] These values are normalized to total organic carbon (TOC). To normalize to TOC, the dry weight concentration for each parameter is divided by the decimal fraction representing the percent total organic carbon content of the sediment.

Grouped RWLs for the SMB Beaches Bacteria TMDL are also expressed in the Permit in terms of allowable exceedance days (AEDs), which vary by season and by Coordinated Shoreline Monitoring Plan (CSMP) monitoring station. These AEDs, as revised per the Reconsideration of the SMB Beaches Bacteria TMDL (Regional Board 2012), are summarized in Table 2-6 below. Upon approval of these revised AEDS, the final grouped RWLs will be immediately effective for dry weather and will be effective July 15, 2021 for wet weather. The CSMP monitoring stations are shown in Figure 2.

Table 2-6. Bacteria RWLs for Beach Cities WMG Shoreline Monitoring Stations

Station	Station Name	Summer Dry Weather (Apr 1 – Oct 31)		Winter Dry Weather (Nov 1 – Mar 31)[a]		Wet Weather (Year-Round)	
		Daily Sample[b]	Weekly Sample	Daily Sample[b]	Weekly Sample	Daily Sample[b]	Weekly Sample
SMB 5-1[c]	Manhattan State Beach at 40th St (El Porto Beach)	0	0	1	1	4	1
SMB 5-2	Terminus of 28th Street Drain in Manhattan Beach	0	0	9	2	17	3
SMB 5-3	Manhattan Beach Pier	0	0	3	1	6	1
SMB 5-4[c]	Near 26th Street on Hermosa Beach	0	0	3	1	12	2
SMB 5-5[c]	Hermosa Beach Pier	0	0	2	1	8	2
SMB 6-1	Herondo Storm Drain	0	0	9	2	17	3
SMB 6-2[c]	Redondo Municipal Pier – 100 Yards South	0	0	3	1	14	2
SMB 6-3	4’x4’ Outlet at Projection of Sapphire Street	0	0	5	1	17	3
SMB 6-4[c]	120’ North of Topaz groin	0	0	9	2	17	3
SMB 6-5	Storm Drain at Projection of Avenue I	0	0	4	1	11	2
SMB 6-6[c]	Malaga Cove, Palos Verdes Estates	0	0	1	1	3	1

[a] The number of allowable exceedance days established in the revised TMDL have increased from the values outlined in the original TMDL.
[b] SMB 5-2 and SMB 6-1 are the only monitoring sites that have been sampled daily (5 days/week).. All other monitoring sites were sampled weekly (on average).
[c] SMB 5-1, 5-4, 5-5, 6-2, 6-4, and 6-6 are all open beach monitoring locations which are not associated with major storm drain outfalls.

2.2 SMB Watershed Data Analysis

To evaluate water-quality conditions within the SMB Watershed, a review of previous studies was conducted to characterize receiving water bodies within the Beach Cities WMG Area. Monitoring data analyzed were limited to bacteria data collected as part of the SMB Beaches Bacteria TMDL CSMP and data collected as part of the 2008 Bight Regional Monitoring

Program. It should be noted that the data analyses presented below are based on receiving water quality data and do not imply any linkage to MS4 contributions.

2.2.1 Indicator Bacteria

Table 2-7 through Table 2-9 below summarize the shoreline monitoring bacteria data for 2005 through 2013 in terms of the number of SMB Beaches Bacteria TMDL CSMP exceedance days (EDs) at each monitoring location for each TMDL-defined season (summer dry, winter dry, and wet weather). These are days on which a water quality sample was found to exceed at least one of four single sample daily maximum REC-1 water quality objectives. If follow-up samples were collected for weekly monitoring sites, those samples have been included in this analysis, which may increase the number of reported EDs. Geometric mean EDs are not summarized here.

Table 2-7. Summer Dry Weather (April 1 – October 31), Exceedance Days (bold red text signifies EDs > AEDs)

Station	AEDs	Number of Exceedance Days per Year (Apr 1 – Oct 31)									Avg Annual EDs	Total Pcnt Exceed
		2005	2006	2007	2008	2009	2010	2011	2012	2013		
SMB 5-1[a]	0	0	0	**1**	**1**	**1**	**1**	0	**2**	0	**0.7**	**2.3%**
SMB 5-2[b,c]	0	**8**	**24**	**6**	**1**	**1**	**7**	**5**	**5**	**4**	**6.8**	**5.0%**
SMB 5-3[a]	0	0	**1**	**2**	**1**	0	0	0	**2**	0	**0.7**	**2.3%**
SMB 5-4	0	0	0	**1**	0	0	**1**	**1**	0	**1**	**0.4**	**1.5%**
SMB 5-5[a]	0	0	**2**	**1**	**1**	**3**	**1**	**1**	**3**	**1**	**1.4**	**4.9%**
SMB 6-1[b]	0	**4**	**7**	**4**	**2**	**1**	**9**	**3**	**5**	**3**	**4.2**	**3.1%**
SMB 6-2	0	**4**	0	**4**	**1**	**2**	**3**	**4**	**8**	**5**	**3.4**	**10.9%**
SMB 6-3	0	**3**	**3**	**1**	0	**2**	**2**	**1**	**3**	**1**	**1.8**	**5.9%**
SMB 6-4	0	0	0	**1**	**4**	**3**	**1**	**3**	**6**	**2**	**2.2**	**7.3%**
SMB 6-5[a]	0	**1**	**2**	**3**	**1**	**2**	**2**	**1**	**4**	0	**1.8**	**5.8%**
SMB 6-6[a]	0	0	0	**1**	0	0	**1**	0	0	0	**0.2**	**0.8%**

[a] Sampling was conducted by multiple agencies at various frequencies. As a result, only weekly sampling data collected per the SMBB Bacteria TMDL CSMP were analyzed.

[b] Station began being sampled daily on July 5, 2005. Weekly data collected prior to this date were not accounted for in this analysis.

[c] A low flow diversion was installed at the 28th Street storm drain, immediately upstream of SMB 5-2, in April 2007. After this time, the average annual EDs dropped to 2.9 and the exceedance percent dropped to 2.6%.

Table 2-8. Winter Dry Weather (November 1 – March 31), Exceedance Days (bold red text signifies EDs > AEDs)

Station	AEDs	Number of Exceedance Days per Year (Nov 1 – Mar 31)									Avg Annual EDs	Total Pcnt Exceed
		2005	2006	2007	2008	2009	2010	2011	2012	2013		
SMB 5-1[a]	1	**2**	0	0	0	0	0	0	0	0	0.2	**1.5%**
SMB 5-2[b,c]	9	0	**18**	**22**	**10**	4	0	**11**	9	2	8.4	**12.3%**
SMB 5-3[a]	1	0	0	0	0	1	0	0	0	0	0.1	**0.8%**
SMB 5-4	1	0	0	1	0	0	0	1	0	0	0.2	**1.6%**
SMB 5-5[a]	1	1	1	0	1	1	0	0	0	0	0.4	**3.0%**
SMB 6-1[b]	9	0	8	4	**11**	6	6	**16**	**13**	**15**	8.8	**12.8%**
SMB 6-2	1	0	1	**2**	**3**	0	1	1	1	1	**1.1**	**7.2%**
SMB 6-3	1	0	1	**2**	1	1	1	**2**	0	0	0.9	**5.8%**
SMB 6-4	2	2	**3**	1	0	**3**	**3**	1	1	**3**	1.9	**12.3%**
SMB 6-5[a]	1	0	0	0	1	1	0	0	0	0	0.2	**1.5%**
SMB 6-6[a]	1	**2**	**2**	0	0	0	0	0	0	0	0.4	**3.0%**

[a] Sampling was conducted by multiple agencies at various frequencies. As a result, only weekly sampling data collected per the SMBB Bacteria TMDL CSMP was analyzed

[b] Station began being sampled daily on July 5, 2005. Weekly data collected prior to this date were not accounted for in this analysis.

[c] A low flow diversion was installed at the 28th Street storm drain, immediately upstream of SMB 5-2, in April 2007. After this time, the average annual EDs dropped to 4.0 and the exceedance percent dropped to 8.0%.

Table 2-9. Wet Weather[a] (November 1 – October 31), Exceedance Days (bold red text signifies EDs > AEDs)

Station	AEDs	Number of Exceedance Days per Year (Nov 1 – Oct 31)									Avg Annual EDs	Total Pcnt Exceed
		2005	2006	2007	2008	2009	2010	2011	2012	2013		
SMB 5-1[b]	1	1	0	0	1	**2**	1	1	0	0	0.7	**7.4%**
SMB 5-2[c]	17	5	**21**	13	17	**23**	**19**	**27**	**21**	15	**17.9**	**50.5%**
SMB 5-3[b]	1	**2**	0	0	0	0	0	1	1	1	0.6	**6.5%**
SMB 5-4	2	**4**	0	1	**3**	2	2	**3**	1	0	1.8	**20.8%**
SMB 5-5[b]	2	2	2	0	0	**3**	2	1	0	1	1.2	**14.1%**
SMB 6-1[c]	17	7	17	8	**19**	**19**	**26**	**28**	**21**	14	**17.7**	**50.0%**
SMB 6-2	2	2	1	0	0	2	**3**	**3**	**5**	2	2.0	**22.0%**
SMB 6-3	3	2	2	0	0	3	3	3	2	1	1.8	**20.5%**
SMB 6-4	3	**4**	0	2	3	3	2	**5**	1	1	2.3	**26.6%**
SMB 6-5[b]	2	1	2	0	0	0	2	**3**	2	0	1.1	**12.8%**
SMB 6-6[b]	1	**2**	1	0	1	1	0	0	0	0	0.6	**6.4%**

[a] Wet weather is defined in the TMDL as days with 0.1 inch of rain and the three days following the rain event. The LAX rain gage was used in this analysis for the purpose of defining wet weather.

[b] Sampling was conducted by multiple agencies at various frequencies. As a result, only weekly sampling data collected per the SMBB Bacteria TMDL CSMP was analyzed

[c] Station began being sampled daily on July 5, 2005. Weekly data collected prior to this date were not accounted for in this analysis.

Although long-term trends have not been comprehensively evaluated for the CSMP bacteria data, at least two conclusions can be stated at this time:

1. Attainment of wet weather AEDs is highly variable on an annual basis since attainment is primarily driven by hydrology; and
2. Although the number of dry and wet weather EDs is highly variable from season-to-season, year-to-year, and site-to-site, there are some sites which appear to have consistently better or worse water quality than others. For example, during both wet weather and winter dry weather, SMB 5-2, SMB 6-1, and SMB 6-4 have the three highest exceedance percentages out of the 11 monitoring sites. SMB 5-2 and 6-1, which are the two largest drainage areas within the EWMP Area, have both been previously identified as being high priority drainage areas, and both have been equipped with low flow diversions. Additionally, these three monitoring sites are the only three sites which exhibit annual average exceedance percentages higher than the respective exceedance percentages at the reference watershed (SMB 1-1) during wet and winter dry weather. During summer dry weather, only SMB 6-2 has an average annual exceedance

percentage greater than the summer dry weather exceedance percentage at the reference watershed.

A preliminary analysis of land use distribution in the SMB Watershed within the Beach Cities WMG Area did not show any noticeable correlation with respect to CSMP monitoring data exceedance rates.

2.2.2 DDT and PCBs

USEPA's Santa Monica Bay DDT and PCBs TMDL relies on a limited dataset to establish stormwater load allocations, relying on a single study (Curren *et al.*, 2011) from a single creek (Ballona Creek, which is outside the Beach Cities WMG Area) to establish MS4 wasteload allocations throughout the entire SMB Watershed. It does not present sufficient data to assign MS4 contributions to the DDT and PCB concentrations observed in SMB.

As part of the Bight Regional Monitoring Program, the Southern California Coastal Watershed Research Project (SCCWRP) conducted limited PCB and DDT monitoring within SMB itself in 2008. Three sampling sites were located between 2 and 6 miles of the coastline of the Beach Cities WMG Area. Sampling was conducted on July 8, 2008. Table 2-10 summarizes the results from this monitoring effort.

Table 2-10. Bight '08 PCB and DDT Monitoring Results[a]

Station ID	Station Description	PCB (ug/kg OC)	DDT (ug/kg OC)
Sediment targets established in the TMDL		700	**2300**
B08-7403	Approximately 4 miles off the coast of Redondo Beach	546	**3100**
B08-7415	Approximately 6 miles off the coast of Manhattan Beach	299	1020
B08-7417	Approximately 2.3 miles off the coast of Hermosa Beach	**1230**	**9490**

[a] Bold red text signifies an exceedance of the sediment targets (normalized to total organic carbon) set forth in the PCBs and DDT TMDL for Santa Monica Bay.

These are estimated values that assume one half of the method detection limit for all non-detect results. Based on location, there is no evidence supporting any linkage between MS4 discharges and the observed sediment concentrations. No other data or source information for DDT and PCBs specific to the Beach Cities WMG are available at this time.

2.2.3 Trash

To date, data for trash discharges from the MS4 are unavailable for the SMB Watershed. Trash Monitoring and Reporting Plans (TMRPs) were submitted to the Regional Board by each Beach Cities WMG Agency before the TMDL-specified deadline of September 20, 2012. These

TMRPs are still awaiting approval by the Regional Board. Following approval, monitoring for trash will begin in the SMB Watershed in accordance with each Agency's respective TMRP. Additionally, each Beach Cities WMG Agency submitted a request to the Regional Board by September 20, 2013 to be exempt from the TMDL requirement to conduct monitoring for plastic pellets based on absence of industrial activities related to the manufacturing, handling, or transportation of plastic pellets within their jurisdictions in the SMB watershed. If approved, monitoring for plastic pellets within the SMB Watershed will not be conducted by the Beach Cities.

2.2.4 Additional Exceedances

No other receiving water limit exceedances due to MS4 discharges were found within the SMB Watershed based on available data.

2.3 Dominguez Channel Watershed Data Analysis

To evaluate water-quality conditions within the Dominguez Channel Watershed, a review of previous studies was conducted to characterize stormwater and non-stormwater discharges potentially from the MS4 and the receiving water bodies within the Beach Cities WMG area. Analyzed raw monitoring data were limited to data collected as part of the Mass Emission Station monitoring program established by the Los Angeles County Department of Public Works (LACDPW). No other data within Dominguez Channel were known to exist. Data were analyzed from two relevant monitoring stations: the Dominguez Channel Mass Emission Station (Station S28), located in Dominguez Channel at Artesia Blvd on the Torrance city boundary; and Tributary Station "Project No. 1232" (Station TS19), located in Torrance Carson Channel (Torrance Lateral) within the City of Carson. The ten most recent years of data (2003 to 2013) from Mass Emission Station S28 were used; all available data (2008 to 2011) from Station TS19 were used.

It should be noted that the data analyses presented below are based on limited receiving water quality data and do not imply MS4 contributions from the Beach Cities WMG.

2.3.1 Ammonia

Dominguez Channel is 303(d)-listed for ammonia, although original source (raw) data that were used as the basis for the listing are not available on the SWRCB's website since this listing was made prior to 2006.

Since 2003, ammonia exceedances were reported by LACDPW at the Dominguez Channel Mass Emission Station. However, in reviewing the water quality data since 2003, it appears that these reported exceedances were mistaken due to the use of an incorrect receiving water limit for ammonia. When water quality data at both stations S28 and TS19 are compared with the one-hour average Basin Plan Objective for ammonia as specified in Regional Board Resolution No. 2002-011 (Regional Board, 2003), no exceedances of the ammonia standard are found. At

Station S28, all 66 samples taken since 2003 meet the pH-dependent Basin Plan Objective values[5]. Similarly, all 26 samples collected at TS19 since November 2008 meet the Basin Plan Objective. Both of these data sets include wet and dry weather samples.

Due to the fact monitoring data since 2003 show that all samples at S28 and TS19 meet the Basin Plan Objective for ammonia, ammonia could reasonably be removed from the State's 303(d) list for Dominguez Channel.

2.3.2 Copper, Lead, and Zinc

Dominguez Channel, including Torrance Lateral, is 303(d)-listed for copper, lead, and zinc. The Dominguez Channel Toxics and Metals TMDL specifically addresses these three metals by setting wet weather wasteload allocations (WLAs). The TMDL Staff Report (Regional Board, 2011b) compares wet and dry weather data from S28 and TS19 to respective hardness-based CTR targets for each metal. The Staff Report summarized the findings as follows:

- At S28: "From 2002 to 2010, CTR criteria for dissolved metals were exceeded in wet weather for copper, lead and zinc: Cu, 29 exceedances out of 35 (83%) wet weather samples; Pb, 16 exceedances of 35 (46%); and Zn, 27 exceedances out of 35 (77%)…. In dry weather, no dissolved exceedances were observed for these three metals. In addition, no exceedances were observed for dissolved cadmium, chromium, mercury, nickel, selenium and silver in wet or dry weather."
- At TS19: "Available water column results (2008 & 2009) reveal exceedances of dissolved copper (8 of 10; 80%) and zinc (9 of 10; 90%) CTR criteria during wet weather conditions. Dissolved lead was below the criteria in wet weather conditions and no dry weather exceedances occurred for any of these three metals."

No long-term trends are apparent when evaluating the copper, lead, and zinc data at these two monitoring stations, except that the water quality standard exceedances are limited to wet weather and not dry weather, which is an observation that is consistent with statements made in the TMDL.

2.3.3 Indicator Bacteria

Dominguez Channel, including Torrance Lateral, is 303(d)-listed for fecal indicator bacteria. At this time, a TMDL has yet to be developed for this impairment. Because Dominguez Channel and Torrance Lateral are REC2 water bodies, fecal coliform data from S28 and TS19 are

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[5] Based on paired pH data, the range of ammonia values applicable to the monitoring data on record is approximately 0.63 – 55.5 mg/L.

compared to the Basin Plan Objective of 4,000 MPN/100 mL.[6] Additionally, days with recorded rainfall greater than 0.5-inch are considered High Flow Suspension days, resulting in a suspension of the REC2 Basin Plan Objective on these days.

At S28, a total of 35 wet weather samples have been collected and analyzed for fecal coliform since 2003. Based on rainfall records tabulated by LACDPW, 18 of these sample events are considered High Flow Suspension days. Of the remaining 17 sample events, 15 samples (88%) exceed the REC2 Basin Plan Objective of 4,000 MPN/100 mL. During dry weather, nine of 26 samples (35%) exceed the REC2 Basin Plan Objective. These observed exceedance rates exceed the average reference stream-based exceedance rates (or 19% and 1.6% for wet and dry weather, respectively) that are used for setting AED-based WLAs in Los Angeles region creek and river bacteria TMDLs.

At TS19, similar results for fecal coliform exceedances are found. A total of 16 wet weather samples have been collected and analyzed for fecal coliform at TS19, though 10 of these sample events are considered High Flow Suspension days. Of the remaining six sample events, five samples (83%) exceed the REC2 Basin Plan Objective for fecal coliform. During dry weather, four of nine samples (44%) exceed the Basin Plan Objective. These observed exceedance rates exceed the average reference stream-based exceedance rates that are used for setting AED-based WLAs in Los Angeles region creek and river bacteria TMDLs.

No long-term trends are apparent when analyzing the indicator bacteria data at these two monitoring stations, other than that significant exceedances persist during both wet and dry weather.

2.3.4 Toxicity and Diazinon

Dominguez Channel is 303(d)-listed for toxicity based on samples from the Dominguez Channel Mass Emission Station taken from 2002 through 2007. The State Board's website states that, "10 of 20 samples (50%) exhibited significant[7] chronic toxicity to Sea Urchin, four of 20 samples (20%) exhibited significant acute toxicity to *Ceriodaphnia dubia*, and three of 21 samples (14%) exhibited significant chronic toxicity to *Ceriodaphnia dubia*." To address this listing, the Dominguez Channel Toxics and Metals TMDL went into effect in March 2012, setting interim and final toxicity allocations for Dominguez Channel freshwater during wet weather. The Permit

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[6] The Basin Plan Objective for fecal coliform for REC2 waters states that no more than 10% of samples collected during any 30-day period [shall] exceed 4,000MPN/100 mL. Due to the limited number of fecal coliform samples collected, this value was treated as a single sample maximum threshold for the purposes of this analysis.

[7] Toxicity was defined as a reduction of the No Observable Effect Concentration (NOEC) below 100% and was considered significant if the effect on the sample exposure was greater than 25%. Chronic toxicity is further expressed as toxic units (TUc), where TUc = 100/NOEC

establishes an interim WQBEL of 2 TUc (chronic toxicity unit) and a final WQBEL of 1 TUc (monthly median) for Dominguez Channel freshwater. The interim WQBEL became effective on December 28, 2012; the final WQBEL is to be met by March 2032. No toxicity targets are set for Torrance Lateral.

The LACDPW conducts wet weather toxicity monitoring twice per year, analyzing samples for chronic *Ceriodaphnia* survival, chronic *Ceriodaphnia* reproduction, and chronic Sea Urchin fertilization. Since the 2003-2004 monitoring year, a total of 18 wet weather toxicity sampling events have occurred at Mass Emission Station S28, with each of these three toxicity analyses conducted per event. Of the 18 sample events, all 18 have met the interim toxicity allocation of 2 TUc (0% exceedance). Compared with the final toxicity allocation of 1 TUc, six of 18 samples (33%) exceed the final allocation for chronic Sea Urchin fertilization. These results are consistent with the data summarized in the TMDL Staff Report (Regional Board, 2011b), which show toxic responses in six of 14 (43%) wet weather sampling events between 2002 and 2010. Dry weather sample results confirm that toxicity is not currently an issue during dry weather, as only one dry weather sample out of 18 (6%) since 2002 exceeds the final toxicity allocation of 1 TUc.

Dominguez Channel is also 303(d)-listed for diazinon, although data are not available on the SWRCB's website since this listing was made prior to 2006. However, as the Dominguez Channel Toxics and Metals TMDL makes clear, the USEPA banned diazinon on December 31, 2005. Dominguez Channel and Torrance Lateral data from 2006-2013, which includes 85 total samples between the two monitoring sites, show no exceedances of the chronic diazinon criteria established by the California Department of Fish and Game (0.10 ug/L). No diazinon TMDLs have been developed at this time.

Due to the fact that monitoring data since 2006 show that all samples at S28 and TS19 meet the applicable water quality criteria for diazinon, diazinon could reasonably be removed from the State's 303(d) list for Dominguez Channel.

2.3.5 Additional Exceedances

The annual monitoring reports published by LACDPW list exceedances of each sampled constituent relative to various water quality criteria, including Basin Plan Objectives (BPOs) and California Toxics Rule (CTR) criteria.[8] Raw data from S28 and TS19 have been reevaluated as

[8] Because of some additional water quality criteria used to evaluate exceedances in the County's annual monitoring reports (e.g., applying Ocean Plan Objectives to freshwater bodies; applying MUN-specific BPOs to potential-MUN-designated water bodies), exceedances were over-reported. As a result, pollutants evaluated as part of this appendix were limited to those pollutants which had at least one reported exceedance since 2003. For pollutants with a reported exceedance since 2003, all historic water quality data from that time forward was evaluated against

part of this appendix. Aside from the constituents described previously, measured exceedances at S28 and TS19 are summarized in Table 2-11.

Table 2-11. LACDPW Monitoring Data Exceedances

Pollutant	Dominguez Channel Mass Emission Station (S28)			Torrance Lateral Tributary Station (TS19)			Water Quality Criteria (Source)
	No. of Samples	No. of Exceedances	% Exceed	No. of Samples	No. of Exceedances	% Exceed	
Cyanide	61	24	39%	25	8	32%	5.2 ug/L (CTR continuous concentration)
pH	66	13	20%	26	11	42%	6.5 – 8.5 (BPO)
Selenium	66	3	5%	26	2	8%	5.0 ug/L (CTR continuous concentration)
Mercury	66	5	8%	26	3	12%	0.051 ug/L (CTR human health criterion, organisms only)
Dissolved Oxygen[a]	60	1	2%	25	0	0%	5.0 mg/L (BPO)
Cadmium	66	3	5%	26	1	4%	2.2 ug/L (CTR continuous concentration)

[a] The Basin Plan states that “no single determination shall be less than 5.0 mg/L, except when natural conditions cause lesser concentrations.” The Basin Plan also states that the mean annual dissolved oxygen concentration of all waters shall be greater than 7 mg/L. Although one sample at S28 was measured to have a dissolved oxygen concentration below the BPO (4.25 mg/L on 9/24/2007), the average annual dissolved oxygen concentration for each monitored year since 2003 is greater than 7 mg/L.

A single exceedance of the Department of Fish and Game’s chronic criterion for chlorpyrifos (0.05 mg/L) occurred in October 2005 at S28. This exceedance occurred prior to EPA’s December 31, 2005 chlorpyrifos ban. Since this time, 85 total samples from S28 and TS19 have been analyzed for chlorpyrifos and no exceedances have been recorded.

2.4 QA/QC Criteria

Quality assurance/quality control (QA/QC) criteria have been established to verify that data referenced in this water body characterization are qualified for use. All data used have either

appropriate water quality criteria. For pollutants with no reported exceedances, it was assumed that LACDPW’s exceedance analyses were accurate.

been peer reviewed; were submitted as part of an official record, such as in an agency's Annual Report to the Regional Board; or have met QA/QC criteria established by another party, such as one of the Beach Cities WMG agencies, County of Los Angeles Department of Health Services, Regional Board, or California Environmental Data Exchange Network (CEDEN). Data not meeting these criteria have not been used in this water body characterization.

3 WATER BODY-POLLUTANT PRIORITIZATION

Based on the water quality characterization above, the water body-pollutant combinations have been classified into one of three categories, in accordance with Section IV.C.5(a)ii of the Permit: highest priority, high priority, and medium priority. This categorization is intended to prioritize water body-pollutant combinations in order to guide the implementation of structural and institutional BMPs. A Reasonable Assurance Analysis (RAA) will be performed on the water body-pollutant combinations in Categories 1-3, unless otherwise stated. Water body pollutant combinations categorized in Table 3-1 below are subject to change based on future data collected as part of the CIMP or other monitoring program. Explanation of the basis for the categorization is provided in Section 3.1, 3.2, and 3.3

Table 3-1. Water Body Pollutant Prioritization (First and Last Applicable Deadlines Included)

Category	Water Body	Pollutant	Compliance Deadline
1: Highest Priority	SMB Beaches	Dry Weather Bacteria	7/15/2006 (Final: Single sample summer AEDs met) 11/1/2009 (Final: Single sample winter AEDs met)[a]
		Wet Weather Bacteria	7/15/2009 (Interim: 10% Single sample ED reduction) 7/15/2021 (Final: Single sample AED and GM targets met)[a]
	SMB	Trash/Debris	3/20/2016 (20% reduction) 3/20/2020 (100% reduction)
		DDTs	[Compliance schedule may be developed through the EWMP][b]
		PCBs	[Compliance schedule may be developed through the EWMP][b]
	Dominguez Channel (including Torrance Lateral)[c]	Toxicity	3/23/2012 (Interim wet weather: 2 TUc) 3/23/2032 (Final wet weather: 1 TUc)
		Total Copper	3/23/2012 (Interim wet weather: 207.51 ug/L) 3/23/2032 (Final wet weather: 1,300.3 g/day) 3/23/2032 (Final wet weather, Torrance Lateral: 9.7 ug/L)
		Total Lead	3/23/2012 (Interim wet weather: 122.88 ug/L) 3/23/2032 (Final wet weather: 5,733.7 g/day) 3/23/2032 (Final wet weather, Torrance Lateral: 35.8 ug/L)
		Total Zinc	3/23/2012 (Interim wet weather: 898.87 ug/L) 3/23/2032 (Final wet weather: 9,355.5 g/day) 3/23/2032 (Final wet weather, Torrance Lateral: 69.7 ug/L)
2: High Priority	Dominguez Channel (including Torrance Lateral)	Indicator Bacteria	N/A
3: Medium Priority	Dominguez Channel (including Torrance Lateral)	Cyanide	N/A
		pH	N/A
		Selenium	N/A
		Mercury	N/A
		Cadmium	N/A

[a] Compliance date per 2013 reopened TMDL, which is not yet effective (i.e., USEPA and Office of Administrative Law approval is pending).

[b] Although the TMDL lacks a formal compliance schedule for the WQBEL, the TMDL Executive Summary does state, “The time frame for attainment of the TMDL targets for the rest of Santa Monica Bay (other than the Palos Verdes shelf) is 11 years for DDT and 22 years for PCBs.”

[c] For metals, the TMDL sets a final mass-based WLA for MS4 contributions within Dominguez Channel above Vermont Avenue. For Torrance Lateral, a concentration-based WLA is set for water and sediment (mg/kg dry). Metal WLAs are set based on a hardness of 50 mg/L and 90th percentile flow rates (62.7 cfs in Dominguez Channel).

3.1 Category 1 – Highest Priority

Water body-pollutant combinations under Category 1 (highest priority) are defined in the Permit as "water body-pollutant combinations for which water quality-based effluent limitations and/or Receiving Water Limitations are established in Part VI.E and Attachments L through R of [the Permit]." These water body-pollutant combinations include:

- SMB beaches for bacteria (wet and dry weather): These are considered Category 1 due to the SMB Beaches Bacteria TMDL.
- SMB offshore/nearshore for DDT and PCBs[9]: These are considered Category 1 due to the USEPA TMDL for DDT and PCBs for SMB Offshore/Nearshore. However, the load-based WQBELs for DDT and PCBs established by the TMDL were set to be the existing stormwater loads (i.e., based on data used in the TMDL, no MS4 load reduction is expected to be required). Therefore, no reductions in DDT and PCB loading from the Beach Cities WMG MS4s are required to meet the TMDL WQBELs and therefore, no RAA is required.
- SMB offshore/nearshore for debris: This is considered Category 1 due to the TMDL for Debris for SMB Offshore/Nearshore. Section VI.E.5.b(i) of the Permit states, "Pursuant to California Water Code section 13360(a), Permittees may comply with the trash [debris] effluent limitations using any lawful means. Such compliance options are broadly classified as full capture, partial capture, institutional controls, or minimum frequency of assessment and collection… and any combination of these may be employed to achieve compliance." While trash will not be modeled as part of the RAA, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with the TMDL WQBELs by providing details on the planned implementation of the methods listed above, primarily through their Trash Monitoring and Reporting Programs.
- Dominguez Channel for copper, lead, and zinc in wet weather: These water body-pollutant combinations are considered Category 1 due to the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxics and Metals TMDL.
- Dominguez Channel for toxicity: This is considered Category 1 due to the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxics and Metals TMDL. Toxicity will not be modeled for Dominguez Channel and Torrance Lateral as part of the RAA since it is not a wet weather parameter that can be modeled using currently available RAA tools for the Los Angeles Region. Instead, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with the TMDL WQBELs. Toxicity will continue to be monitored under the Beach Cities' CIMP.

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[9] SMB Offshore/Nearshore is 303(d)-listed for fish consumption advisory due to DDT and PCBs. Therefore, the fish consumption advisory will be assumed to be addressed by the DDT and PCB categorization.

"Highest Priority" water body-pollutant combinations have been assigned based strictly on the Permit definition. Not all of these pollutants (e.g., DDT and PCBs) have been definitively linked to MS4 sources. As a result, this categorization and prioritization will be reevaluated based on results from the future water quality monitoring efforts conducted under the CIMP.

3.2 Category 2 – High Priority

Category 2 (high priority) water body-pollutant combinations are defined as "pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment." As summarized in Table 2-3, a number of water body-pollutant combinations within the Beach Cities WMG Area have been listed on the SWRCB's 2010 303(d) list. Aside from those water body-pollutant combinations already identified as Category 1, the remaining water body-pollutant combination list can be condensed by excluding pollutants which are not stormwater related (i.e., MS4 discharges are unlikely to cause or contribute to the impairment) as well as pollutants which are already being addressed (directly or indirectly) by one of the TMDLs.[10] Therefore, the Category 2 water body-pollutant combinations are limited to the following[11]:

- Dominguez Channel (including Torrance Lateral) for indicator bacteria. This qualifies as a Category 2 water body-pollutant combination based on the 303(d) listing for indicator bacteria.
- Dominguez Channel (including Torrance Lateral) for ammonia. In conformance with Permit requirements, this qualifies as a Category 2 water body-pollutant combination based on the 303(d) listing for ammonia. However, as detailed in Section 2.3.1, monitoring data since 2003 show that all water quality samples at S28 and TS19 meet the freshwater Basin Plan Objective for ammonia. As a result, ammonia will not be modeled as part of the Beach Cities' RAA. Monitoring for ammonia will occur under the CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to ammonia exceedances in the receiving water, the EWMP will be revised accordingly.

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[10] These include: the fish consumption advisory listing in SMB, which is being addressed by the PCB and DDT TMDL; and the diazinon listing for Dominguez Channel, which is referenced in the Dominguez Channel Toxics and Metals TMDL as not requiring a TMDL due to the USEPA ban on diazinon and subsequent water quality sampling.

[11] SMB Offshore/Nearshore is also 303(d)-listed for sediment toxicity. However, the USEPA PCB and DDT TMDL states the following regarding sediment toxicity: "There is little evidence of sediment toxicity in Santa Monica Bay…Our evaluation of the data showed only 3 out of 116 samples exhibited toxicity. Following the California listing policy, Santa Monica Bay is meeting the toxicity objective and there is sufficient evidence to delist sediment toxicity. We therefore make a finding that there is no significant toxicity in Santa Monica Bay and recommend that Santa Monica Bay not be identified as impaired by toxicity in the California's next 303(d) list." For this reason, sediment toxicity will be excluded as a Category 2 pollutant, and excluded from the EWMP and RAA.

3.3 Category 3 – Medium Priority

Category 3 (Medium Priority) designations are applied to water body-pollutant combinations which are not 303(d)-listed but which exceed applicable Receiving Water Limitations contained in the Permit and for which MS4 discharges may be causing or contributing to the exceedance. Although data are not currently available to evaluate a linkage between Beach Cities WMG MS4 discharges and these receiving water exceedances, the following water body-pollutant combinations are considered Category 3 based on the receiving water exceedances described in Section 2.3.5:

- Dominguez Channel (including Torrance Lateral) for cyanide, due to exceedances of the CTR continuous concentration criterion for cyanide summarized in Table 2-11. Cyanide will not be modeled for Dominguez Channel and Torrance Lateral as part of the RAA since it is not a parameter that can be modeled using currently available RAA tools for the Los Angeles Region. Instead, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with applicable cyanide criteria. Cyanide will continue to be monitored under the Beach Cities' CIMP.
- Dominguez Channel (including Torrance Lateral) for pH, due to exceedances of the BPO for pH summarized in Table 2-11. However, due to the fact that there is currently no evidence supporting a linkage between MS4 discharges and exceedances of the pH criteria, pH will not be modeled as part of the Beach Cities' RAA. Instead, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with applicable pH criteria. Monitoring for pH will occur under the CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to pH exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel (including Torrance Lateral) for selenium, due to exceedances of the CTR continuous concentration criterion for selenium summarized in Table 2-11. However, due to the fact that there is currently no evidence supporting a linkage between MS4 discharges and exceedances of selenium,[12] selenium will not be modeled as part of the Beach Cities' RAA. Instead, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with applicable selenium criteria. Monitoring for selenium will occur under the CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to selenium exceedances in the receiving water, the EWMP will be revised accordingly.

[12] Water quality results from urban runoff throughout Southern California show average selenium concentrations to be well below the referenced CTR criterion of 5 ug/L. A 2003 study by SCCWRP examined selenium concentrations in runoff from five different land uses in urbanized watersheds. Findings showed that even 90th percentile concentrations for each land use were all below the 5 ug/L threshold, with the largest 90th percentile concentration being 2.9 ug/L from agricultural land (Ackerman and Schiff, 2003).

- Dominguez Channel (including Torrance Lateral) for mercury, due to exceedances of the CTR human health criterion for mercury summarized in Table 2-11. Mercury will not be modeled for Dominguez Channel and Torrance Lateral as part of the RAA since it is not a parameter that can be modeled using currently available RAA tools for the Los Angeles Region. Instead, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with applicable mercury criteria. Mercury will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to mercury exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel (including Torrance Lateral) for cadmium, due to exceedances of the CTR continuous concentration criterion for cadmium summarized in Table 2-11. Cadmium will not be modeled for Dominguez Channel and Torrance Lateral as part of the RAA since it is not a parameter that can be modeled using currently available RAA tools for the Los Angeles Region. Instead, the RAA will qualitatively describe how the Beach Cities WMG Agencies will comply with applicable cadmium criteria. Cadmium will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to cadmium exceedances in the receiving water, the EWMP will be revised accordingly.

The Beach Cities WMG Agencies understand that data collected as part of their approved Coordinated Integrated Monitoring Program (CIMP) may result in future Category 3 designations in instances when Receiving Water Limits are exceeded and MS4 discharges are identified as contributing to such exceedances. Under these conditions, the Beach Cities WMG agencies will adhere to Section VI.C.2.a.iii of the Permit.

4 SOURCE ASSESSMENT

The following data sources have been reviewed as part of the source assessment for the water body-pollutant combinations listed previously:

- Findings from the Permittees' Illicit Connections and Illicit Discharge Elimination Programs (IC/ID);
- Findings from the Permittees' Industrial/Commercial Facilities Programs;
- Findings from the Permittees' Development Construction Programs;
- Findings from the Permittees' Public Agency Activities Programs;
- TMDL source investigations;
- Watershed model results;
- Findings from the Permittees' monitoring programs, including but not limited to TMDL compliance monitoring and receiving water monitoring; and
- Any other pertinent data, information, or studies related to pollutant sources and conditions that contribute to the highest water quality priorities.

Since sources of pollutants for the various water bodies within the Beach Cities WMG Area are essentially identical based on similarity of land uses (e.g., sources of trash within SMB Watershed and Dominguez Channel Watershed are believed to be the same), the following source assessment is broken down by pollutant.

4.1 Indicator Bacteria

The SMBB Bacteria TMDL for both dry and wet weather was the first bacteria TMDL adopted by the Regional Board in the State of California. The SMBB Bacteria TMDL was recently opened for reconsideration, although the source assessment was not part of this update. As a result, the general findings from the original source assessment remain unchanged. These findings are summarized in the 2012 Basin Plan Amendment for the reopened SMBB Bacteria TMDL (Attachment A to Resolution No. R12-007):

> "With the exception of isolated sewage spills, dry weather urban runoff and stormwater runoff conveyed by storm drains and creeks is the primary source of elevated bacterial indicator densities to SMB beaches. Limited natural runoff and groundwater may also potentially contribute to elevated bacterial indicator densities during winter dry weather" (Regional Board, 2012b).

The SMBB Bacteria TMDL source assessment (Regional Board, 2002) maintains that dry weather urban runoff and stormwater runoff is the primary source of elevated bacteria concentrations at SMB beaches. Although definitive information regarding the specific sources of bacteria within the watershed is not presented, speculation provided in the dry weather staff report provides some insight into possible sources:

> "Urban runoff from the storm drain system may have elevated levels of bacterial indicators due to sanitary sewer leaks and spills, illicit connections of sanitary lines to the storm drain system, runoff from homeless encampments, illegal discharges from recreational vehicle holding tanks, and malfunctioning septic tanks among other things. Swimmers can also be a direct source of bacteria to recreational waters. The bacteria indicators used to assess water quality are not specific to human sewage; therefore, fecal matter from animals and birds can also be a source of elevated levels of bacteria, and vegetation and food waste can be a source of elevated levels of total coliform bacteria, specifically" (Regional Board, 2002).

Following the TMDL, a study by the Southern California Coastal Water Research Project (SCCWRP) investigated bacteria runoff concentrations from various land uses in the Los Angeles region (Stein *et al*, 2007). Results showed that wet weather runoff event mean concentrations (EMCs) for fecal coliform bacteria were highest for agricultural land uses, followed by commercial and educational, single family residential, multi-family residential, open space, industrial, and transportation. In this 2007 SCCWRP study, results also showed that indicator bacteria concentrations in stormwater are highly variable, with concentrations often ranging by factors of 10 to 100 during a single storm. Additionally, bacterial counts were found to typically vary by up to five orders of magnitude on daily, seasonal, and inter-annual scales.

Information on non-MS4 sources of surfzone bacteria were provided by the City of Malibu in its comment letter on the SMBB Beaches TMDL reconsideration, based on a comprehensive review of Southern California published literature, as part of comments on the reopened Bacteria TMDL (City of Malibu, 2012):

> "A number of recent Santa Monica Bay studies have further identified and confirmed natural (non-anthropogenic) sources of fecal indicator bacteria including plants, algae, decaying organic matter, beach wrack and bird feces – implicating these as potentially significant contributors to exceedances (Imamura *et al* 2011, Izbicki 2012b). Beach sands, sediments and beach wrack have been shown to be capable of serving as reservoirs of bacteria, possibly by providing shelter from UV inactivation and predation by allowing for regrowth (Imamura *et al* 2011, Izbicki *et al* 2012b, Lee *et al* 2006, Ferguson *et al* 2005, Grant *et al* 2001, Griffith 2012, Litton *et al* 2010, Phillips *et al* 2011, Jiang *et al* 2004, Sabino *et al* 2011, and Weston Solutions 2010). In fact, enterococci include non-fecal or "natural" strains that live and grow in water, soil, plants and insects (Griffith, 2012). Thus, elevated levels of enterococci in water could be related to input from natural sources. The phenomenon of regrowth of bacteria from either anthropogenic or natural sources has been suggested by several studies as a possible source of beach bacteria exceedances (Griffith 2012, Litton *et al* 2010, Weston Solutions 2010, Izbicki *et al* 2012b, Weisberg *et al* 2009)."

In 2009, a bacterial source identification program was undertaken at the Redondo Beach Pier (Los Angeles County Sanitation District, 2009). This program relied on a multi-tiered toolbox approach to attempt to identify sources of dry weather bacteria exceedances near Redondo Beach Pier per CSMP monitoring at SMB 6-2. Utilizing microbial source tracking, the effort focused on the shoreline near the pier, a storm drain under the pier, and ponded water near the storm drain. Investigators found a lack of human sources within the ocean water samples during dry weather:

> "Lack of detectable human viruses and the de minimus quantities detection of human-associated *Bacteridales* in the ocean water strongly implied that a human source was not present. Other sources of FIB may include bacterial persistence in the sand and sea wrack, as well as endogenous sea life and birds. Tide, wave action, wind, and other natural fluctuations may be affecting FIB levels at the shoreline monitoring locations next to the pier. The study also indicated that the storm drain under the pier and the pond that forms at the storm drain outlet are probably impacted by human fecal pollution but are not contributing to microbial contamination of the ocean water during the dry season. This conclusion is most strongly supported by the differences between the FIB concentrations and *Bacteroidales* populations at the shoreline sites compared to the pond and storm drain samples, particularly with respect to human-associated *Bacteroidales*."

In addition to the Redondo Beach surfzone microbial source tracking study, a dry weather MS4 microbial source tracking study was conducted in 2010, focusing on two high priority subwatersheds (SMB 5-2 and 6-1) within the Beach Cities WMG (Geosyntec Consultants, 2010). Results indicated that primary bacteria sources may have included pet waste, possible illicit discharges, irrigation runoff, and in-drain sources (i.e., re-growth, sediment, etc.). Although Human Bacteroides Marker (HBM) sources were not explicitly identified in the study, "sources were surmised to include direct contamination (i.e., illicit connections, RV discharges, homeless deposits), and indirect contamination (i.e, sewer exfiltration)."[13]

Additional data will be needed to quantify the contribution of MS4 discharges – particularly relative to the many other identified sources that have been documented within SMB – to the elevated bacteria concentrations measured at Beach Cities WMG compliance monitoring locations. Additional data are also needed to identify the sources of bacteria within MS4 discharges as well as their potential to contribute to recreational illness risks, which has the potential to affect the TMDL WLAs through a future reopener. MS4 outfall monitoring (through the CIMP) and source identification (through special studies) will be essential to support future BMP planning and EWMP updates.

4.2 DDT and PCBs

As stated previously, limited data are available characterizing DDT and PCBs within Santa Monica Bay, particularly since direct discharges of these pollutants from publically owned treatment works (POTWs) have ceased. The largest concentration of DDT and PCBs within SMB is contained within the Palos Verdes shelf, which is being addressed by the USEPA as a CERCLA site. Loadings from the shelf to the bay are large and have been well characterized (USEPA, 2012).

With respect to stormwater, the TMDL does not specifically characterize MS4 loadings, though it does recognize that "DDT and PCBs are no longer detected in routine stormwater sampling from Ballona Creek or Malibu Creek." However, the TMDL also states that current detection limits used to analyze DDT and PCB concentrations are too high to appropriately assess the water quality. Despite a lack of supporting data, however, EPA assumed that stormwater inputs of DDT and PCBs come from urban areas (USEPA, 2012).

No other data or source information are available at this time. Once three years of water quality data are collected under the CIMP and evaluated consistent with the recommendations by USEPA in the TMDL to utilize a three-year averaging period, then further source assessment

[13] The LACSD and Geosyntec microbial source tracking studies summarized here predate the 2013 California Source Identification Pilot Project, which identified new recommended human fecal source markers. Therefore new analytical methods may need to be applied to verify or adjust previous findings.

will be considered and the categorization and prioritization of PCB and DDTs as MS4-related pollutants of concern will be reevaluated.

4.3 Trash

Source information for trash within SMB is provided by the SMB Nearshore Debris TMDL. A detailed source breakdown is not provided, but other debris TMDLs attribute trash to general areas such as “litter from adjacent land areas, roadways, and direct dumping and deposition” (Regional Board, 2008) while also attributing trash inputs to point sources such as storm drains.

The plastic pellet portion of the SMB Debris TMDL is not assumed to be applicable to the Beach Cities WMG, as the respective Agencies[14] have applied to be exempt from this portion of the TMDL.

4.4 Copper, Lead, and Zinc

The Dominguez Channel Toxics and Metals TMDL (which applies to wet weather only in Dominguez Channel) provides general information on sources of metals within the Dominguez Channel Watershed, but does not provide a detailed source assessment. The TMDL states that “the major pollutant sources of metals into Dominguez Channel and Torrance Lateral freshwaters are stormwater and urban runoff discharges. Nonpoint sources include atmospheric deposition” (Regional Board and USEPA, 2011).

Stein et al. conducted a detailed study of various wet weather pollutants throughout the Los Angeles region, including Dominguez Channel (Stein et al., 2007). They found that industrial land use sites contributed a substantially higher flux of copper and zinc compared to other land uses evaluated, followed by agriculture, recreational, transportation (copper), and high density residential (zinc). Wet weather event mean concentrations (EMCs) for copper and zinc, based on the Los Angeles County EMC dataset, were similar to Stein et al.’s findings, showing that the highest runoff concentrations are expected from industrial, transportation, and commercial land uses, excluding agriculture (Geosyntec Consultants, 2012). With respect to copper, research has shown that brake pads are a significant source of copper in urban stormwater (TDC Environmental, 2004 and 2013b). A separate study focusing on zinc showed that the major sources of zinc in urban runoff are outdoor zinc surfaces (including galvanized surfaces) and tire wear debris (TDC Environmental, 2013a).

For lead, Stein et al. found that the greatest land use contributors were agricultural (minimal in Dominguez Channel Watershed), high density residential, and recreational (horse) land uses (Stein et al., 2007). The Los Angeles County EMC dataset found the highest lead contributors to

[14] Although the City of Redondo Beach has not yet submitted a request for exemption from the plastic pellet requirements of the SMB Debris TMDL, they are planning to submit this letter prior to or along with the CIMP.

be agriculture, industrial, commercial, and single family residential (Geosyntec Consultants, 2012).

For both copper and lead, Stein et al. and Los Angeles County found that EMCs exceed applicable CTR continuous concentration criteria for each land use investigated. For zinc, some land uses (single family residential, education, and vacant) demonstrate EMCs below the CTR continuous concentration criterion, while others (commercial, industrial, transportation, multi-family residential, and agriculture) exceed this criterion.

These potential sources will be evaluated for BMP implementation as part of the RAA.

4.5 Toxicity

As is the case with metals, the Dominguez Channel Toxics and Metals TMDL does not provide a detailed source assessment for toxicity within the Dominguez Channel Watershed, nor is a linkage provided to other pollutants, such as total suspended solids or dissolved metals. The source assessment simply states that “the major sources of organo-chlorine pesticides [and] PCBs…into Dominguez Channel are stormwater and urban runoff discharges. Nonpoint sources include atmospheric deposition and fluxes from contaminated sediments into the overlying water” (Regional Board and USEPA, 2011).

Pesticides are used in urban settings for structural pest control, landscape maintenance (parks, golf courses, cemeteries, right-of-ways), vertebrate control, and public health pest control. Two specific pesticides, diazinon and chlorpyrifos, were banned by the USEPA on December 31, 2005. As a result, mass emission monitoring at S28 has resulted in no measured exceedance of chlorpyrifos or diazinon in Dominguez Channel since 2006. Similarly, both DDT and PCBs were banned from general production and use in the 1970s, resulting in the elimination of direct discharges of these chemicals to Dominguez Channel, SMB, and other local surface water bodies.

Additional sources of toxicity within the Dominguez Channel Watershed are unknown at this time. Therefore, monitoring conducted under the Beach Cities CIMP will help assess if MS4 discharges are causing or contributing toxicity exceedances in Dominguez Channel.

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FIGURES

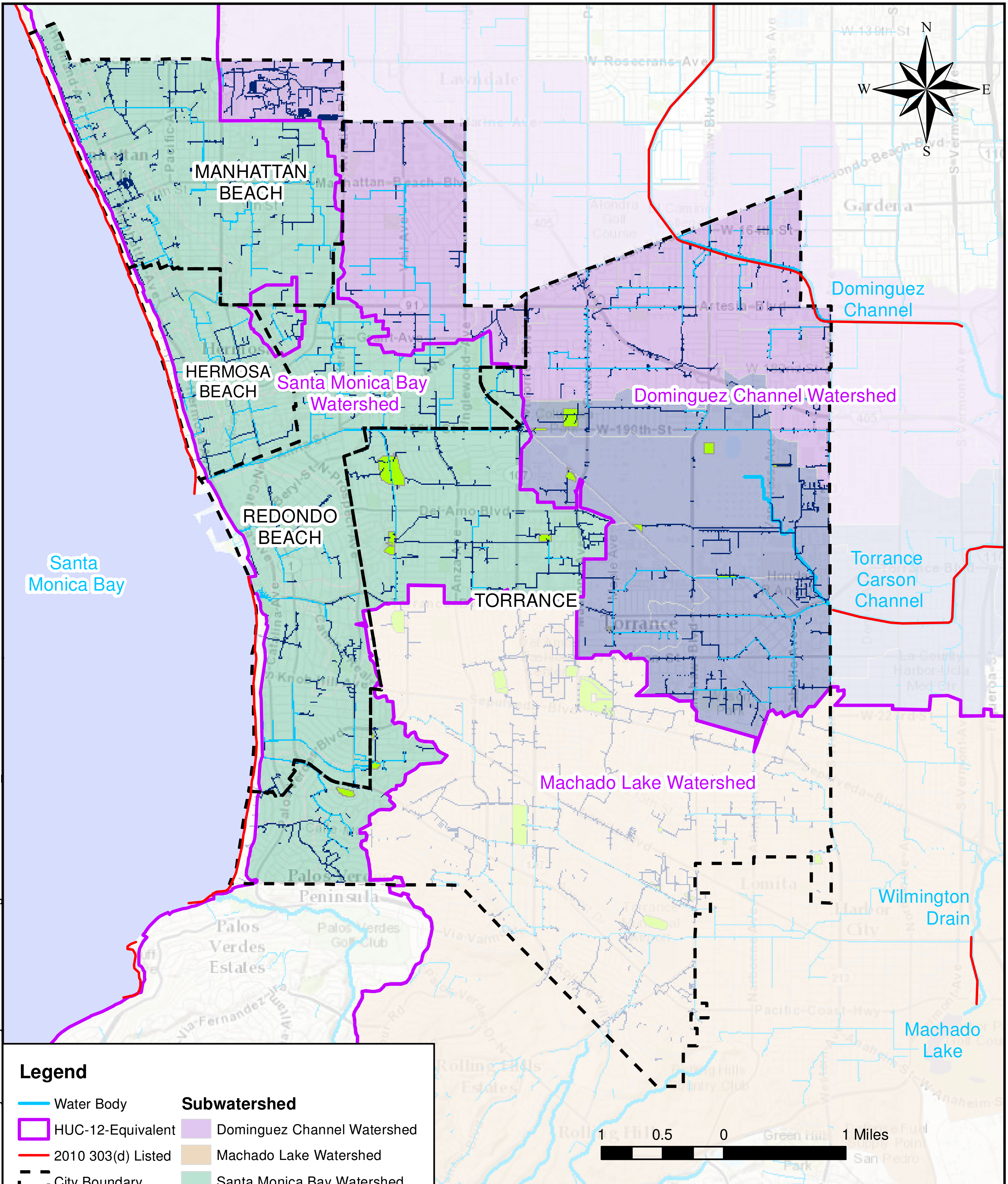

Figure 1. Water Bodies
Appendix A
Beach Cities EWMP WP

June 2014

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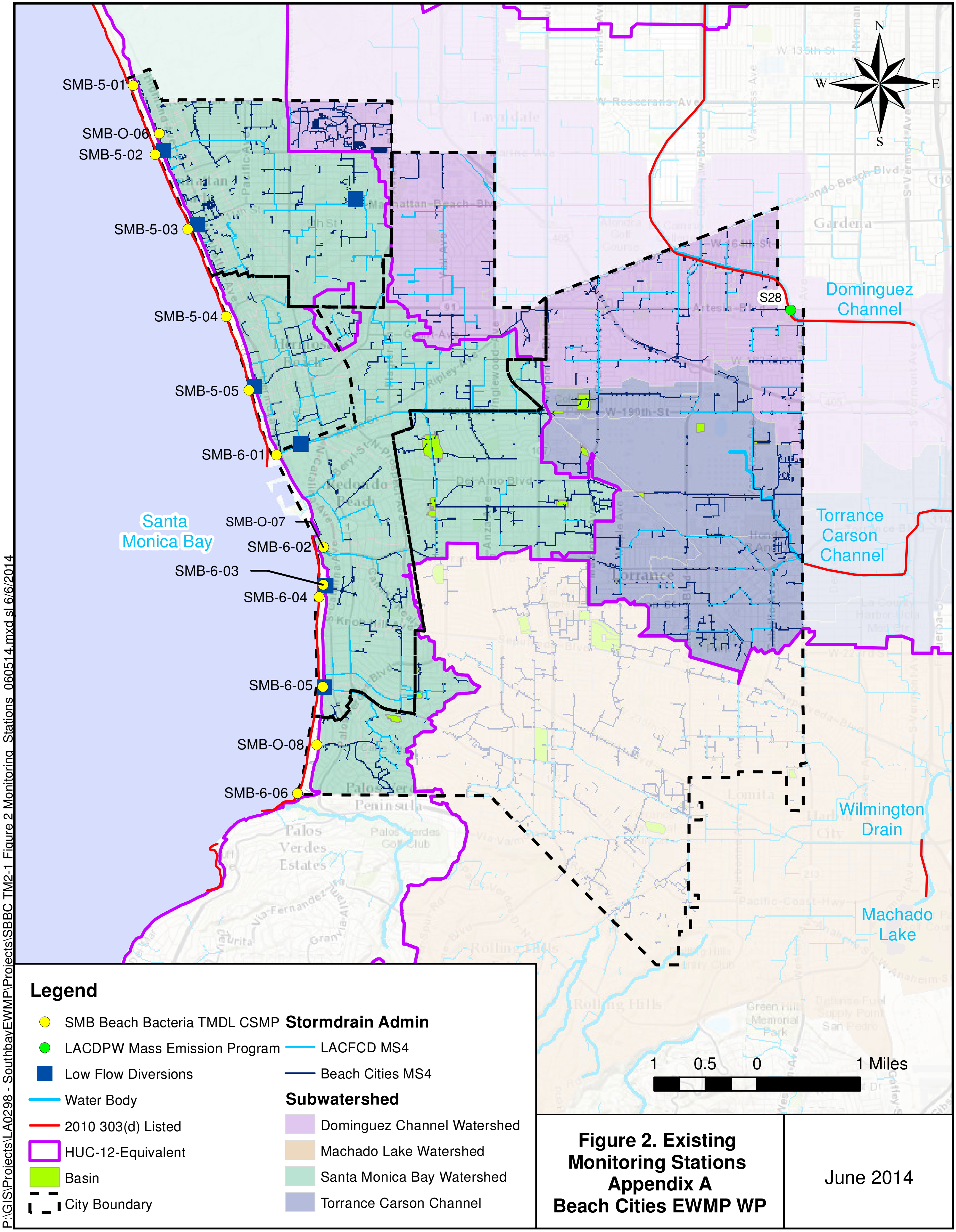

Figure 2. Existing Monitoring Stations Appendix A Beach Cities EWMP WP

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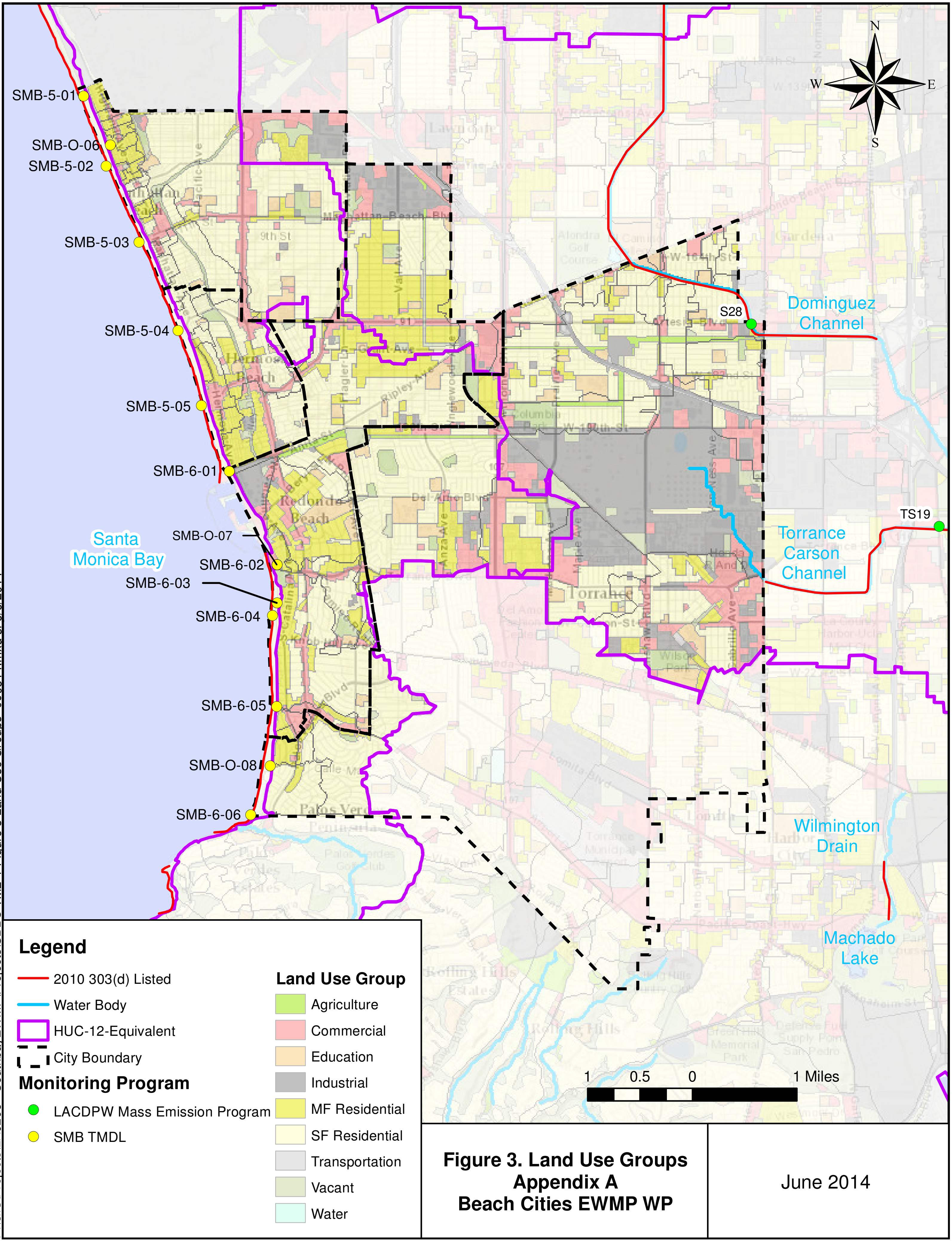

Figure 3. Land Use Groups
Appendix A
Beach Cities EWMP WP

June 2014

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Attachment A
Approach to Addressing Receiving Water Exceedances

APPROACH TO ADDRESSING RECEIVING WATER EXCEEDANCES

Sections VI.C.2 and VI.C.3 of the Permit describe how compliance with receiving water limits is attained for the various water body-pollutant combinations identified in a permittee's EWMP. Different actions are required for different types of receiving water limits. Specifically, the following classifications are addressed by the Permit:

- Water Body-Pollutant Combinations Addressed by a TMDL.
- 303(d)-listed Water Body-Pollutant Combinations: Pollutants in the same class as those identified in a TMDL and for which the water body is 303(d)-listed (Section VI.C.2.a.i), and pollutants not in the same class as those identified in a TMDL, but for which the water body is 303(d)-listed (Section VI.C.2.a.ii).
- Non 303(d)-listed Water Body-Pollutant Combinations: Pollutants for which there are exceedances of receiving water limitations, but for which the water body is not 303(d)-listed (Section VI.C.2.a.iii).

Figure A-1 illustrates this process.

Water Body-Pollutant Combinations Addressed by a TMDL

For water body-pollutant combinations addressed by a TMDL, adherence to all requirements and compliance dates as set forth in the approved EWMP will constitute compliance with applicable interim TMDL-based water quality based effluent limits and interim receiving water limits.

303(d)-listed Water Body-Pollutant Combinations

303(d)-listed water body-pollutant combinations are equivalent to the identified Category 2 combinations. Category 2 pollutants that will be addressed by the EWMP are limited to indicator bacteria in Dominguez Channel.[15] However, with the understanding that water body-pollutant combinations may be added to the Category 2 list based on future monitoring data, an approach to address both types of 303(d)-listed water body-pollutant combinations is provided below.

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[15] As detailed in this document, pollutants which have not been definitively tied to MS4 discharges are not included in the EWMP at this time, but will be evaluated as part of future monitoring under the CIMP.

Pollutants in the same class as those identified in a TMDL

If in the future a water body within the Beach Cities EWMP Area is added to the State's 303(d) list and a direct linkage to MS4 discharges is shown, the requirements of Permit Section VI.C.2.a.i will apply to this water body-pollutant combination, and the following actions will be completed as part of the EWMP:

- Demonstrate that the BMPs selected to achieve the applicable TMDL provisions will also adequately address MS4 contributions of the pollutant(s) within the same class. Assumptions and requirements of the corresponding TMDL provisions must be applied to the additional pollutant(s), including interim and final requirements and deadlines for their achievement, such that the MS4 discharges of the pollutant(s) will not cause or contribute to exceedances of receiving water limitations.
- Perform a RAA for this water body-pollutant combination.
- Identify milestones and dates for their achievement consistent with those in the applicable TMDL.

If outfall and receiving water monitoring under the CIMP indicate that such a listing is not linked to MS4 discharges, the Category 2 designation will be removed and further action for this water-body pollutant combination under the EWMP will cease.

Pollutants not in the same class as those identified in a TMDL

If in the future a water body within the Beach Cities EWMP Area is added to the State's 303(d) list and a direct linkage to MS4 discharges is shown, the requirements of Permit Section VI.C.2.a.ii will apply to this water body-pollutant combination. Currently, indicator bacteria in Dominguez Channel is the only 303(d)-listed pollutant that is not in the same class as any existing TMDL within the Dominguez Channel portion of the Beach Cities EWMP Area. Although the 303(d) source assessment only lists "point sources" and "nonpoint sources," and a definitive linkage to the Beach Cities has not been demonstrated, the MS4 system *may* cause or contribute to the bacteria impairment. Therefore, the following actions will be completed as part of the EWMP for indicator bacteria in Dominguez Channel, as well as in the future for any future applicable 303(d) listings:

- This water body-pollutant combination will be included in the RAA.
- If necessary, BMPs will be identified to address contributions of indicator bacteria from MS4 discharges to the receiving water, such that the MS4

discharges of bacteria will not cause or contribute to the exceedance of the receiving water limits.

- Enforceable milestones and dates for their achievement will be identified to control MS4 discharges such that they do not cause or contribute to exceedances of receiving water limitations within a timeframe that is as short as practicable, taking into account the technological, operational, and economic factors that affect the design, development, and implementation of the BMPs that are necessary. The time between dates will not exceed one year. Milestones will relate to a specific water quality endpoint (e.g., percent load reduction) and dates will relate either to taking a specific action or meeting a numeric water quality endpoint. If the identified dates are beyond the term of the Order, then Permit Section VI.C.2.a.ii(5) will apply.

If outfall and receiving water monitoring under the CIMP indicate that indicator bacteria is not an MS4-related pollutant, the Category 2 designation will be removed and further action for this water-body pollutant combination under the EWMP will cease.

Non 303(d)-listed Water Body-Pollutant Combinations

Permit Section C.2.a.iii discusses the requirements for pollutants for which there are exceedances of receiving water limitations, but for which the water body is *not* 303(d)-listed. As summarized previously, existing data indicate that cyanide, pH, selenium, mercury, and cadmium are all considered Category 3 pollutants for Dominguez Channel (including Torrance Lateral). However, at this time, due to an overall lack of data, these pollutants have not been definitively linked to MS4 discharges. As a result, these combinations (along with any potential future WBPCs) will ultimately be identified based on data collected pursuant to the approved CIMP. If and when sufficient CIMP monitoring data suggest that MS4 discharges may[16] have caused or contributed, or have reasonable potential to cause or contribute, to the exceedance of receiving water limitations, then the EWMP will be modified as follows:

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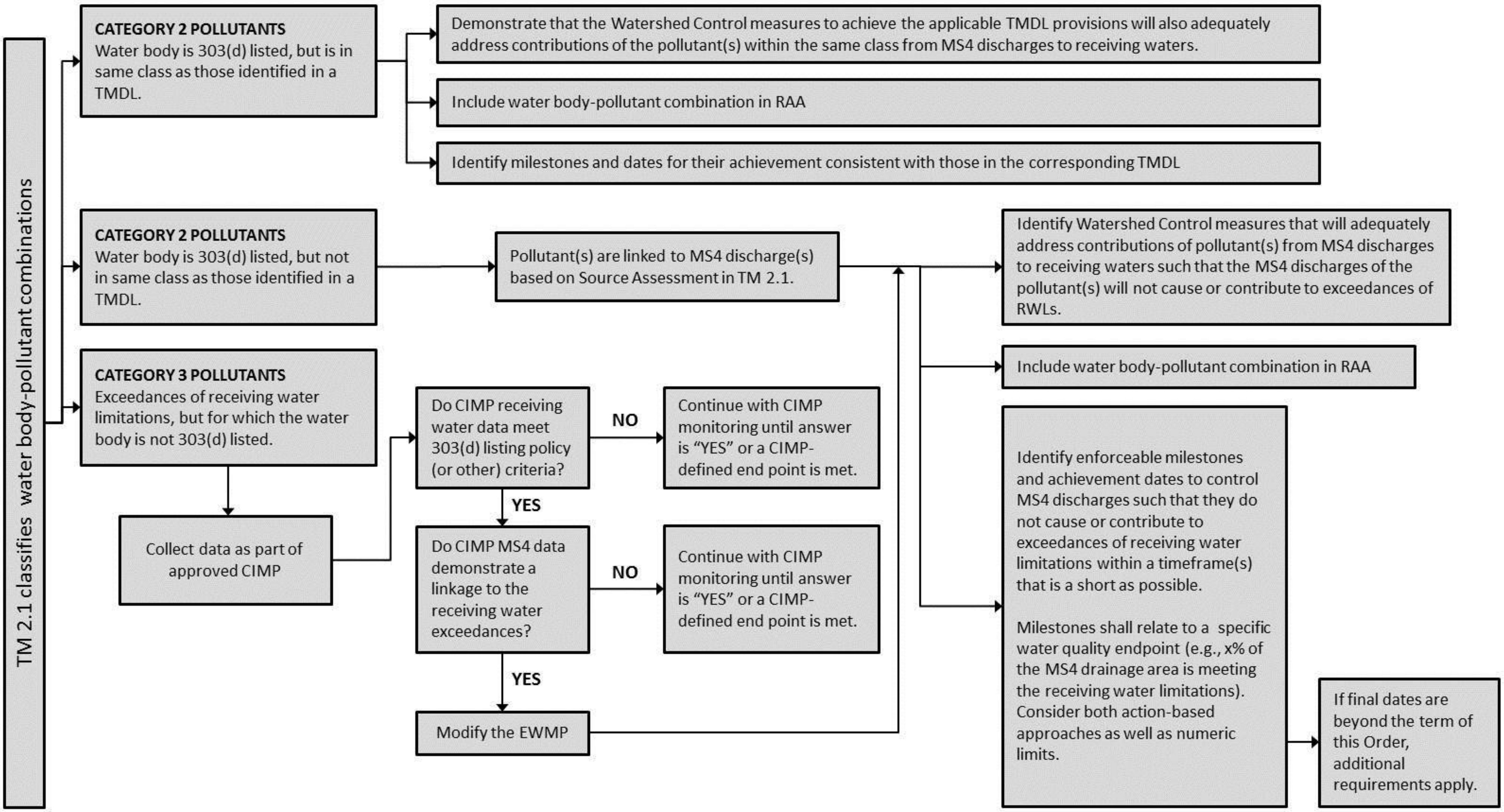
[16] Where CIMP monitoring data demonstrate that MS4 discharges may have caused or contributed to the exceedance of receiving water limitations, it should be noted that this does not constitute any admission of known contributions, but reflects uncertainty in linking datasets.

- BMPs will be identified to address contributions of the pollutant(s) from MS4 discharges to the receiving water(s), such that the MS4 discharges of the pollutant(s) will not cause or contribute to the exceedance of the receiving water limits.
- A RAA will be conducted for the water body-pollutant combination(s). In some instances this will require modeling of the identified pollutant.
- Enforceable milestones and dates for their achievement will be identified to control MS4 discharges such that they do not cause or contribute to exceedances of receiving water limitations within a timeframe(s) that is as short as practicable, taking into account the technological, operational, and economic factors that affect the design, development, and implementation of the BMPs that are necessary. The time between dates will not exceed one year. Milestones will relate to a specific water quality endpoint (e.g., percent load reduction) and dates will relate either to taking a specific action or meeting a milestone. If the identified dates are beyond the term of the Order, then Permit Section VI.C.2.a.iii(2)(d) will apply.

To evaluate if MS4 discharges may have caused or contributed to the exceedance of receiving water limitations, all of the following criteria will be applied:

- Receiving water samples exceed the applicable receiving water limitations at such frequency that they meet the listing criteria in Tables 3.1 and 3.2 in California’s Water Control Policy (State Water Board, 2004);
- MS4 outfall samples (taken per the CIMP) exceed the applicable WQBELs or receiving water limits; and
- Data do not exist to demonstrate that the outfall exceedances were a result of other permitted discharges to the MS4 (e.g., permitted dewatering or groundwater treatment projects).

Figure A-1. Compliance with Receiving Water Limitations Not Otherwise Addressed by a TMDL



APPENDIX B

Summary of Existing and Potential Control Measures

Beach Cities EWMP Work Plan Appendix B

Summary of Existing and Potential Control Measures

Prepared for

The Los Angeles Regional Water Quality Control Board

Prepared by

Beach Cities Watershed Management Group

(Cities of Hermosa Beach, Manhattan Beach, Redondo Beach, and Torrance and the Los Angeles County Flood Control District)

June 2014

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LIST OF ATTACHMENTS

1 INTRODUCTION

The 2012 Municipal Separate Storm Sewer System (MS4) Permit[1] (Permit) was adopted on November 8, 2012, by the Los Angeles Regional Water Quality Control Board (Regional Board) and became effective December 28, 2012. The Permit was created for the purpose of protecting the beneficial uses in the receiving waters in the Los Angeles region by ensuring that MS4s in the County of Los Angeles are not causing or contributing to exceedances of applicable water quality objectives. The Permit allows the Permittees to customize their stormwater programs through the development and implementation of an Enhanced Watershed Management Program (EWMP) to achieve compliance with certain Receiving Water Limitations (RWLs) and water quality based effluent limits (WQBELs). Following the adoption of the Permit, the Cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance along with the Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an EWMP for both the Santa Monica Bay Watershed and Dominguez Channel Watershed areas within their jurisdictions. This group of Permittees is hereinafter referred to as the Beach Cities Watershed Management Group (Beach Cities WMG).

As a necessary step in EWMP development, the Permit specifies that strategies, control measures, and best management practices (BMPs)[2] must be identified for implementation by the Beach Cities WMG. This document summarizes existing and planned BMPs within the geographical scope of the Beach Cities WMG EWMP Area, identifies potential regional BMPs, analyzes BMP effectiveness data, and sets forth a plan for customization of minimum control measures (MCMs) within the watershed. The plan presented herein conforms to Part VI.C.5.b of the Permit, which states:

> *"Permittees shall identify strategies, control measures, and BMPs to implement through their individual stormwater management programs, and collectively on a watershed scale, with the goal of creating an efficient program to focus individual and collective resources on watershed priorities."*

2 STRUCTURAL BMP CATEGORIES AND DESIGN CHARACTERISTICS

The Permit specifies that BMPs are expected to be implemented so that MS4 discharges meet effluent limitations as established in the Permit and to reduce impacts to receiving waters from

[1] Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4.

[2] For simplification, the term "BMP" will be used throughout the EWMP Work Plan to collectively refer to strategies, control measures, and/or best management practices.

stormwater and non-stormwater runoff. This expectation assumes the implementation of both types of BMPs – non-structural and structural – by the EWMP permittees.

Non-structural BMPs are BMPs that prevent or reduce the release of pollutants or transport of pollutants within the MS4 area but do not involve construction of facilities that physically remove pollutants. Non-structural BMPs are often implemented as programs or strategies which seek to prevent and/or reduce runoff and/or pollution close to the source. Examples include but are not limited to: street sweeping, downspout disconnect programs, pet waste cleanup stations, covered trash receptacles, and illicit discharge elimination. MCMs as set forth in the Permit are a subset of non-structural BMPs even though some MCMs include measures that require the implementation of structural BMPs by private parties.

Structural BMPs are BMPs that involve the construction of a physical control measure to alter the hydrology and/or water quality of incoming stormwater or non-stormwater. There are two categories of structural BMPs, defined by the runoff area treated by the BMP: regional BMPs[3] and distributed BMPs. Regional BMPs are designed to treat runoff from a large drainage area expected to include multiple parcels and various land uses. Distributed BMPs are designed to treat runoff from smaller drainage areas and are normally installed to collect runoff close to the source from a limited number of parcels. Relevant regional and distributed structural BMPs are described below.

Infiltration Basins

An infiltration basin typically consists of an earthen basin (i.e., pervious soft bottom, or without impervious barrier inhibiting loss of surface waters into subsurface soils) constructed in naturally pervious soils (Type A or B soils). A forebay settling basin or separate treatment control measure may be provided as pretreatment and to facilitate maintenance. An infiltration basin functions by retaining the stormwater quality design volume and allowing the retained runoff to percolate into the underlying native soils over a specified period of time, avoiding or mitigating potential adverse effects of standing water (e.g., vectors). This is a full-capture / zero discharge approach, meaning all influent up to the design storm is infiltrated at the BMP and therefore 100% of pollutant loads in the influent are removed from the system.

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[3] The term "regional BMP" in this context does not necessarily indicate that the project can capture and retain the 85th percentile storm, as described in the Permit. Nomenclature for regional BMPs that can capture and retain the 85th percentile storm will be useful to the EWMP process. The term "regional EWMP project" is recommended for those regional BMPs that are expected to be able to capture and retain the 85th percentile storm.

Dry Extended Detention Basins

Dry extended detention basins are basins whose outlets have been designed to detain the stormwater quality design volume for 36 to 48 hours to provide treatment through sedimentation with some volume loss due to infiltration and soil soaking (and evaporation/evapotranspiration). Dry extended detention basins do not have a permanent pool and are designed to drain completely between storm events. Limited biological and physicochemical treatment processes are typically provided due to lack of vegetation or constant presence of water necessary to support microbes, but detention basin performance is expected to increase with vegetation due to the breakdown of some pollutants by microbes growing on the vegetated substrate (e.g., stems, leaves, and root zone). These basins can also be used to provide hydromodification and/or flood control by modifying the outlet control structure and providing additional detention storage. The slopes, bottom, and forebay of dry extended detention basins are typically vegetated. Even without the addition of an engineered sand filter beneath the basin, considerable stormwater volume reduction can still occur, depending on the infiltration capacity of the subsoil.

Constructed Free Surface Flow Wetlands

A constructed free surface flow wetland is a system consisting of a sediment forebay and one or more permanent micro-pools with aquatic vegetation covering a significant portion of the basin. Constructed free surface flow wetlands typically include components such as an inlet with energy dissipation, a sediment forebay for settling out coarse solids and to facilitate maintenance, a base with shallow sections (1 to 2 feet deep) planted with emergent vegetation, deeper areas or micro pools (3 to 5 feet deep), and a water quality outlet structure. The interactions between the incoming stormwater runoff, aquatic vegetation, wetland soils, and the associated physical, chemical, and biological unit processes are a fundamental part of constructed treatment wetlands. Constructed wetlands provide multiple biological and physiochemical treatment processes associated with aerobic and anaerobic soil zones, submerged and emergent vegetation, and associated microbial activities.

Subsurface Flow Wetlands

Subsurface flow wetlands have a history of highly-effective implementation for tertiary treatment of wastewater, and are considered a “natural treatment system” with particular effectiveness for bacteria and pathogen reduction. Subsurface flow treatment processes within sub-surface flow wetlands range from simple physical filtration mechanisms to complex chemical adsorption and microbial transformation. With the addition of a detention basin for settling of coarse materials, subsurface flow wetlands can be considered an advanced treatment system nearly comparable (though less reliable) to a conventional wastewater treatment plant and would be expected to remove pollutants (e.g., TSS) at least as effectively as constructed surface flow wetlands.

Sanitary Diversions

Sanitary diversions (often also called low-flow diversions) are structural BMPs that divert and redirect urban runoff away from the MS4 and to the sanitary sewer system, primarily during dry weather. In many cases, low flow diversions also function during wet weather up to the specified design storm depth (e.g., the first $1/10^{th}$ inch of rainfall), thereby reducing a portion of the wet weather runoff volume and associated pollutant load transported downstream.

Treatment Facilities

This BMP type includes the complete or partial diversion of the water quality design storm to a treatment plant for disinfection. Conventional treatment practices (e.g., ultraviolet disinfection), while more common for the treatment of dry weather urban runoff than stormwater runoff due in part to capacity and energy requirements, are considered to be the most effective at removing pollutants since they are highly engineered systems with designs driven by the constituents of concern.

Cisterns

Cisterns are a rainfall harvest-and-use BMP, typically designed to capture a water quality design storm. Captured water is infiltrated or used for irrigation,[4] thereby reducing runoff and associated pollutants. Because cisterns are typically a full-capture BMP, the pollutant removal effectiveness of cisterns is considered comparable to infiltration basins. Capture-and-use regulations currently in place in the Beach Cities WMG effectively require captured water to be used for landscape irrigation only.

Bioretention/Biofiltration

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil- and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plantings. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. An optional gravel layer can be added below the planting soil to provide additional storage volume for infiltration. Bioretention is typically designed without an underdrain to serve as a retention BMP in areas of high soil permeability, where infiltration can occur in addition to filtration. Bioretention with an underdrain (or “biofiltration”) is a treatment control measure that can be used for areas with low permeability native soils or steep slopes, to allow for the treatment of runoff through filtration despite impermeable underlying

[4] Currently, utilization of harvested rainwater for purposes other than irrigation (e.g., indoor toilet use) is limited and requires high levels of treatment and additional permitting requirements.

soils. Bioretention can also be designed with a raised underdrain (or “bioinfiltration”) to enhance the amount of retention and incidental infiltration achieved by the BMP.

Bioswales

Bioswales (also known as vegetated swales) are open, shallow channels with low-growing vegetation covering the side slopes and bottom topography that collect and slowly convey runoff to downstream discharge points. Bioswales provide pollutant removal through settling and filtration via the vegetation (usually grasses) lining the channels, thereby allowing for stormwater volume reduction through infiltration and evapotranspiration, reduction in the flow velocity, and conveyance of stormwater runoff. The vegetation in the bioswale can vary depending on its location, depending on the design criteria outlined in this section.

Green Roofs

Green roofs (also known as eco-roofs and vegetated roof covers) are roofing systems that layer a soil/vegetative cover over a waterproof membrane. Green roofs rely on highly-porous media and moisture retention layers to treat runoff via biofiltration, store intercepted precipitation, and support vegetation that can reduce the volume of stormwater runoff via evapotranspiration. Cisterns can also be incorporated into green roof design to receive the filtered runoff and store it for on-site use.

Porous / Permeable Pavements

Permeable pavements are infiltration-type BMPs that contain significant voids to allow water to pass through to a stone base, typically reaching infiltrative soils. These BMPs come in forms such as modular paving systems (concrete pavers, grass-pave, or gravel-pave) or poured-in-place solutions (porous concrete or permeable asphalt). Permeable pavements with a stone reservoir base provide some treatment of stormwater and removal of sediments and metals. While conventional non-permeable pavement results in increased rates and volumes of surface runoff, porous pavements (when properly constructed and maintained) allow some of the stormwater to percolate through the pavement and enter the soil below. This process facilitates groundwater recharge while providing the structural and functional features needed for roadways, parking lots, and sidewalks. The paving surface, subgrade, and installation requirements of permeable pavements are more complex than those for conventional asphalt or concrete surfaces.

Media Filters

Media filters consist of sand filters, compost filters, cartridge filters, and any other BMP designed with filtration media that absorbs pollutants. The treatment pathway is vertical (downward through the sand or media) to a perforated underdrain system that is connected to the downstream storm drain system or to an infiltration facility. As stormwater or dry weather urban runoff passes through the sand, pollutants are trapped in the small pore spaces between sand grains or are adsorbed to the sand surface. Media filters can be used as stand-alone or pre-treatment measures to extend the life and effectiveness of downstream BMPs.

Hydrodynamic Separators

Hydrodynamic separation devices (e.g., CDS, ARS, and CPS units) are devices that remove trash, debris, and coarse sediment from incoming flows using screening, gravity settling, and (often) centrifugal forces generated by forcing the influent into a circular motion. Several types of hydrodynamic separation devices are also designed to remove floating oils and grease using sorbent media. Like media filters, hydrodynamic separators can be used as stand-alone or pre-treatment measures to extend the life and effectiveness of downstream BMPs.

3 SUMMARY OF EXISTING AND PLANNED BMPS

This section provides a summary of existing, planned, and potential BMPs within the Beach Cities EWMP Area based on input received from the Beach Cities WMG and a review of available data. Existing BMPs are those BMPs that have been constructed and are functional at the time of drafting the EWMP Work Plan. Planned BMPs are those BMPs which have been identified for implementation and conceptual designs have been initiated. These BMPs are not necessarily funded at this time and their future construction depends on a number of factors which have not necessarily been evaluated at this stage of the EWMP development. Such factors include technical feasibility, constructability, cost, and modeled performance during the reasonable assurance analysis (RAA), among others. Potential BMPs are those BMPs which have been identified for possible implementation, but no design plans have been initiated at this time. Table 3-1 provides a summary of the existing, planned, and potential regional and distributed structural BMPs within the Beach Cities EWMP Area.

Table 3-1. Summary of Existing, Planned, and Potential BMPs Within the Beach Cities EWMP Area

Agency	Regional BMPs[1]				Distributed BMPs				Total
	Existing	Planned	Potential	Total	Existing	Planned	Potential	Total	
Hermosa Beach	3	3	1	7	107	1	2	110	**117**
LACFCD	3	-	-	3	-	-	-	0	**3**
Manhattan Beach	7	5	-	12	101	-	4	105	**117**
Redondo Beach	5	2	2	9	127	-	7	134	**143**
Torrance	18	-	-	18	242	-	2	244	**262**
Total	**36**	**10**	**3**	**49**	**577**	**1**	**15**	**593**	**642**

[1]Regional projects shown are not necessarily equivalent to the Permit-specified “regional EWMP projects,” which must retain (i) all non-stormwater runoff and (ii) all stormwater runoff from the 85th percentile, 24-hour storm event for the drainage areas tributary to the projects.

This appendix is focused on the SMB Watershed and Dominguez Channel Watershed within the Beach Cities EWMP Area. A separate BMP Implementation Plan has been submitted by the City of Torrance to address Machado Lake Nutrient and Toxics TMDLs. The EWMP being developed for the Beach Cities WMG will rely on this previous work and will not separately re-analyze BMP performance and implementation in the Machado Lake Watershed. The Machado Lake Nutrient TMDL Special Study Work Plan is included as Appendix D in the EWMP Work Plan.

3.1 Existing Regional BMPs

Table 3-2 summarizes the number of existing regional BMPs (and BMP types) within the Beach Cities EWMP Area. These numbers reflect BMPs that have been implemented or retrofitted since the applicable TMDL. Although these BMPs do not necessarily meet the Permit’s design criterion for a “regional EWMP project,” the BMPs do capture and/or treat runoff from large tributary areas which include multiple parcels. Locations of these BMPs are shown on Figure 1. Details for each BMP are provided in Attachment A.

Table 3-2. Summary of Existing Regional BMPs by BMP Type

Permittee	Number of Existing Regional BMPs					Total
	Infiltration	Detention	Retention	Low Flow Diversion	Constructed Wetland	
Hermosa Beach	3[a]	-	-	-	-	**3**
Manhattan Beach	1	3	1	1	1[b]	**7**
Redondo Beach	2		1	2	-	**5**
Torrance	-	16	-	1	1	**18**
LACFCD	-	-	-	3	-	**3**
Total	**3**	**19**	**2**	**7**	**2**	**36**

[a] The "Pier Avenue Improvement Infiltration Systems" project actually contains 31 water quality inlets, each with infiltration galleries, and could therefore be considered a distributed BMP; however, it is assumed to be one regional BMP to avoid double counting.
[b] Polliwog Park Wet Pond

3.2 Existing Distributed BMPs

Table 3-3 provides a compilation of known existing distributed BMPs for the Beach Cities WMG. Like the existing regional BMPs, these numbers reflect BMPs that have been implemented or retrofitted since the applicable TMDL. Locations of existing distributed BMPs are shown on Figure 2 where sufficient location information is readily available. Details for each BMP are provided in Attachment B.

Table 3-3. Summary of Existing Distributed BMPs by BMP Type

BMP Type	Existing Distributed BMPs				
	Hermosa Beach	**Manhattan Beach**	**Redondo Beach**	**Torrance**	**Total**
Biofiltration	-	-	2	-	**2**
Bioswale	-	-	-	1	**1**
Catch Basin Insert	41	11	66	30	**148**
Clarifier	-	5	2	-	**7**
Detention Basin	-	-	2	-	**2**
Green Roof	2	1	-	-	**3**
Hydrodynamic Separator	-	10	7	10	**27**
Infiltration	27	4	39	-	**70**
Low Flow Diversion	-	2	1	-	**3**
Porous Pavement	2	7	7	-	**16**
Rainwater Harvesting	-	-	1	-	**1**
Trash Excluder	35	57	-	201	**293**
Trench Drain Insert	-	4	-	-	**4**
Total	**107**	**101**	**127**	**242**	**577**

3.3 Planned and Potential Regional BMPs

Table 3-4 summarizes the planned and potential regional BMPs within the Beach Cities EWMP Area. These BMPs are not necessarily funded at this time and their future construction depends on a number of factors which have not necessarily been evaluated at this stage of the EWMP development. Such factors include technical feasibility, constructability, cost, and modeled performance during the RAA, among others. Locations of these BMPs are shown on Figure 3. Details for each BMP are provided in Attachment C.

Table 3-4. Planned/Potential Regional BMPs by BMP Type

Permittee	Number of Planned/Potential Regional BMPs	
	Infiltration	**Constructed Wetland**
Hermosa Beach	3[a]	1[b]
Manhattan Beach	5	-
Redondo Beach	2	2[c]
Torrance	-	-
Total	10	3

[a] Includes the SMB 5-4 Infiltration Trench, which will exist in both Hermosa Beach and Manhattan Beach
[b] Valley Park Wet Pond
[c] Includes the Alta Vista Park Wet Pond

3.4 Planned and Potential Distributed BMPs

Table 3-5 summarizes the planned and potential distributed BMPs within the Beach Cities EWMP Area. Locations of these BMPs are shown on Figure 3 where location information was available. Details for each BMP are provided in Attachment D.

Table 3-5. Summary of Planned and Potential Distributed BMPs by BMP Type

Permittee	Number of Planned/Potential Distributed BMPs			
	Cistern	Infiltration	Porous Pavement	Vegetated Filter Strip
Hermosa Beach	-	1[a]	2	-
Manhattan Beach	2	-	2	-
Redondo Beach	2	-	2	3
Torrance	-	-	2	-
Total	4	1	8	3

[a] 48 infiltration catch basins at the Hermosa Avenue Green Street,

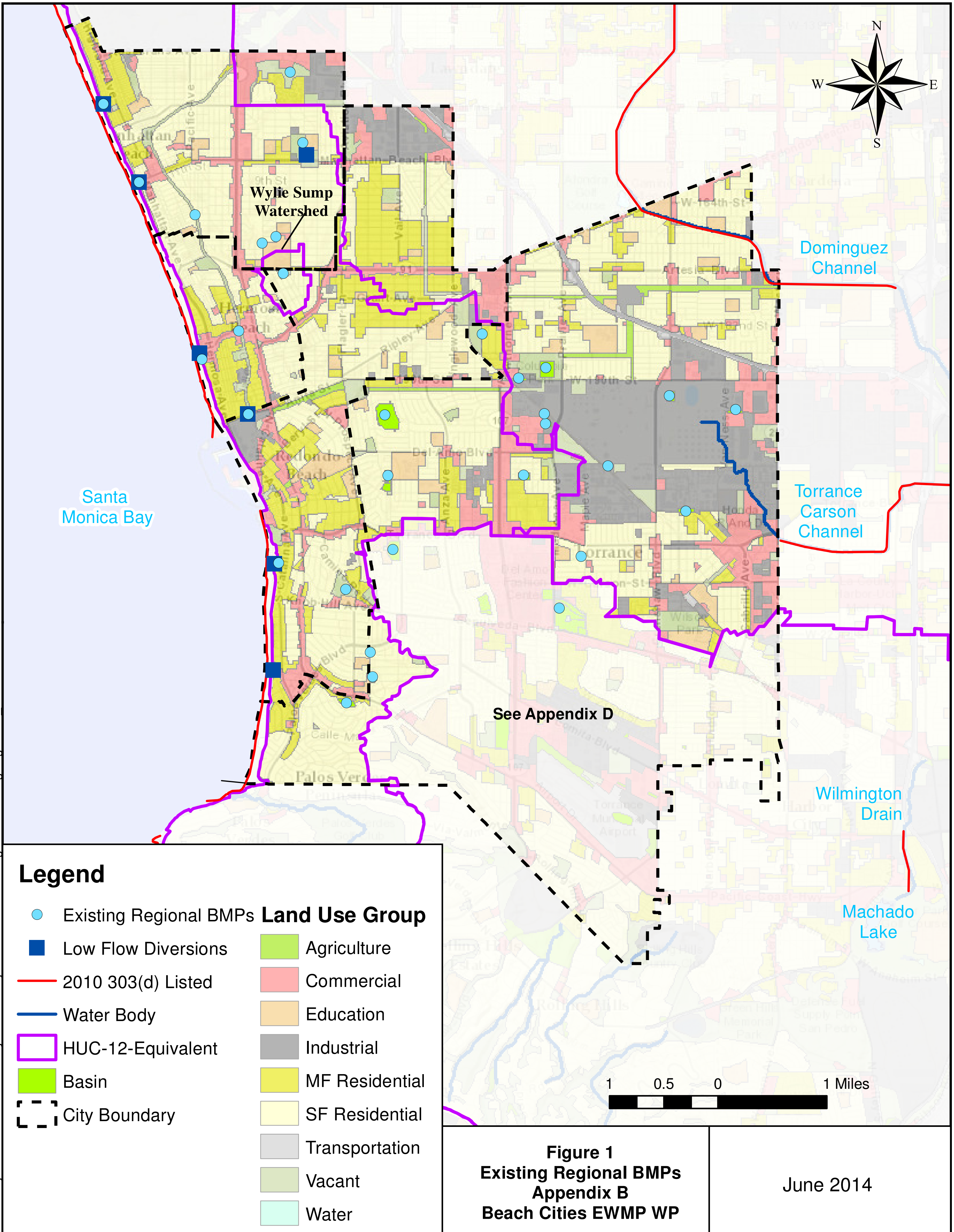

Figure 1
Existing Regional BMPs
Appendix B
Beach Cities EWMP WP

June 2014

P:\GIS\Projects\LA0298 - SouthbayEWMP\Projects\SBBC TM2-2 Figure 1 ExistingRegBMPs 060514.mxd sl 6/6/2014

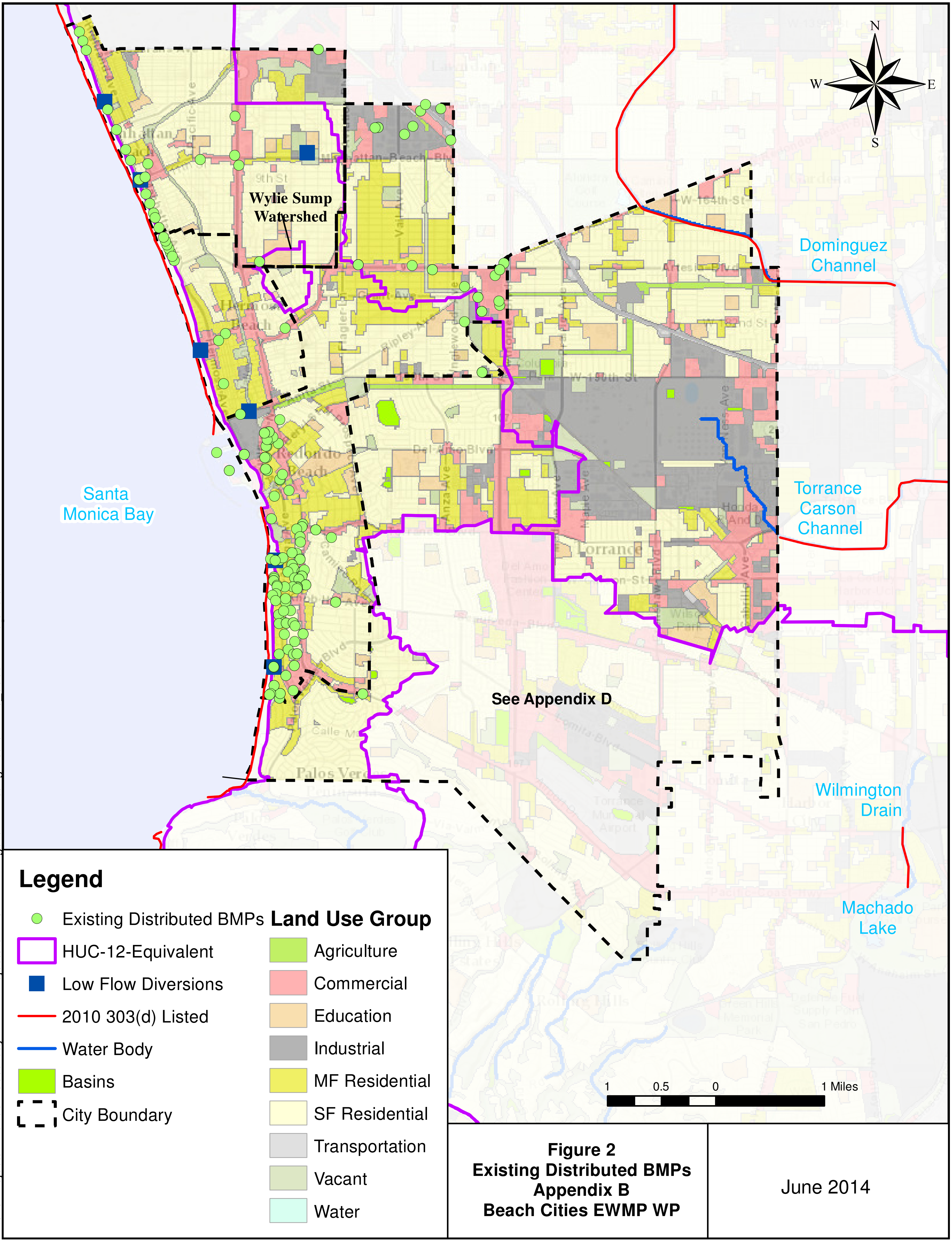

Figure 2
Existing Distributed BMPs
Appendix B
Beach Cities EWMP WP

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P:\GIS\Projects\LA0298 - SouthbayEWMP\Projects\SBBC TM2-2 Figure 2 ExistingDistribBMPs 060514.mxd sl 6/6/2014

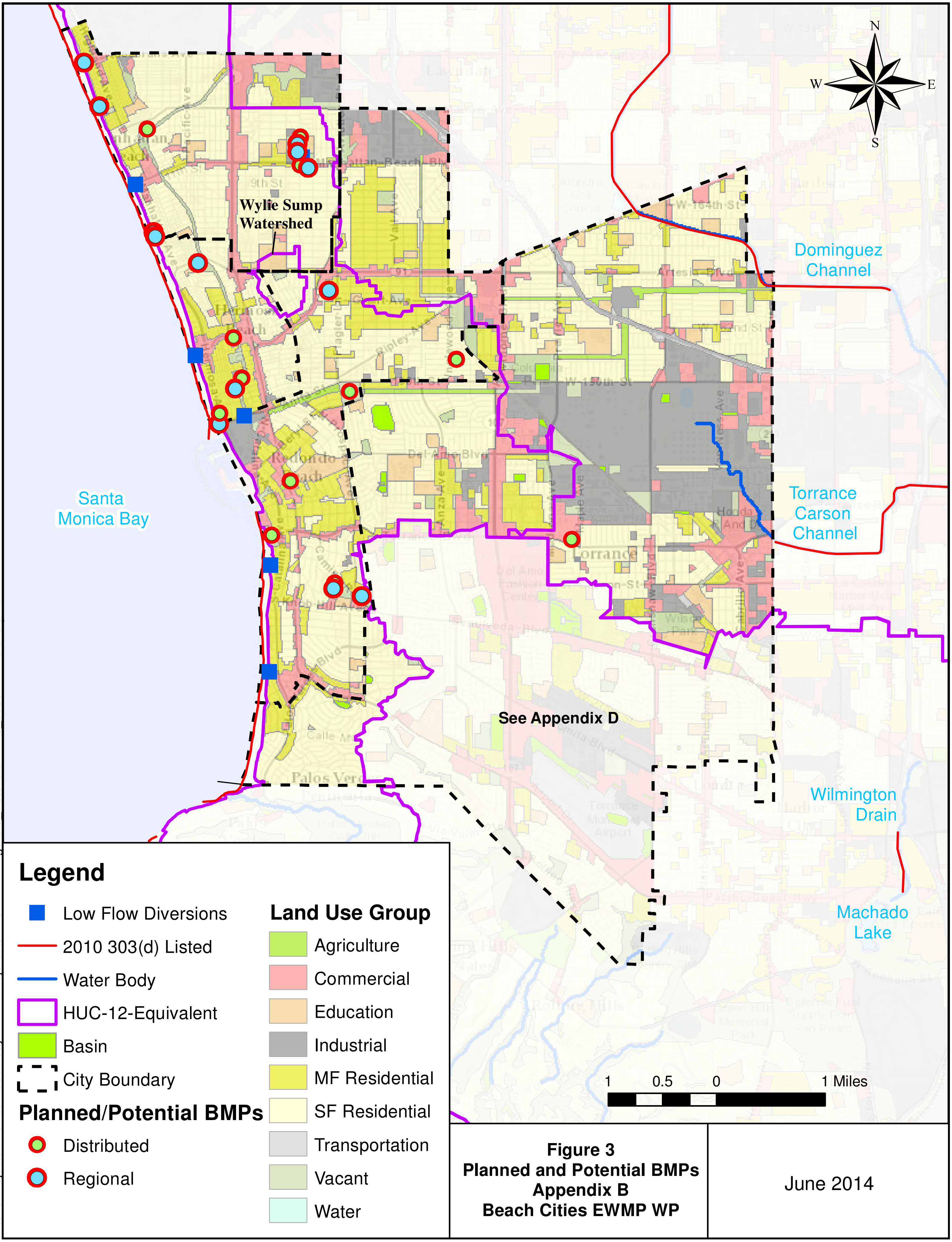

Figure 3
Planned and Potential BMPs
Appendix B
Beach Cities EWMP WP

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P:\GIS\Projects\LA0298 - SouthbayEWMP\Projects\SBBC TM2-2 Figure 3 PotentialBMPs 060514.mxd sl 6/6/2014

4 REGIONAL EWMP PROJECTS

Participation in an EWMP requires comprehensive evaluation of opportunities for collaboration among permittees on multi-benefit regional projects that, wherever feasible, retain (i) all non-stormwater runoff and (ii) all stormwater runoff from the 85th percentile, 24-hour storm event for the drainage areas tributary to the projects, while also achieving other benefits including flood control and water supply, among others. Such projects and their tributary drainage areas will not be included in the EWMP reasonable assurance analysis, as specified in Section V1.C.1.g of the Permit.

There is one regional EWMP project within the Beach Cities EWMP Area. Additional regional EWMP projects may be identified during the EWMP planning process.

4.1 Wylie Sump Regional Project

The regional EWMP project, the Wylie Sump in Redondo Beach, is currently is designed to capture and retain more than the 85th percentile design storm from its entire 131 acre tributary area. The Wylie Sump is located on Artesia Blvd between Goodman Ave and Ford Ave. The Wylie Sump receives runoff from 38 acres of the City of Manhattan Beach, 20 acres of Hermosa Beach, and 73 acres of Redondo Beach.

4.2 Process for Identifying Additional Regional EWMP Projects

Additional regional EWMP projects may be identified during the EWMP planning process. These projects will be identified using a combination of computer modeling with the Structural BMP Prioritization and Analysis Tool (SBPAT) and desktop-level screening to identify areas that are suitable for a regional EWMP project.

SBPAT is a Permit-approved model that prioritizes catchments based on water quality needs and identifies parcels which provide opportunities for structural BMP implementation. After first evaluating and prioritizing catchments within a watershed with the highest water quality improvement need, SBPAT identifies potential BMP opportunities by calculating a regional BMP score for every catchment within a watershed. The BMP score is determined by first calculating parcel scores according to their size, ownership, land use, and distance from major storm drains and then an area-weighted parcel score is calculated for every catchment. These BMP scores are then compared with the calculated catchment prioritization results, resulting in a prioritized list of BMP opportunity sites based on parcel characteristics as well as water quality considerations. The sizing of these potential BMPs will be evaluated consistent with the SBPAT modeling process.

SBPAT then has the capability to evaluate BMP performance based on a hydrologic/hydraulic assessment, a water quality evaluation, and a cost analysis. Section 5 details the performance data used to evaluate each type of BMP. A more detailed description of the modeling process implemented by SBPAT is provided in the RAA Approach documentation (EWMP Work Plan Appendix C).

SBPAT was previously applied within two high priority drainage areas in the SMB Watershed of the Beach Cities EWMP Area. Projects previously identified through this earlier study have been included either as planned or potential structural BMPs.

4.3 Process for Evaluating Potential Regional EWMP Projects

Potential regional EWMP projects will be evaluated (i.e., confirmed to retain the 85th percentile event, including the effects of upstream LID and other distributed BMPs) using SBPAT or an alternative hydrological calculation approach. Regional EWMP project opportunity sites that are identified and evaluated but do not meet the 85th percentile retention criteria may then alternatively be considered for inclusion in the EWMP as a regional BMP project, and would then be evaluated as part of the RAA modeling analysis.

5 SUMMARY OF BMP PERFORMANCE DATA

The performance of existing and planned BMPs in the Beach Cities EWMP Area will be evaluated through the RAA as described in Section VI.C.5.b.iv(5) of the Permit, both in terms of volume capture (based on BMP design criteria) and predicted effluent quality. Due to a lack of sufficient project-specific monitoring data quantifying the performance of an installed BMP, modeling of expected BMP performance will be based on existing, peer-reviewed pollutant reduction data for similar types of pollutants and BMPs. Coupled with information on the capacity/volume of each BMP in question, modeling will predict the impact of each BMP on water quality.

The International Stormwater BMP Database (IBD) is a comprehensive source of BMP performance information (www.bmpdatabase.org), comprised of data from a peer-reviewed collection of studies that have monitored the effectiveness of a variety of BMPs in treating water quality pollutants for a variety of land use types. Research on characterizing BMP performance suggests that effluent quality is more reliable in modeling stormwater treatment rather than percent removal, which assumes a linear influent-to-effluent relationship (Strecker et al. 2001). Schueler (1996) also found in his evaluation of detention basins and stormwater wetlands that BMP performance is often limited by an achievable effluent quality, or "irreducible pollutant concentration"; acknowledging that a practical lower limit exists at which stormwater pollutants can be removed by any given technology. While there is likely a relationship between influent and effluent water quality for some BMPs and some constituent concentrations, analyses conducted to date do not support fixed percent removal values relative to influent quality for the following reasons (WWE and Geosyntec, 2007):

1. Percent removal depends heavily on influent quality, and in the majority of cases, higher observed influent pollutant concentrations actually result in higher percent removals (i.e., observed effluent concentrations for most BMPs are relatively consistent, so the use of a pre-set percent removal would under-predict BMP performance when influent concentrations are high and over-predict BMP performance when influent concentrations are low);
2. The variability in percent removal is often more broad than the variability in effluent pollutant concentration;
3. A high percent removal may still result in a high pollutant concentration, thereby leading to a false determination that BMPs are performing well; and
4. Different percent removals can be calculated within the same dataset (i.e., when looking at individual pairs of influent/effluent samples).

For the reasons stated above, percent removal is not used to quantify BMP performance. Instead raw effluent data has been used to estimate the "irreducible pollutant concentration" attributable to each BMP that will be analyzed as part of the RAA.

Future studies may support a refinement to the assumption of effluent concentration-based BMP performance modeling, such as the development of more complex influent-effluent relationships (WWE and Geosyntec, 2007). However, it should be noted that the stochastic modeling approach accounts for, at least in part, the uncertainty in the relationship between influent and effluent concentrations because the modeled BMP effluent distributions are based on a variety of BMP studies with a wide range of influent concentrations, representing a variety of tributary drainage area land use characteristics.

A November 2011 interim release of the IBD was analyzed in early 2012 for the purpose of developing BMP effluent statistics (this analysis utilized the same dataset used to produce the summary statistics contained in Geosyntec and WWE, 2012). As with the estimation of land use event mean concentrations (EMCs), final effluent values used to predict BMP performance were determined from the data contained in the IBD using a combination of regression-on-order statistics and the "bootstrap" method.[5] Log-normality was also assumed for BMP effluent concentrations. This assumption has been confirmed previously through goodness-of-fit tests on the BMP effluent concentration data (Geosyntec, 2008). Statistics for effluent concentrations based on available water quality performance data were developed for the BMPs and constituents listed in Table 5-1.

[5] The bootstrap approach randomly samples the dataset several thousand times and computes the desired statistic from the subset of data.

Table 5-1. BMPs and Constituents Modeled[a]

BMPs	Constituents
Constructed Wetland / Retention Pond (with Extended Detention)	Total suspended solids (TSS)
Constructed Wetland / Retention Pond (without Extended Detention)	Total phosphorus (TP)
Dry Extended Detention Basin	Dissolved phosphorus as P (DP)[b]
Hydrodynamic Separator	Ammonia as N (NH3)
Media Filter	Nitrate as N (NO3)
Subsurface Flow Wetland	Total Kjeldahl nitrogen as N (TKN)
Treatment Plant	Dissolved copper (DCu)
Bioswale	Total copper (TCu)
Bioretention with underdrain	Total lead (TPb)
Bioretention (volume reduction only)	Dissolved zinc (DZn)
Infiltration Basins (volume reduction only)	Total zinc (TZn)
Cistern (volume reduction only)	Fecal Coliform (FC)
Green Roof (volume reduction only)	
Porous Pavement (volume reduction only)	
Low Flow Diversion (volume reduction only)	

[a] All constituents are addressed for all BMPs that provide treatment (i.e., excluding those identified as "volume reduction only").
[b] Dissolved phosphorus and orthophosphate datasets were combined to provide a larger dataset, and because the majority of orthophosphate is typically dissolved and many datasets either report dissolved phosphorus or orthophosphate, but not both.

Table 5-2 summarizes the number of effluent data points (individual storm events) and percent non-detects for the pollutants and BMP types of interest for which sufficient data were available. A large percentage of non-detects can bias the effluent statistics derived from the dataset (e.g., total lead for bioretention shows a 60% non-detect ratio).

Table 5-3 summarizes arithmetic averages and Table 5-4 summarizes the arithmetic standard deviations of the BMP effluent concentrations that will be used in the RAA.

Consistent with IBD documentation (WWE and Geosyntec, 2007), BMP effluent concentrations are assumed to be limited by an "irreducible effluent concentration," or a minimum achievable concentration (Schuler, 1996). Lower limits are currently set at the 10th percentile effluent concentration of BMP data in the IBD for each modeled BMP type for which the BMP data show statistically significant reductions between influent and effluent means. If the differences are not statistically significant or there is a statistically significant increase, the 90th percentile is used as the minimum achievable effluent concentration, which essentially assumes no treatment except when influent to the BMP is very high. Table 5-5 summarizes the irreducible effluent concentration estimates that are used in SBPAT to prevent treatment from occurring when influent concentrations are equal to or below these values.

Table 5-2. Summary of Number of Data Points and Percent Non-Detects for BMP Effluent Concentration Data from the International BMP Database

BMP		TSS	TP	DP	NH3	NO3	TKN	DCu	TCu	TPb	DZn	TZn	FC
Bioretention	Count	193	249	164	184	259	201	NA	39	48	15	48	29
	%ND	10%	5%	4%	18%	3%	2%	NA	18%	60%	0%	35%	0%
Vegetated Swales (Bioswales)	Count	354	364	249	225	372	324	82	309	308	72	373	92
	%ND	1%	1%	0%	17%	1%	0%	4%	3%	39%	6%	23%	0%
Hydrodynamic Separators (not updated - original SBPAT analysis, 2008)	Count	199	170	58	69	59	77	89	99	95	99	174	31
	%ND	7%	3%	33%	28%	3%	5%	17%	0%	8%	18%	7%	3.2%
Media Filters	Count	409	403	244	215	391	374	186	361	341	221	433	185
	%ND	7%	6%	14%	24%	2%	6%	7%	12%	21%	19%	13%	0%
Detention Basins	Count	299	275	116	94	213	185	170	198	209	163	189	190
	%ND	1%	3%	16%	6%	7%	4%	32%	31%	50%	17%	15%	0%
Retention Ponds	Count	723	654	618	423	626	496	213	536	646	212	593	137
	%ND	4%	3%	6%	8%	6%	3%	26%	21%	30%	15%	7%	0%
Wetland Basins/Retention Ponds (combined)	Count	1028	932	862	681	872	680	228	684	767	227	770	158
	%ND	4%	3%	6%	7%	7%	2%	25%	20%	28%	14%	8%	0%

Table 5-3. International BMP Database Arithmetic Mean Estimates of BMP Effluent Concentrations

BMP	TSS mg/L	TP mg/L	DP mg/L	NH3 mg/L	NO3 mg/L	TKN mg/L	DCu ug/L	TCu ug/L	TPb ug/L	DZn ug/L	TZn ug/L	FC #/100 mL
Constructed Wetland / Retention Pond (with Extended Detention)[1]	38.3	0.19	0.11	0.18	0.42	1.20	5.3	6.7	7.2	22.1	35.3	1.01E+04
Constructed Wetland / Retention Pond (without Extended Detention)[2]	32.9	0.17	0.09	0.17	0.38	1.20	5.3	6.2	12.0	22.6	38.0	9.89E+03
Dry Extended Detention Basin[3]	42.3	0.37	0.26	0.16	0.61	2.40	6.5	11.4	14.4	33.7	78.4	1.41E+04
Hydrodynamic Separator[4]	98.1	0.50	0.06	0.30	0.67	2.07	13.1	16.7	12.7	78.4	107.4	2.68E+04
Media Filter[5]	22.3	0.14	0.07	0.18	0.74	0.98	8.3	11.0	4.6	34.7	37.6	5.89E+03
Sub-surface Flow Wetland[6]	18.1	0.06	0.06	0.09	0.27	0.87	4.6	4.6	0.7	20.9	25.8	PR=90%
Treatment Plant[7]	2.0	0.00	0.00	0.00	0.27	0.01	1.0	1.0	4.4	5.0	5.0	2.00E+00
Vegetated Swale (Bioswale)[8]	27.1	0.28	0.17	0.09	0.43	0.87	9.6	10.1	6.4	33.3	33.3	8.00E+04
Bioretention[9]	18.1	0.14	0.07	0.18	0.37	0.98	8.3	8.8	4.2	34.7	37.6	5.89E+03
Bioretention w/o underdrain	Volume reductions only											
Cistern	Volume reductions only											
Green Roof	Volume reductions only											
Porous Pavement	Volume reductions only											
Infiltration Basin	Volume reductions only											

[1] Based on retention pond IBD category (basis per Geosyntec 2008)
[2] Based on combined wetland basin and retention pond IBD categories (basis per Geosyntec 2008)
[3] Strictly detention basin category from the IBD
[4] From Geosyntec, 2008
[5] Includes non-bio media filters (e.g., sand filters)
[6] Subsurface flow wetlands have not been extensively studied for stormwater treatment effectiveness and, though applied research exists, the International BMP database currently does not contain data with regard to their performance. As a result, the lowest effluent concentration of all IBD categories is used; except for Fecal Coliform, where 90% removal is used. The 90% removal is based on USEPA, 1993, which states that SSF wetlands are generally capable of a 1 to 2 log reduction in fecal coliforms.
[7] Secondary Drinking Water Standards or Minimum of all BMP types, whichever is less
[8] Strictly from vegetated swale category from the IBD
[9] Effluent quality assigned to treated underdrain discharge is based on the better performing characteristics of the "media filter" and "bioretention" categories for each pollutant.

Table 5-4. International BMP Database Arithmetic Standard Deviations of BMP Effluent Concentrations

BMP	TSS mg/L	TP mg/L	DP mg/L	NH3 mg/L	NO3 mg/L	TKN mg/L	DCu ug/L	TCu ug/L	TPb ug/L	DZn ug/L	TZn ug/L	FC #/100 mL
Constructed Wetland / Wetpond (with Extended Detention)	76.80	0.253	0.357	0.234	0.787	0.688	4.288	9.710	12.96	42.46	61.96	3.23E+04
Constructed Wetland / Wetpond (without Extended Detention)	71.14	0.228	0.313	0.375	0.750	0.848	4.196	8.849	123.0	41.88	85.57	3.08E+04
Dry Extended Detention Basin	87.36	0.673	0.439	0.183	1.173	5.029	6.656	19.96	56.01	64.68	137.9	4.15E+04
Hydrodynamic Separator	236.5	1.237	0.093	0.880	1.198	3.737	11.98	11.98	25.70	137.4	137.4	2.16E+05
Media Filter	40.73	0.168	0.099	0.382	0.852	1.213	13.75	17.20	10.02	142.2	100.3	1.27E+04
Sub-surface Flow Wetland	30.66	0.145	0.088	0.145	0.552	0.594	3.504	3.504	1.845	12.84	17.16	5.37E+02
Treatment Plant	2.00	0.003	0.003	0.006	0.552	0.030	3.000	3.000	10.97	15.00	15.00	1.00E+00
Vegetated Swale (Bioswale)	35.12	0.311	0.239	0.145	0.905	0.872	7.749	9.429	15.36	28.49	34.86	1.19E+06
Bioretention	30.66	0.168	0.099	0.382	0.552	1.213	13.75	11.12	4.84	100.3	100.3	1.27E+04
Bioretention w/o underdrain	Volume reductions only											
Cistern	Volume reductions only											
Green Roof	Volume reductions only											
Porous Pavement	Volume reductions only											
Infiltration Basin	Volume reductions only											

Table 5-5. International BMP Database Arithmetic Irreducible of BMP Effluent Concentrations

BMP	TSS mg/L	TP mg/L	DP mg/L	NH3 mg/L	NO3 mg/L	TKN mg/L	DCu ug/L	TCu ug/L	TPb ug/L	DZn ug/L	TZn ug/L	FC #/100 mL
Constructed Wetland / Wetpond (with Extended Detention)	1.358	0.034	0.010	0.019	0.011	0.499	1.387	1.387	0.429	1.000	2.933	4
Constructed Wetland / Wetpond (without Extended Detention)	1.300	0.030	0.009	0.012	0.010	0.520	1.267	1.267	0.400	1.075	3.000	5.4
Dry Extended Detention Basin	5.460	0.089	0.523	0.336	0.026	3.650	1.153	1.274	0.435	8.396	8.396	19.6
Hydrodynamic Separator	5.543	0.023	0.172	0.014	1.299	3.576	3.340	3.340	1.351	17.793	17.793	3295
Media Filter	1.487	0.026	0.010	0.013	0.064	0.210	0.995	1.298	0.372	1.000	2.000	13.1
Sub-surface Flow Wetland	1.268	0.025	0.006	0.009	0.008	0.141	1.000	1.000	0.089	1.000	2.933	4
Treatment Plant	0.500	0.001	0.001	0.001	0.008	0.001	0.100	0.100	0.255	0.500	0.500	1
Vegetated Swale (Bioswale)	2.000	0.079	0.040	0.009	0.056	0.141	2.708	2.708	0.434	5.720	5.720	9.53E+04
Bioretention	1.605	0.026	0.010	0.013	0.050	0.210	0.995	1.524	0.836	1.000	2.000	13.1
Bioretention w/o underdrain	Volume reductions only											
Cistern	Volume reductions only											
Green Roof	Volume reductions only											
Porous Pavement	Volume reductions only											
Infiltration Basin	Volume reductions only											

In some cases, performance data are not available for all types of BMPs requiring a performance assessment as part of the RAA. If the unit treatment processes (e.g., filtration, sedimentation, etc.) for a BMP with data ("BMP 1") can be expected to be similar for a BMP without data ("BMP 2"), then equivalent performance for "BMP 2" is assumed based on the performance of "BMP 1". However, if no data exist and unit treatment processes cannot be associated with a BMP with data, then no treatment is assumed except for load reductions associated with simulated volume loss. Table 5-6 summarizes the performance assumptions for each of the BMPs that will be modeled in the RAA. Additionally, bioretention with underdrains will be assessed in the RAA using a vegetated swale BMP from the IBD, which represents some incidental volume reduction as well as a certain percent treated discharge and a certain percent bypass discharge. These inputs will be modified to match the proposed implementation. Effluent quality assigned to treated underdrain discharge will be based on the better performing characteristics of the "media filter" and "bioretention" categories for each pollutant.

Table 5-6. Major Assumptions and Source Data for BMP Performance

BMP Name	Source/Analysis Assumptions
Vegetated Swale (Bioswale)	Strictly from vegetated swale category from the IBD
Cistern	No treated effluent; volume reductions only
Bioretention w/o underdrain	No treated effluent; volume reductions only
Porous Pavement	No treated effluent; volume reductions only
Green Roof	No treated effluent; volume reductions only
Low Flow Diversion	No treated effluent; volume reductions only
Media Filter	Strictly from media filter category from the IBD; includes non-bio media filters (e.g., sand filters)
Subsurface Flow Wetland	Lowest of all IBD categories; except for Fecal Coliform where 90% removal is used [a]
Constructed Wetland / Retention Pond (w/o Extended Detention)	Based on combined wetland basin and retention pond IBD categories (basis per Geosyntec 2008)
Treatment Plant	Secondary Drinking Water Standards or Minimum of all BMP types, whichever is less
Dry Extended Detention Basin	Strictly detention basin category from the IBD
Hydrodynamic Separator	From Geosyntec, 2008
Infiltration Basin	No treated effluent; volume reductions only
Constructed Wetland / Retention Pond (w/ Extended Detention)	Based on retention pond IBD category (basis per Geosyntec 2008)

[a] SSF wetlands provide multiple unit treatment processes provided by other BMPs (e.g., sedimentation, filtration, biochemical, etc.). The 90% removal is based on USEPA, 1993, which states that SSF wetlands are generally capable of a 1 to 2 log reduction in fecal coliforms.

6 MINIMUM CONTROL MEASURES

6.1 Existing MCMs/Non-Structural BMPs

Participating agencies are continuing to implement the MCMs required under the 2001 MS4 Permit. Applicable new MCMs will be implemented by the time the EWMP is approved by the Regional Board.

The Permit requires the permittees to implement prescribed MCMs in each of six categories/programs: Public Information & Participation, Industrial/Commercial Facilities, Planning & Land Development, Development Construction, Public Agency Activities, and Illicit Connection & Illicit Discharges Elimination. These measures include procedures such as outreach programs, inspections, and reporting requirements designed to reduce runoff-related pollution within each permittees' MS4 area. Although structural BMPs may be implemented as part of MCM programs, the MCMs themselves are considered non-structural BMPs. MCMs in each of these categories are already being implemented by the Beach Cities WMG as prescribed under the previous MS4 Permit (Order 01-182), and in some cases MCM program enhancements have been implemented to address watershed priorities for TMDL implementation. A summary of existing MCMs/non-structural BMPs for each Beach Cities WMG Agency is provided in Attachment E. Additionally, a narrative summary of some of the water quality measures implemented within the Beach Cities EWMP Area is provided below.

Stormwater Awareness Websites: The Beach Cities developed the Southbay Stormwater website (www.southbaystormwaterprogram.com) to raise awareness regarding urban runoff and the pollution it causes. A baseline survey to assess public awareness and understanding of urban runoff pollution was conducted through this website.

Accelerated Implementation of Machado Lake Trash TMDL: The City of Torrance is implementing the Machado Lake Trash TMDL on an accelerated schedule. In addition to the installation of 631 Automatic Retractable Screens, this program will include installation of 5,000 'no parking' signs (to improve street sweeping operations and therefore the effectiveness of the screens) as well as a program of outreach and education.

Enhanced Street Sweeping: All the Beach Cities provides street sweeping within their respective cities at least twice per month, which is at the highest Priority A frequency under the MCMs.

Torrance provides weekly street sweeping and will install "No Parking" for street sweeping signs within the Amie, Henrietta and Entradero Basin watersheds.

Manhattan Beach conducts additional street sweeping and spot pressure washing twice a week on the Strand. Parking lot sweeping is also conducted following the weekly Farmer's Market.

The City of Hermosa Beach performs daily enhanced street sweeping in the downtown and Pier commercial area. This includes dry-sweeping of the area, followed by steam cleaning with wash water vacuumed and contained to keep it from entering the storm drain system. Municipal parking lots are swept twice each week, and downtown trash enclosures are dry swept and then steam cleaned twice per week. The Hermosa Pier plaza is steam cleaned twice a month with wash water vacuumed and discharged to the sanitary sewer.

Pet Waste Disposal and Dog Parks: All the Beach Cities provide targeted outreach to pet owners regarding the proper disposal of pet waste. The City of Torrance provides outreach to the public via their "Picking Up After Your Pet" program. Similarly, the City of Redondo Beach provides targeted outreach regarding pet waste awareness, and offers free pet waste collection bags at the City Engineering Counter.

Manhattan Beach maintains a total of 23 pet waste collection stations equipped with disposable bags. These stations are located in municipal parks and along the linear greenbelt, which are used frequently by dog owners. The leash law is strictly enforced in all public parks except for two off-leash dog parks at Live Oak Park and Marine Avenue Park. These dog parks are also equipped with pet waste stations, and contain wood chips spread to a depth of 4-6 inches, which is serviced by the City's landscape contractor at least twice a week. The wood chips are removed and replaced twice a year.

The City of Hermosa Beach has also installed and maintains pet waste collection stations in municipal parks and along the linear greenbelt, which are areas with a high frequency of use by dog owners. These stations have disposable bags for collecting and disposing of pet waste. Leash laws are strictly enforced in all public parks.

Smoking and Packaging Regulations: All the Beach Cities prohibit smoking on their beaches. Smoking is also prohibited at all parks in Los Angeles County and at public beaches operated by the County. In Manhattan Beach, the City Council adopted an ordinance that prohibits smoking in a variety of high traffic areas, including the Strand walkway, Veterans Parkway (the Greenbelt), the pier, and all public recreation facilities. The City of Hermosa Beach also banned smoking in numerous public areas, including the pier, Pier Plaza, the Strand, the Greenbelt, and public parks. Torrance prohibits smoking at all City parks.

Additionally, the cities of Manhattan Beach and Hermosa Beach passed a polystyrene ordinance to ban the sale and distribution of polystyrene products in food service items. These ordinances, along with Manhattan Beach's ban on the distribution of single-use plastic bags at point-of-sale, have been helpful in reducing the amount of trash in the coastal and marine environment.

Clean Bay Restaurant Program: All four Beach Cities participate in and implement the Clean Bay Restaurant Program, which targets food service establishments with exposure to stormwater. All food service establishments are inspected against a comprehensive 43-point stormwater inspection checklist that requires 100% compliance in order for the facility to be awarded a Clean Bay Restaurant Certificate by the SMB Restoration Commission. The Beach Cities also have regulations related to the use and maintenance of grease traps in restaurants.

Water Conservation Ordinance: All four Beach Cities have adopted a water efficient landscape ordinance that either meets or exceeds the State requirements. Additionally, Hermosa Beach adopted a water conservation and drought management plan ordinance, which is enforced as part of their illicit connections and illicit discharge program. Among other requirements, the ordinance limits outside watering to 15 minutes per day, requires the use of automatic shut-off nozzles on hand-held hoses, and prohibits irrigation overspray. Manhattan Beach adopted a similar water conservation ordinance in July 2009.

Low Impact Development: All four Beach Cities have adopted the required elements of the California Green Building Code (CalGreen). The City of Hermosa Beach also chose to adopt the low impact development (LID) requirements of CalGreen, incorporating these requirements into their city code. These building requirements apply to both residential and non-residential projects, incorporating LID BMPs such as water permeable surfaces, subsurface infiltration, and rainfall harvest-and-use.

6.2 Process for Customization of MCMs

The Permit gives permittees that are developing an EWMP the opportunity to customize the MCMs specified in the Permit to focus resources on high priority issues within their watersheds. Modifications to the MCMs must be appropriately justified and still be consistent with 40 CFR § 122.26(d)(2)(iv)(A)-(D). A control measure may only be eliminated based on the justification that it is not applicable to a particular permittee (per Section IV.C.5.b.iv.1(c) of the Permit). Customized measures, once approved as part of the EWMP, will replace in part or in whole the prescribed MCMs in the Permit. The Planning & Land Development Program is not eligible for customization in that it may be no less stringent than the baseline requirements in the Permit. However, it can be enhanced over the baseline permit requirements such as LA County has done in its LID ordinance, thereby yielding additional pollutant and stormwater volume control for the watershed.

The Permit-specified MCMs (baseline MCMs) build upon the MCMs in the previous MS4 Permit (Order 01-182). Although similar in many ways to the previously-required MCMs, in most cases the baseline MCMs contain more prescriptive record-keeping and/or implementation requirements. A few examples of new provisions incorporated as baseline MCMs include:

- Activity-specific materials distribution to the public at point-of-purchase including but not limited to: landscaping and garden centers, pet shops and feed stores, auto parts stores, home improvement centers, lumber yards, and hardware/paint stores;
- Implementation of a business assistance program including on-site, telephone, or email consultation targeted to select business sectors or small businesses based on

determination that activities may contribute a substantial pollutant load. Under the previous Permit such a program was optional;

- Records documenting industrial-commercial facility inspections must be retained and provided upon request to document implementation of the permittee's progressive enforcement policy. These records include: inspection reports, warning letters, and NOVs;
- Under the Public Agency Activities MCM, Permittees must maintain annual records of Permittee pesticide use through an inventory system and establish an integrated pest management program (IPM) and annually document IPM implementation;
- Also new under the Public Agency Activities MCM, Permittees must develop an inventory of stormwater quality retrofitting opportunities within public right-of-way or those identified in TMDL implementation plans and rank retrofit opportunities for implementation;
- Another example of a new requirement under the Public Agency Activities MCM is to develop a program to encourage retrofitting of existing development on private property in cooperation with private land owners;
- Enhanced Planning and Land Development requirements for qualifying new development and redevelopment projects. These updates include lower thresholds to trigger required implementation by project owners, more prescriptive BMP design requirements, and increased tracking and reporting requirements. This MCM is not customizable; and
- Increased inspection and tracking requirements for construction projects along with increased training requirements for inspectors with content equivalent to the QSD/QSP program under the Construction General Permit.

6.2.1 General Framework for MCM Customization

As previously stated, permittees are implementing the existing MCMs under Order 01-182 and in some cases MCM program enhancements have been implemented to address watershed priorities for TMDL implementation which may be more stringent or more targeted than the baseline MCMs. The task of MCM customization is to identify which MCMs should be customized in order to address the identified water quality priorities.

The Regional Board has stated that a permittee must show an "equivalent effectiveness" to justify customization of an MCM.[6] In order to accomplish this, a permittee must compare the effectiveness of proposed customized MCMs with the corresponding effectiveness of the baseline MCMs in the context of the identified water quality priorities.

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[6] Stated on page E-2 of response to comments on the Tentative Order Minimum Control Measures, found here: http://www.waterboards.ca.gov/losangeles/water_issues/programs/stormwater/municipal/StormSewer/CommentLetters/E_MCM%20Matrix%2010-26-12%20Final.pdf

The following steps provide a general framework for MCM customization:

- **Identify MCMs for potential customization**. This may include identifying:
    - MCM requirements prescribed by the Permit which are not already being implemented by the permittee;
    - Currently implemented MCMs which have been enhanced over the previous Permit as part of TMDL implementation, e.g., Clean Bay Restaurant Program;
    - Programmatic solutions/non-structural controls identified in TMDL implementation plans which may not yet have been implemented; and
    - MCMs which are currently being implemented but which may be excessive in scope. For example, commercial inspections being conducted of retail gasoline facilities which are already heavily regulated through other environmental programs in areas that have no receiving water impairments for the pollutants of concern may be carried out less frequently, or discontinued indefinitely.
- **Identify MCMs which are not applicable**. A control measure may be eliminated based on the justification that it is not applicable to a particular permittee. For example if it is the policy of a permittee not to use pesticides in public agency activities, then there is no need for tracking of pesticide use and this MCM may be proposed for elimination.
- **Assess the effectiveness of the incremental baseline MCM requirements with respect to water quality priorities**. The data necessary to quantify this will vary greatly by MCM, but may include information such as: receiving water quality, inspection and reporting records, number of qualifying projects (e.g., number of construction projects greater than 1 acre), number of pet station bags used, amount of material picked up by street sweeping activities, number of employees trained, and maintenance records. Additionally, the California Stormwater Quality Association (CASQA) provides a tool to estimate the effectiveness of stormwater management programs. The tool recommends possible assessment metrics that can be used for various stormwater programs.
- **Quantify the additional resources required to implement the incremental baseline MCMs.** This may include estimating additional staff resources in terms of full-time employees, consulting resources, and contracted services.
- **Assess the effectiveness and resources required to implement the customized MCM**. The process to quantify these will be the same as the process used to quantify the baseline effectiveness of the existing MCM.
- **Compare the assessed effectiveness and resources required to implement the incremental baseline MCMs and the customized MCMs**. Customization can be justified in several ways:

    - If the customized MCM effectiveness is equal to or greater than the baseline MCM, customization can be justified.
    - If an MCM requirement is not applicable, then elimination is justified.
    - If the incremental MCM requires additional resources that are disproportionate to the increased effectiveness achieved, then retention of the existing MCM may be justified.
- **Document the customized MCM justification**.

This customization framework provides a general process to justify customization of MCMs. The Beach Cities WMG will conduct the customization, develop justification, and provide the materials for documentation in the EWMP. These materials may include any of the information outlined in the above framework to modify or eliminate a MCM. The customization of MCMs will be evaluated separately by each Agency and included in the EWMP, although coordination among the Beach Cities WMG Agencies will occur where feasible.

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ATTACHMENT A
Existing Regional BMPs

Existing Regional BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category	Tributary Area Treated (ac)	Treatment Volume (ac ft)	Approx BMP Footprint (ac)
R2	Hermosa Beach	Installed BMPs doc	Hermosa Strand Infiltration Trench Sun Tree Baffle Box pretreatment	On beach south of County Lifeguard Station	Infiltration	76		
R3	Hermosa Beach	Installed BMPs doc	Hermosa Strand Infiltration Trench	On beach south of County Lifeguard Station	Infiltration	76		
R4	Hermosa Beach	Installed BMPs doc	Pier Avenue Improvement Project infiltration systems (31 wq inlets)	Pier Ave. from Valley to Hermosa Ave	Infiltration			
R7	LACFCD	NOI	28th Street storm drain low flow diversion, SMB 5-2	28th Street and Strand, Manhattan Beach	Low flow diversion			
R8	LACFCD	NOI	Herondo low flow diversion, SMB 6-1	Herondo Street and Valley Drive	Low flow diversion			
R9	LACFCD	NOI	SMB 6-5 LFD		Low flow diversion			
R10	Manhattan Beach	Installed BMPs doc	Bryant sump (aka Meadows Sump?)	Bryant Place and Meadows Avenue, Manhattan Beach	Detention basin			
R12	Manhattan Beach	NOI	Manhattan Beach Greenbelt Infiltration Project	Valley and 2nd St. Manhattan Beach, CA	Infiltration	55		
R14	Manhattan Beach	NOI	Manhattan Beach Pier drain, SMB5-3	Manhattan Beach Blvd and Ocean Drive	Low flow diversion			
R15	Manhattan Beach	Installed BMPs doc	Marriot Golf Course detention basin		Detention basin			
R16	Manhattan Beach	Installed BMPs doc	Polliwog Park stormwater retention basin	Polliwog Park	Retention basin			
R20	Manhattan Beach	Installed BMPs doc	Voorhees sump	1360 Voorhees Avenue (approx.), Manhattan Beach	Detention basin			
R22	Manhattan Beach	SMBBB TMDL IP J5/6	Polliwog Park wet pond	1701 N Herrin Ave Manhattan Beach, CA 90266	Wet pond	468	3.4	0.87328
R24	Redondo Beach	Internal Communication	Alta Vista Park Diversion and Re-Use Project	801 Camino Real Redondo Beach, CA 90277	Infiltration	101	1	0.60000
R28	Redondo Beach	NOI	SMB 6-3 Low flow diversion		Low flow diversion			
R29	Redondo Beach	Internal Communication	Wylie Sump	Artesia, between Goodman and Ford	Retention basin	131		
R30	Redondo Beach	Redondo Beach NPDES Annual Report FY12-13 Final	Sapphire St Infiltration BMP	111 Sapphire St	Infiltration			
R31	Redondo Beach	Redondo Beach NPDES Annual Report FY12-13 Final	Lowflow Diversion (storm drain under the pier)		Low flow diversion			
R32	Torrance	Torrance Annual Report 2012	Dry weather diversion from Amie detention basin	Aime Avenue and Spencer Street, Torrance	Low flow diversion			
R33	Torrance	SMBBB TMDL IP J5/6	El Nido Park constructed wetland	18319 Kingsdale Ave Redondo Beach, CA 90278	Constructed wetland			
R34	Torrance	Task 1 Final Report	Amie Detention Basin	Aime Avenue and Spencer Street, Torrance	Detention Basin	396	135	
R35	Torrance	Task 1 Final Report	Entradero Detention Basin	Entradero Park (Halison St)	Detention Basin	463	85	
R36	Torrance	Task 1 Final Report	Henrietta Detention Basin	Spencer St at Henrietta St	Detention Basin	594	101	
R37	Torrance	Torrance Detention Basin GIS File	Mobil Detention Basin	Already in GIS	Detention Basin	464		
R38	Torrance	Torrance Detention Basin GIS File	Pioneer Detention Basin	Already in GIS	Detention Basin	120	45.5	
R39	Torrance	Torrance Detention Basin GIS File	Bishop Montgomery Retention Ba	Already in GIS	Detention Basin	292	122	
R40	Torrance	Torrance Detention Basin GIS File	El Dorado Detention Basin	Already in GIS	Detention Basin	64	13.8	
R41	Torrance	Torrance Detention Basin GIS File	Susana Detention Basin	Already in GIS	Detention Basin	273	18	
R42	Torrance	Torrance Detention Basin GIS File	Doris Detention Basin	Already in GIS	Detention Basin			
R43	Torrance	Torrance Detention Basin GIS File	Vista Del Parque Retention Bas	Already in GIS	Detention Basin			
R44	Torrance	Torrance Detention Basin GIS File	195th St. Retention Basin	Already in GIS	Detention Basin			
R45	Torrance	Torrance Detention Basin GIS File	190th St. Retention Basin	Already in GIS	Detention Basin			
R46	Torrance	Torrance Detention Basin GIS File	Columbia Park Retention Basin	Already in GIS	Detention Basin			
R47	Torrance	Torrance Detention Basin GIS File	Union Carbide Retention Basin	Already in GIS	Detention Basin			
R48	Torrance	Torrance Detention Basin GIS File	Dow Chemical Retention Basin	Already in GIS	Detention Basin			
R49	Torrance	Torrance Detention Basin GIS File	Dominguez Way Retention Basin	Already in GIS	Detention Basin			

ATTACHMENT B
Existing Distributed BMPs

Existing Distributed BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category
D2	Hermosa Beach	Installed BMPs doc	Debris excluders (35 catch basins)	Downtown commercial area along Hermosa and Pier Avenues	Trash excluder
D3	Hermosa Beach	Installed BMPs doc	Drain Pac Catch Basin Inserts (41 catch basins fitted)		Catch basin insert
D4	Hermosa Beach	Installed BMPs doc	Green Roof	200 Pier Avenue	Green roof
D5	Hermosa Beach	Installed BMPs doc	Green Roof	445 Manhattan Avenue	Green roof
D6	Hermosa Beach	Installed BMPs doc	Infiltration System	338 Pier Avenue office and retail stores with the parking structure at 400 Pier	Infiltration
D7	Hermosa Beach	Installed BMPs doc	Infiltration Systems (19)	Private property	Infiltration
D8	Hermosa Beach	Installed BMPs doc	Infiltration Systems (7)	Hermosa Avenue from 27th to 35th Streets	Infiltration
D9	Hermosa Beach	Installed BMPs doc	Porous paving	1081 Aviation Blvd	Porous pavement
D10	Hermosa Beach	Installed BMPs doc	Porous paving	Private property	Porous pavement
D13	Manhattan Beach	Installed BMPs doc	Abtech UltraUrban catch basin insert	2001 N. Sepulveda	Catch basin insert
D14	Manhattan Beach	Installed BMPs doc	Abtech UltraUrban catch basin insert	Chevron	Catch basin insert
D15	Manhattan Beach	Installed BMPs doc	Catch Basin Inserts (5 of unidentified brand name)		Catch basin insert
D16	Manhattan Beach	Installed BMPs doc	CDS Gross Pollutant Separators (10 units)		Hydrodynamic Separators
D17	Manhattan Beach	Installed BMPs doc	Flo-Guard Plus catch basin insert	1129 Sepulveda	Catch basin insert
D18	Manhattan Beach	Installed BMPs doc	Flo-Guard Plus catch basin insert (2 inserts)	1700 Rosecrans	Catch basin insert
D19	Manhattan Beach	Installed BMPs doc	Flo-Guard Plus catch basin insert with FloGuard Downspout Filter and FloGuard LoPro Trench Drain Filter Insert	1010-1022 N. Sepulveda	Catch basin insert
D20	Manhattan Beach	Installed BMPs doc	Green Roof	838 Manhattan Beach Blvd	Green roof
D21	Manhattan Beach	Installed BMPs doc	HydroFloGard LoPro trench drain inserts (4 total)		Trench drain insert
D24	Manhattan Beach	Installed BMPs doc	Municipal parking lot porous paving (7 lots)		Porous pavement
D26	Manhattan Beach	Installed BMPs doc	Private Clarifiers (3 clarifiers)		Clarifier
D27	Manhattan Beach	Installed BMPs doc	Public Works Maintenance Yard Clarifiers (2 clarifiers)		Clarifier
D29	Manhattan Beach	Installed BMPs doc	Strand Infiltration Catch Basins		Infiltration
D30	Manhattan Beach	Installed BMPs doc	Infiltration Trenches/Pits	2001 N. Sepulveda	Infiltration
D31	Manhattan Beach	Installed BMPs doc	Infiltration Trenches/Pits	1129 Sepulveda	Infiltration
D32	Manhattan Beach	Installed BMPs doc	Infiltration Trenches/Pits	1243 Artesia	Infiltration
D33	Manhattan Beach	Installed BMPs doc	Subterranean parking with pretreatment and diversion of drainage	1300 Highland Ave	Low Flow Diversion
D34	Manhattan Beach	Installed BMPs doc	Trash enclosure LFD		Low Flow Diversion
D35	Manhattan Beach	Installed BMPs doc	Trash excluder	1700 Rosecrans	Trash excluder
D36	Manhattan Beach	Installed BMPs doc	Trash excluder	1129 Sepulveda	Trash excluder
D37	Manhattan Beach	Installed BMPs doc	Trash excluders (4)	Intersection of Manhattan Beach Boulevard & Manhattan Ave	Trash excluder
D38	Manhattan Beach	Installed BMPs doc	Trash excluders (51)		Trash excluder
D42	Redondo Beach	Redondo Beach NPDES Annual Report FY12-13 Final	Low flow diversion facility to biofiltration (Filterra tree basin)	Sapphire Street storm drain	Biofiltration
D43	Redondo Beach	Redondo Beach NPDES Annual Report FY12-13 Final	Rainwater Harvesting system		Rainwater harvesting
D46	Redondo Beach	Redondo Beach NPDES Annual Report FY12-13 Final	Trash filters in drain inlets and re-routing roof gutters (harbor area)		Catch basin insert
D48	Redondo Beach	Internal Communication	Southbay Galleria CDS Unit	1815 Hawthorne Blvd Redondo Beach, CA 90278	Hydrodynamic Separator

Existing Distributed BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category
D49	Redondo Beach	Internal Communication	Redondo Beach Esplanade CDS Unit	1801 Esplanade Redondo Beach, CA 90277	Hydrodynamic Separator
D50	Redondo Beach	Internal Communication	City Yard clarifier	531 N. Gertruda	Clarifier
D51	Redondo Beach	Internal Communication	City Hall parking lot clarifier	415 Diamond Street	Clarifier
D52	Redondo Beach	SUSMP Records	Private SUSMP BMP (409 S. Irena)	409 S. Irena	Catch Basin Inserts
D53	Redondo Beach	SUSMP Records	Private SUSMP BMP (1601 Kingsdale Ave)	1601 Kingsdale Ave	Hydrodynamic Separator
D54	Redondo Beach	SUSMP Records	Private SUSMP BMP (1601 Kingsdale Ave)	1601 Kingsdale Ave	Infiltration Basin
D55	Redondo Beach	SUSMP Records	Private SUSMP BMP (Ave I and Esplanade)	Ave I and Esplanade	Low Flow diversion
D56	Redondo Beach	SUSMP Records	Private SUSMP BMP (736 Esplanade)	736 Esplanade	Infiltration Basin
D57	Redondo Beach	SUSMP Records	Private SUSMP BMP (615, 617, 619 & 621 S. Pacific Coast Hwy)	615, 617, 619 & 621 S. Pacific Coast Hwy	Infiltration Basin
D58	Redondo Beach	SUSMP Records	Private SUSMP BMP (2819 182nd St.)	2819 182nd St.	Infiltration Basin
D59	Redondo Beach	SUSMP Records	Private SUSMP BMP (801 Esplanade)	801 Esplanade	Detention Basins
D60	Redondo Beach	SUSMP Records	Private SUSMP BMP (300 Pacific Coast Hwy)	300 Pacific Coast Hwy	Catch Basin Inserts
D61	Redondo Beach	SUSMP Records	Private SUSMP BMP (300 Pacific Coast Hwy)	300 Pacific Coast Hwy	Hydrodynamic Separator
D62	Redondo Beach	SUSMP Records	Private SUSMP BMP (705 & 707 Esplanade)	705 & 707 Esplanade	Catch Basin Inserts
D63	Redondo Beach	SUSMP Records	Private SUSMP BMP (705 & 707 Esplanade)	705 & 707 Esplanade	Porous Pavement
D64	Redondo Beach	SUSMP Records	Private SUSMP BMP (3705 Inglewood)	3705 Inglewood	Catch Basin Inserts
D65	Redondo Beach	SUSMP Records	Private SUSMP BMP (2600 Marine Ave)	2600 Marine Ave	Catch Basin Inserts
D66	Redondo Beach	SUSMP Records	Private SUSMP BMP (1208 S. Catalina)	1208 S. Catalina	Infiltration Basin
D67	Redondo Beach	SUSMP Records	Private SUSMP BMP (306 S. Broadway)	306 S. Broadway	Catch Basin Inserts
D68	Redondo Beach	SUSMP Records	Private SUSMP BMP (2520 Artesia)	2520 Artesia	Catch Basin Inserts
D69	Redondo Beach	SUSMP Records	Private SUSMP BMP (2520 Artesia)	2520 Artesia	Infiltration Basin
D70	Redondo Beach	SUSMP Records	Private SUSMP BMP (4002 Marine Ave)	4002 Marine Ave	Catch Basin Inserts
D71	Redondo Beach	SUSMP Records	Private SUSMP BMP (1 Space Park - JWST TF3)	1 Space Park - JWST TF3	Catch Basin Inserts
D72	Redondo Beach	SUSMP Records	Private SUSMP BMP (2410 Marine Ave)	2410 Marine Ave	Catch Basin Inserts
D73	Redondo Beach	SUSMP Records	Private SUSMP BMP (2410 Marine Ave)	2410 Marine Ave	Hydrodynamic Separator
D74	Redondo Beach	SUSMP Records	Private SUSMP BMP (307 N. Broadway)	307 N. Broadway	Infiltration Basin
D75	Redondo Beach	SUSMP Records	Private SUSMP BMP (713 Elvira)	713 Elvira	Catch Basin Inserts
D76	Redondo Beach	SUSMP Records	Private SUSMP BMP (309 N. Broadway)	309 N. Broadway	Infiltration Basin
D77	Redondo Beach	SUSMP Records	Private SUSMP BMP (206 Av)	206 Av	Infiltration Basin
D78	Redondo Beach	SUSMP Records	Private SUSMP BMP (260 Portofino Way)	260 Portofino Way	Catch Basin Inserts
D79	Redondo Beach	SUSMP Records	Private SUSMP BMP (260 Portofino Way)	260 Portofino Way	Infiltration Basin
D80	Redondo Beach	SUSMP Records	Private SUSMP BMP (4000 Redondo Beach Ave.)	4000 Redondo Beach Ave.	Catch Basin Inserts
D81	Redondo Beach	SUSMP Records	Private SUSMP BMP (717 S. Broadway)	717 S. Broadway	Catch Basin Inserts
D82	Redondo Beach	SUSMP Records	Private SUSMP BMP (722 Esplanade)	722 Esplanade	Infiltration Basin
D83	Redondo Beach	SUSMP Records	Private SUSMP BMP (720 Esplanade)	720 Esplanade	Infiltration
D84	Redondo Beach	SUSMP Records	Private SUSMP BMP (100-106 Paseo De La Playa)	100-106 Paseo De La Playa	Infiltration Basin
D85	Redondo Beach	SUSMP Records	Private SUSMP BMP (522 N. Elena)	522 N. Elena	Infiltration Basin
D86	Redondo Beach	SUSMP Records	Private SUSMP BMP (1704 Ruxton Ln)	1704 Ruxton Ln	Infiltration Basin
D87	Redondo Beach	SUSMP Records	Private SUSMP BMP (210 Knob Hill)	210 Knob Hill	Catch Basin Inserts
D88	Redondo Beach	SUSMP Records	Private SUSMP BMP (505 S. Broadway)	505 S. Broadway	Catch Basin Inserts
D89	Redondo Beach	SUSMP Records	Private SUSMP BMP (223 Avenue F)	223 Avenue F	Infiltration Basin
D90	Redondo Beach	SUSMP Records	Private SUSMP BMP (1103 S. Catalina)	1103 S. Catalina	Infiltration Basin
D91	Redondo Beach	SUSMP Records	Private SUSMP BMP (1515 Hawthorne Blvd)	1515 Hawthorne Blvd	Catch Basin Inserts

Existing Distributed BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category
D92	Redondo Beach	SUSMP Records	Private SUSMP BMP (104 Ave. G)	104 Ave. G	Detention Basins
D93	Redondo Beach	SUSMP Records	Private SUSMP BMP (714 Elvira Ave)	714 Elvira Ave	Catch Basin Inserts
D94	Redondo Beach	SUSMP Records	Private SUSMP BMP (127-137 N. Broadway)	127-137 N. Broadway	Infiltration Basin
D95	Redondo Beach	SUSMP Records	Private SUSMP BMP (619 S. Broadway)	619 S. Broadway	Infiltration Basin
D96	Redondo Beach	SUSMP Records	Private SUSMP BMP (1724 Esplande)	1724 Esplande	Catch Basin Inserts
D97	Redondo Beach	SUSMP Records	Private SUSMP BMP (105-109 Paseo Del La Playa)	105-109 Paseo Del La Playa	Infiltration Basin
D98	Redondo Beach	SUSMP Records	Private SUSMP BMP (1724 Esplande)	1724 Esplande	Infiltration Basin
D99	Redondo Beach	SUSMP Records	Private SUSMP BMP (105-109 Paseo Del La Playa)	105-109 Paseo Del La Playa	Catch Basin Inserts
D100	Redondo Beach	SUSMP Records	Private SUSMP BMP (528-542 N. Francisca)	528-542 N. Francisca	Infiltration Basin
D101	Redondo Beach	SUSMP Records	Private SUSMP BMP (310 N. Catalina Ave)	310 N. Catalina Ave	Infiltration Basin
D102	Redondo Beach	SUSMP Records	Private SUSMP BMP (310 N. Catalina Ave)	310 N. Catalina Ave	Catch Basin Inserts
D103	Redondo Beach	SUSMP Records	Private SUSMP BMP (520 N. Elena)	520 N. Elena	Infiltration Basin
D104	Redondo Beach	SUSMP Records	Private SUSMP BMP (704 and 706 S. Pacific Coast Hwy.)	704 and 706 S. Pacific Coast Hwy.	Catch Basin Inserts
D105	Redondo Beach	SUSMP Records	Private SUSMP BMP (205 Beryl Street)	205 Beryl Street	Catch Basin Inserts
D106	Redondo Beach	SUSMP Records	Private SUSMP BMP (908 S. Catalina Ave)	908 S. Catalina Ave	Infiltration Basin
D107	Redondo Beach	SUSMP Records	Private SUSMP BMP (712 Elvira Ave)	712 Elvira Ave	Catch Basin Inserts
D108	Redondo Beach	SUSMP Records	Private SUSMP BMP (1100 S Catalina Ave)	1100 S Catalina Ave	Infiltration Basin
D109	Redondo Beach	SUSMP Records	Private SUSMP BMP (2001 Artesia Blvd.)	2001 Artesia Blvd.	Hydrodynamic Separator
D110	Redondo Beach	SUSMP Records	Private SUSMP BMP (2001 Artesia Blvd.)	2001 Artesia Blvd.	Catch Basin Inserts
D111	Redondo Beach	SUSMP Records	Private SUSMP BMP (1870 S. Elena Ave)	1870 S. Elena Ave	Catch Basin Inserts
D112	Redondo Beach	SUSMP Records	Private SUSMP BMP (1001 S. Catalina Ave.)	1001 S. Catalina Ave.	Catch Basin Inserts
D113	Redondo Beach	SUSMP Records	Private SUSMP BMP (3730 Redondo Beach Ave)	3730 Redondo Beach Ave	Catch Basin Inserts
D114	Redondo Beach	SUSMP Records	Private SUSMP BMP (601 S. Brodway)	601 S. Brodway	Infiltration Basin
D115	Redondo Beach	SUSMP Records	Private SUSMP BMP (601 S. Brodway)	601 S. Brodway	Catch Basin Inserts
D116	Redondo Beach	SUSMP Records	Private SUSMP BMP (604 S. Broadway)	604 S. Broadway	Catch Basin Inserts
D117	Redondo Beach	SUSMP Records	Private SUSMP BMP (528-534 N. Francisca)	528-534 N. Francisca	Catch Basin Inserts
D118	Redondo Beach	SUSMP Records	Private SUSMP BMP (226 Avenue G)	226 Avenue G	Infiltration Basin
D119	Redondo Beach	SUSMP Records	Private SUSMP BMP (226 Avenue G)	226 Avenue G	Catch Basin Inserts
D120	Redondo Beach	SUSMP Records	Private SUSMP BMP (623 Elvira Ave)	623 Elvira Ave	Catch Basin Inserts
D121	Redondo Beach	SUSMP Records	Private SUSMP BMP (411 S. Pacific Coast Highway)	411 S. Pacific Coast Highway	Catch Basin Inserts
D122	Redondo Beach	SUSMP Records	Private SUSMP BMP (611 S. Pacific Coast Highway)	611 S. Pacific Coast Highway	Infiltration Basin
D123	Redondo Beach	SUSMP Records	Private SUSMP BMP (1212 S. Pacific Coast Hwy)	1212 S. Pacific Coast Hwy	Catch Basin Inserts
D124	Redondo Beach	SUSMP Records	Private SUSMP BMP (339 S. Pacific Coast Highway)	339 S. Pacific Coast Highway	Catch Basin Inserts
D125	Redondo Beach	SUSMP Records	Private SUSMP BMP (710 Elvira Ave)	710 Elvira Ave	Catch Basin Inserts
D126	Redondo Beach	SUSMP Records	Private SUSMP BMP (2407 Artesia Blvd.)	2407 Artesia Blvd.	Catch Basin Inserts
D127	Redondo Beach	SUSMP Records	Private SUSMP BMP (804-812 N Irena Ave)	804-812 N Irena Ave	Hydrodynamic Separator
D128	Redondo Beach	SUSMP Records	Private SUSMP BMP (221 Avenue I)	221 Avenue I	Catch Basin Inserts
D129	Redondo Beach	SUSMP Records	Private SUSMP BMP (300 The Village)	300 The Village	Catch Basin Inserts
D130	Redondo Beach	SUSMP Records	Private SUSMP BMP (225 Avenue D)	225 Avenue D	Catch Basin Inserts
D131	Redondo Beach	SUSMP Records	Private SUSMP BMP (1930 S. Pacific Coast Highway)	1930 S. Pacific Coast Highway	Infiltration Basin
D132	Redondo Beach	SUSMP Records	Private SUSMP BMP (1930 S. Pacific Coast Highway)	1930 S. Pacific Coast Highway	Catch Basin Inserts
D133	Redondo Beach	SUSMP Records	Private SUSMP BMP (546-548 N. Gertruda Ave)	546-548 N. Gertruda Ave	Infiltration Basin
D134	Redondo Beach	SUSMP Records	Private SUSMP BMP (546-548 N. Gertruda Ave)	546-548 N. Gertruda Ave	Catch Basin Inserts
D135	Redondo Beach	SUSMP Records	Private SUSMP BMP (1509 Hawthorne Blvd)	1509 Hawthorne Blvd	Catch Basin Inserts
D136	Redondo Beach	SUSMP Records	Private SUSMP BMP (507 N. Gertruda Ave)	507 N. Gertruda Ave	Catch Basin Inserts

Existing Distributed BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category
D137	Redondo Beach	SUSMP Records	Private SUSMP BMP (204 Avenue C)	204 Avenue C	Infiltration Basin
D138	Redondo Beach	SUSMP Records	Private SUSMP BMP (204 Avenue C)	204 Avenue C	Catch Basin Inserts
D139	Redondo Beach	SUSMP Records	Private SUSMP BMP (220 Avenue C)	220 Avenue C	Catch Basin Inserts
D140	Redondo Beach	SUSMP Records	Private SUSMP BMP (516 S. Guadalupe Ave)	516 S. Guadalupe Ave	Porous Pavement
D141	Redondo Beach	SUSMP Records	Private SUSMP BMP (516 S. Guadalupe Ave)	516 S. Guadalupe Ave	Catch Basin Inserts
D142	Redondo Beach	SUSMP Records	Private SUSMP BMP (1 Space Park - M4)	1 Space Park - M4	Catch Basin Inserts
D143	Redondo Beach	SUSMP Records	Private SUSMP BMP (280 Marina Way)	280 Marina Way	Catch Basin Inserts
D144	Redondo Beach	SUSMP Records	Private SUSMP BMP (2321 Hawthorne Blvd)	2321 Hawthorne Blvd	Catch Basin Inserts
D145	Redondo Beach	SUSMP Records	Private SUSMP BMP (500 Torrance Blvd)	500 Torrance Blvd	Catch Basin Inserts
D146	Redondo Beach	SUSMP Records	Private SUSMP BMP (722 Knob Hill)	722 Knob Hill	Catch Basin Inserts
D147	Redondo Beach	SUSMP Records	Private SUSMP BMP (1521 Kingsdale Ave)	1521 Kingsdale Ave	Infiltration Basin
D148	Redondo Beach	SUSMP Records	Private SUSMP BMP (1521 Kingsdale Ave)	1521 Kingsdale Ave	Catch Basin Inserts
D149	Redondo Beach	SUSMP Records	Private SUSMP BMP (532 N Francisca Ave)	532 N Francisca Ave	Catch Basin Inserts
D150	Redondo Beach	SUSMP Records	Private SUSMP BMP (528 N. Francisca Ave)	528 N. Francisca Ave	Catch Basin Inserts
D151	Redondo Beach	SUSMP Records	Private SUSMP BMP (316 N Catalina Ave)	316 N Catalina Ave	Catch Basin Inserts
D152	Redondo Beach	SUSMP Records	Private SUSMP BMP (246 S Pacific Coast Hwy)	246 S Pacific Coast Hwy	Biofilters
D153	Redondo Beach	SUSMP Records	Private SUSMP BMP (One Space Park Drive)	One Space Park Drive	Catch Basin Inserts
D154	Redondo Beach	SUSMP Records	Private SUSMP BMP (502 S Broadway)	502 S Broadway	Catch Basin Inserts
D155	Redondo Beach	SUSMP Records	Private SUSMP BMP (628 Elvira Ave)	628 Elvira Ave	Infiltration Basin
D156	Redondo Beach	SUSMP Records	Private SUSMP BMP (628 Elvira Ave)	628 Elvira Ave	Porous Pavement
D157	Redondo Beach	SUSMP Records	Private SUSMP BMP (218 Avenue G)	218 Avenue G	Infiltration Basin
D158	Redondo Beach	SUSMP Records	Private SUSMP BMP (205 Avenue A)	205 Avenue A	Porous Pavement
D159	Redondo Beach	SUSMP Records	Private SUSMP BMP (901 N. Catalina)	901 N. Catalina	Catch Basin Inserts
D160	Redondo Beach	SUSMP Records	Private SUSMP BMP (655 N Harbor)	655 N Harbor	Catch Basin Inserts
D161	Redondo Beach	SUSMP Records	Private SUSMP BMP (655 N Harbor)	655 N Harbor	Infiltration Basin
D162	Redondo Beach	SUSMP Records	Private SUSMP BMP (722 Knob Hill Ave)	722 Knob Hill Ave	Infiltration Basin
D163	Redondo Beach	SUSMP Records	Private SUSMP BMP (521 S Catalina Ave)	521 S Catalina Ave	Infiltration Basin
D164	Redondo Beach	SUSMP Records	Private SUSMP BMP (810 Esplanade)	810 Esplanade	Catch Basin Inserts
D165	Redondo Beach	SUSMP Records	Private SUSMP BMP (2809 190th Street)	2809 190th Street	Catch Basin Inserts
D166	Redondo Beach	SUSMP Records	Private SUSMP BMP (2809 190th Street)	2809 190th Street	Porous Pavement
D167	Redondo Beach	SUSMP Records	Private SUSMP BMP (215 Avenue B)	215 Avenue B	Porous Pavement
D168	Redondo Beach	SUSMP Records	Private SUSMP BMP (207 Avenue G)	207 Avenue G	Porous Pavement
D169	Redondo Beach	SUSMP Records	Private SUSMP BMP (711 Esplanade)	711 Esplanade	Infiltration Basin
D170	Redondo Beach	SUSMP Records	Private SUSMP BMP (711 Esplanade)	711 Esplanade	Catch Basin Inserts
D171	Redondo Beach	SUSMP Records	Private SUSMP BMP (504 N Broadway)	504 N Broadway	Catch Basin Inserts
D173	Torrance	Torrance Annual Report 2012	Bioswales and catch basins	City Yard	Bioswale
D174	Torrance	Torrance Annual Report 2012	Catch basin full capture screens (30 total)		Catch basin insert
D175	Torrance	Internal Communication	Trash Excluders (201 total)	Basin Retrofit Project Watershed	Trash Excluder
D176	Torrance	Torrance Annual Report 2012	CDS Units (10)	Torrance Beach	Hydrodynamic Separators

ATTACHMENT C

Planned & Potential Regional BMPs

Planned and Potential Regional BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category	Tributary Area Treated (ac)	Treatment Volume (ac ft)	Approx BMP footprint (ac)
R1	Hermosa Beach	Task 1 Final Report	Hermosa Beach Infiltration Facility - Herondo	Intersection of Herondo St. and the Strand	Infiltration	3000	2.7	1.35445
R5	Hermosa Beach	Task 1 Final Report	South Park Subsurface infiltration gallery	425 Valley Drive Hermosa Beach, CA 90254	Infiltration	151	1.9	0.48026
R6	Hermosa Beach	SMBBB TMDL IP J5/6	Valley Park wet pond	526 Gould Ave Hermosa Beach, CA 90254	Wet pond			
R11	Manhattan Beach	Task 1 Final Report	Manhattan Heights infiltration gallery	1600 Manhattan Beach Blvd Manhattan Beach, CA 90266	Infiltration	468	2.6	0.65657
R13	Manhattan Beach	Task 1 Final Report	SMB 5-2 Infiltration Trench	28th Street and Strand, Manhattan Beach	Infiltration	1565	9.1	4.30441
R17	Manhattan Beach	Task 1 Final Report	Polliwog Park infiltration BMP	Polliwog Park	Infiltration	468		
R18	Manhattan Beach	Task 1 Final Report	SMB-5-1 Infiltration trench	Strand and 44th Street through 32nd Street [six outfalls]	Infiltration	51.4	0.47	0.17911
R19	Manhattan Beach	Task 1 Final Report	SMB-5-3 Infiltration trench	Strand and 2nd Street to 18th Street, Manhattan Beach [nine outfalls]	Infiltration	161.4	1.074	0.60916
R21	Manhattan Beach/ Hermosa Beach	Task 1 Final Report	SMB-5-4 Infiltration trench	Strand and 1st Street in Manhattan Beach to 35th Street in Hermosa Beach [2 outfalls]	Infiltration	211	1.2	0.72796
R23	Redondo Beach	SMBBB TMDL IP J5/6	Alta Vista Park wet pond	801 Camino Real Redondo Beach, CA 90277	Wet pond			
R25	Redondo Beach	Task 1 Final Report	Andrews Park	1801 Rockefeller Lane, Redondo Beach	Infiltration	122	1.6	0.33058
R26	Redondo Beach	Task 1 Final Report	Herondo Parking Lot detention basin and infiltration project	Herondo Street and Strand, Redondo Beach	Infiltration	3000	2.7	0.37190
R27	Redondo Beach	SMBBB TMDL IP J5/6	Hopkins Wilderness Area constructed wetland	1119 Barbara St Torrance, CA 90503	Constructed wetland			

ATTACHMENT D
Planned & Potential Distributed BMPs

Planned and Potential Distributed BMPs in the Beach Cities EWMP Area

BMP ID	Jurisdiction	Data Source	Project Name	Address	BMP Category
D1	Hermosa Beach	SMBBB TMDL IP J5/6	City Hall permeable walkways and parking	1315 Valley Dr. Hermosa Beach, CA 90254	Porous pavement
D11	Hermosa Beach		Hermosa Avenue Green Street	Hermosa Avenue, from Herondo St to 2nd St	Infiltration
D12	Hermosa Beach	SMBBB TMDL IP J5/6	South Park	425 Valley Drive Hermosa Beach, CA 90254	Porous pavement
D22	Manhattan Beach	SMBBB TMDL IP J5/6	Live Oak Park cistern	1998 N Valley Dr Manhattan Beach, CA 90266	Cistern
D23	Manhattan Beach	SMBBB TMDL IP J5/6	Manhattan Heights Park cistern	1600 Manhattan Beach Blvd Manhattan Beach, CA 90266	Cistern
D25	Manhattan Beach	SMBBB TMDL IP J5/6	Polliwog Park	1701 N Herrin Ave Manhattan Beach, CA 90266	Porous pavement
D28	Manhattan Beach	SMBBB TMDL IP J5/6	Public Works Maintenance Yard permeable walkways and parking	3621 Grandview Ave Manhattan Beach, CA 90266	Porous pavement
D39	Redondo Beach	SMBBB TMDL IP J5/6	Alta Vista Park cistern	801 Camino Real Redondo Beach, CA 90277	Cistern
D40	Redondo Beach	SMBBB TMDL IP J5/6	Czuleger Park vegetated buffer strips		Vegetated buffer strip
D41	Redondo Beach	SMBBB TMDL IP J5/6	Franklin Park	2723 Alvord Ln Redondo Beach, CA 90278	Porous pavement
D44	Redondo Beach	SMBBB TMDL IP J5/6	Redondo Beach dog park vegetated buffer strips	190 Flagler Ln Redondo Beach, CA 90278	Vegetated buffer strip
D45	Redondo Beach	SMBBB TMDL IP J5/6	Redondo Union High School cistern	1 Sea Hawk Way Redondo Beach, CA 90277	Cistern
D47	Redondo Beach	SMBBB TMDL IP J5/6	Veteran's Park vegetated buffer strips	309 Esplanade Redondo Beach, CA 90277	Vegetated buffer strip
D172	Redondo Beach	SMBBB TMDL IP J5/6	Water Wise Demonstration Garden permeable walkways		Porous pavement
D177	Torrance	SMBBB TMDL IP J5/6	Civic Center permeable walkways and parking	3141 Torrance Blvd Torrance, CA 90503	Porous pavement
D178	Torrance	SMBBB TMDL IP J5/6	Las Arboles "Rocketship" Park	5199 Calle De Ricardo Torrance, CA 90505	Porous pavement

ATTACHMENT E

Existing Non-Structural BMPs

Non-Structural BMP Programs in the Beach Cities EWMP Area

Program Element	ID	Activity	Existing Hermosa Beach BMP?	Existing Manhattan Beach BMP?	Existing Redondo Beach BMP?	Existing Torrance BMP?	Existing Flood Control BMP?
Public Information and Participation Program		Maintain storm water website(s)	Y	Y	Y	Y	Yes
		Reporting hotline for the public (e.g., 888-CLEAN-LA)	Y	Y	Y	Y	Yes
		Make reporting info available to public	Y	Y	Y	Y	Yes
		Public service announcements, advertising, and media relations	Y	Y	Y	Y	Yes
		Educational activities and countywide events	Y	Y	Y	Y	Yes
		Educate and involve ethnic communities and businesses	N	N	N	N	Yes
		Pet Owner Outreach	Y	Y	Y	Y	Yes
		Inter-agency coordination	Y	Y	Y	Y	Yes
		Irrigation Management Outreach and Retrofits	Y	Y	Y	Y	Yes
		Pesticide, Herbicide, Fertilizer Management	Y	Y	Y	Y	N/A
		Downspout disconnect program	Y	Y	Y	Y	N/A
Industrial/Commercial		Tracking of critical sources	N	N	N	N	N/A
		BMP material available for industrial/commercial owners	Y	Y	Y	Y	N/A
		Maintained inventory of critical sources annually	N	N	N	N	N/A
		Inspections of industrial/commercial facilities	Y	Y	Y	Y	N/A
		Progressive enforcement of compliance with stormwater requirements	Y	Y	Y	Y	N/A
		Regular restaurant inspections	Y	Y	Y	Y	N/A
		Restaurant reward and recognition program	Y	Y	Y	Y	N/A
		Industry-specific workshops	N	N	N	N	N/A
		Sustainable/Green Business Program	N	N	N	N	N/A
Planning and Land Development Program		Lid Ordinance/Planning and Land Development Program implementation	Y	Y	Y	Y	N/A
		Green Streets Policy	Y	Y	Y	Y	N/A
		Plan check process in place for qualifying projects	Y	Y	Y	Y	N/A
		LID guidance documents available for development community	Y	Y	Y	Y	N/A
		Tracking database	Y	Y	Y	Y	N/A
		Post-project inspections	Y	Y	Y	Y	N/A
		Require verification of maintenance provisions for BMPs	Y	Y	Y	Y	N/A
		Targeted Employee training of Development planning employees	Y	Y	Y	Y	N/A
		Annual reporting of mitigation project descriptions	N	N	N	N	N/A
Development Construction Program		Electronic tracking system (database and/or GIS)	In Progress	In Progress	In Progress	In Progress	N/A
		Required documents prior to issuance of building/grading permit	Y	Y	Y	Y	N/A
		Implement technical BMP standards	Y	Y	Y	Y	N/A
		Progressive enforcement	Y	Y	Y	Y	N/A
		Require preparation of a Local SWPPP for approval of permitted sites	Y	Y	Y	Y	N/A
		Inspect construction sites as-necessary	Y	Y	Y	Y	N/A
		Permittee staff training	Y	Y	Y	Y	N/A
Public Agency Activities Program		Public construction activities management	Y	Y	Y	Y	Yes
		Public facility inventory	Y	Y	Y	Y	No - In Progress
		Inventory of existing development for retrofitting opportunities	N	N	N	N	No - In Progress
		Public facility and activity management	Y	Y	Y	Y	Yes
		Vehicle maintenance, material storage facilities, corporation yard management	Y	Y	Y	Y	Yes
		Landscape, park, and recreational facilities management	Y	Y	Y	Y	Yes
		Storm drain operation and maintenance	Y	Y	Y	Y	Yes
		Streets, roads, and parking facilities maintenance	Y	Y	Y	Y	Yes
		Parking Facilities Management	Y	Y	Y	Y	Yes
		Municipal employee and contractor training	Y	Y	Y	Y	Yes - Employees Only
		Sewage system maintenance, overflow, and spill prevention	Y	Y	Y	Y	No
		Street Sweeping	Y	Y	Y	Y	No
IC/ID Elimination Program		Implementation program	N	N	N	N	Yes
		MS4 Tracking (mapping) of permitted connections and IC/ID	N	N	N	N	Yes
		Procedures for conducting source investigations for IC/IDs	N	N	N	N	Yes
		Procedures for eliminating IC/IDs	N	N	N	N	Yes
		Procedures for public reporting of ID	N	N	N	N	Yes
		Spill response plan	Y	Y	Y	Y	Yes
		IC/ID response plan	N	N	N	N	Yes
		IC/IDs education and training for staff	N	N	N	N	Yes

APPENDIX C

Reasonable Assurance Analysis Approach

Beach Cities EWMP Work Plan Appendix C
Reasonable Assurance Analysis Approach

Prepared for

The Los Angeles Regional Water Quality Control Board

Prepared by

Beach Cities Watershed Management Group

(Cities of Hermosa Beach, Manhattan Beach, Redondo Beach, and Torrance and the Los Angeles County Flood Control District)

June 2014

Table of Contents

List of Attachments

1 INTRODUCTION

The 2012 Municipal Separate Storm Sewer System (MS4) Permit[1] (Permit) was adopted on November 8, 2012, by the Los Angeles Regional Water Quality Control Board (Regional Board) and became effective December 28, 2012. The Permit was created for the purpose of protecting the beneficial uses in the receiving waters in the Los Angeles region by ensuring that MS4s in the County of Los Angeles are not causing or contributing to exceedances of applicable water quality objectives. The Permit allows the permittees to customize their stormwater programs through the development and implementation of an Enhanced Watershed Management Program (EWMP) to achieve compliance with certain receiving water limitations and water quality based effluent limits. Following the adoption of the Permit, the cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance along with the Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an EWMP for both the Santa Monica Bay (SMB) Watershed and Dominguez Channel Watershed areas within their jurisdictions served by the MS4. This group of Permittees is referred to as the Beach Cities Watershed Management Group (Beach Cities WMG).

The Permit requires that a Reasonable Assurance Analysis (RAA) be conducted for the water body-pollutant combinations addressed by the EWMP (detailed in Work Plan Appendix A). The RAA will involve the identification and evaluation of potential best management practice (BMP) implementation scenarios with respect to the Permit-specified effluent and receiving water limitations for the priority pollutants of concern for the Beach Cities WMG. The RAA must demonstrate achievement of appropriate water quality standards as developed through applicable TMDLs and other Permit limitations for each water body-pollutant combination addressed in the EWMP. The identification and numeric expression of these effluent and receiving water limitations are not addressed explicitly in this memorandum but will be included in other EWMP deliverables and will be evaluated as part of the final RAA.

This document summarizes the recommended modeling approach for conducting the RAA for the Beach Cities WMG EWMP. The RAA approach presented herein conforms to Part VI.C.5.b.iv(5) of the Permit, which states:

> *"Permittees shall conduct a Reasonable Assurance Analysis for each water body-pollutant combination addressed by the [EWMP]. [The] RAA shall be quantitative and performed using a peer-reviewed model in the public domain. Models to be considered for the RAA, without exclusion, are the Watershed Management Modeling System (WMMS), Hydrologic*

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[1] Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4.

> *Simulation Program-FORTRAN (HSPF), and the Structural BMP Prioritization and Analysis Tool (SBPAT)…. The objective of the RAA shall be to demonstrate the ability of [the EWMP] to ensure that Permittees' MS4 discharges achieve applicable water quality based effluent limitations and do not cause or contribute to exceedances of receiving water limitations."*

The Regional Board has developed a guidance document titled, "Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program, Including an Enhanced Watershed Management Program (March 25, 2014)." Although the guidance document presents guidelines and not necessarily requirements, the RAA approach presented in this document has been developed to conform to the Regional Board guidance document where appropriate. The approach outlined in this document was presented to the Regional Board by Geosyntec on April 9, 2014 (Geosyntec, 2014) and was found to be consistent with their guidelines.

2 WATERSHED MANAGEMENT AREA

The Beach Cities WMG area is divided into three HUC-12 watersheds: SMB Watershed, Dominguez Channel Watershed, and Machado Lake Watershed. The SMB Watershed accounts for 38.4% (7,840 acres) of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance, along with the entirety of the City of Hermosa Beach. The Dominguez Channel Watershed accounts for 36.1% (7,380 acres) of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance. The Machado Lake Watershed (including Wilmington Drain) accounts for 25.5% (5,182 acres) of the total Beach Cities WMG area, and all but 1.2 acres (0.02%) of this area is within the City of Torrance.

Per guidance from the Beach Cities WMG, a separate Machado Lake Nutrient TMDL Special Study Work Plan has been approved by the Regional Board. This plan is included in the Beach Cities EWMP Work Plan as Appendix D. As a result, the EWMP Work Plan being developed for the Beach Cities WMG relies on this previous work for the Machado Lake Watershed. The remainder of this document focuses solely on the RAA approach for the SMB Watershed and Dominguez Channel Watershed within the Beach Cities WMG area.

3 MODEL SELECTION FOR RAA ANALYSIS

The recommended RAA approach leverages the strengths of the publicly available, Permit-approved, GIS-based models that have already been developed for the region: WMMS' Loading Simulation Program in C++ (LSPC) and the SBPAT.[2] The following describes the rationale for

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[2] SBPAT is specifically referenced in the MS4 Permit Part VI.C.5.b.iv and, along with WMMS, was presented at the first two Permit Group TAC RAA Subcommittee meetings.

utilization of these models for the wet weather RAA. No opinion on the appropriateness of other, alternative modeling approaches is provided here. A non-modeling based methodology is recommended for the dry weather RAA. This methodology is described later in this document.[3]

The SMB and Dominguez Channel Watersheds will utilize two different approaches for performing the RAA. The RAA will be performed in the portions of the Dominguez Channel Watershed within the Cities of Manhattan and Redondo Beach using WMMS' LSPC to establish a baseline and set target load reductions for the pollutants of concern, and SBPAT for BMP modeling to meet the established targets.

The portion of the Dominguez Channel Watershed within the City of Torrance was previously modeled utilizing a tool referred to as the Pollutant Loading and Analysis Tool (PLAT), a module linking a number of publicly available models including: USEPA's PLOAD, the Program for Predicting Pollution Particle Passage thru Pits, Puddles, & Ponds (P8), and USEPA's SUSTAIN.

The RAA will be performed on the land areas within the SMB Watershed using SBPAT for both setting target load reductions and BMP modeling to meet the established targets. A summary of the approaches used by each Agency is provided in Table 3-1.

Table 3-1. RAA Models Proposed for Various City-Watershed Areas

Watershed	City	Model Selection	
		Set Target Load Reduction	Perform RAA
Santa Monica Bay	Manhattan Beach	SBPAT	SBPAT
	Hermosa Beach	SBPAT	SBPAT
	Redondo Beach	SBPAT	SBPAT
	Torrance	SBPAT	SBPAT
Dominguez Channel	Manhattan Beach	LSPC	SBPAT
	Redondo Beach	LSPC	SBPAT
	Torrance	LSPC	PLAT

The remainder of this document focuses on the RAA approach for areas outside of the City of Torrance. Specifics on the PLAT modeling approach are provided as Attachment B.

3.1 LSPC

LSPC is a publically available watershed model that was developed for the Los Angeles County Flood Control District (LACFCD) in connection with WMMS. This model uses Hydrologic Simulation Program Fortran (HSPF) algorithms to simulate hydrology, sediment transport, water

[3] A similar methodology will also be adhered to for open beach compliance monitoring locations, where drainage areas are not defined and MS4 discharges are not immediately present. Six out of 11 compliance monitoring locations in the EWMP Area are designated as open beach sites.

quality on land, and fate and transport within streams. GIS is used for the spatial component of the analysis in addition to visualization. The LSPC model has been calibrated for the following pollutants in the Dominguez Channel Watershed: fecal coliform, total nitrogen, total phosphorus, copper, lead, and zinc.

3.2 SBPAT

SBPAT is a public domain, “open source,” GIS-based water quality analysis tool intended to: 1) facilitate the prioritization and selection of BMP project opportunities and technologies in urbanized watersheds; and 2) quantify benefits, costs, variability, and potential compliance risk associated with stormwater quality projects. The decision to use SBPAT for the Beach Cities WMG RAA in the manner described below was partially based on the model capabilities and the unique characteristics of the Beach Cities WMG, specifically:

1. **Modeling of SMB hydrologic and watershed processes –** SBPAT utilizes EPA’s Stormwater Management Model (SWMM) as the hydrologic engine, and SBPAT has been calibrated to local rainfall and SMB streamflow gauges, confirming the ability to predict stormwater runoff volumes on an annual basis;
2. **SMB pollutants of concern and their compliance metric expression –** SBPAT has been utilized for planning applications related to Bacteria TMDL compliance (and specifically exceedance-day predictions, based on SMB criteria), including a demonstrated linkage of load reduction to exceedance days;
3. **Availability of new open space water quality loading data –** Recently developed Event Mean Concentration (EMC) data are consistent with, and easily incorporated into, SBPAT and were developed in SMB as part of this RAA-development effort;
4. **Capability to conduct opportunity and constraints investigations –** SBPAT is capable of supporting structural BMP placement, prioritization, and cost-benefit quantification, and has been applied for such purposes previously in the North Santa Monica Bay Coastal Watersheds (NSMBCW) and other nearby SMB subwatersheds;
5. **Characterization of water quality variability –** SBPAT is capable of quantifying model output variability and confidence levels, which is a component of the Regional Board’s recent RAA guidance; and
6. **Supports quantification of interim milestones, consistent with methods addressing both structural and non-structural BMPs –** SBPAT is a wet weather tool, but implementation is easily compatible with methods for addressing dry weather and non-structural BMPs.

The quantification analysis component of SBPAT includes a number of features. The model:

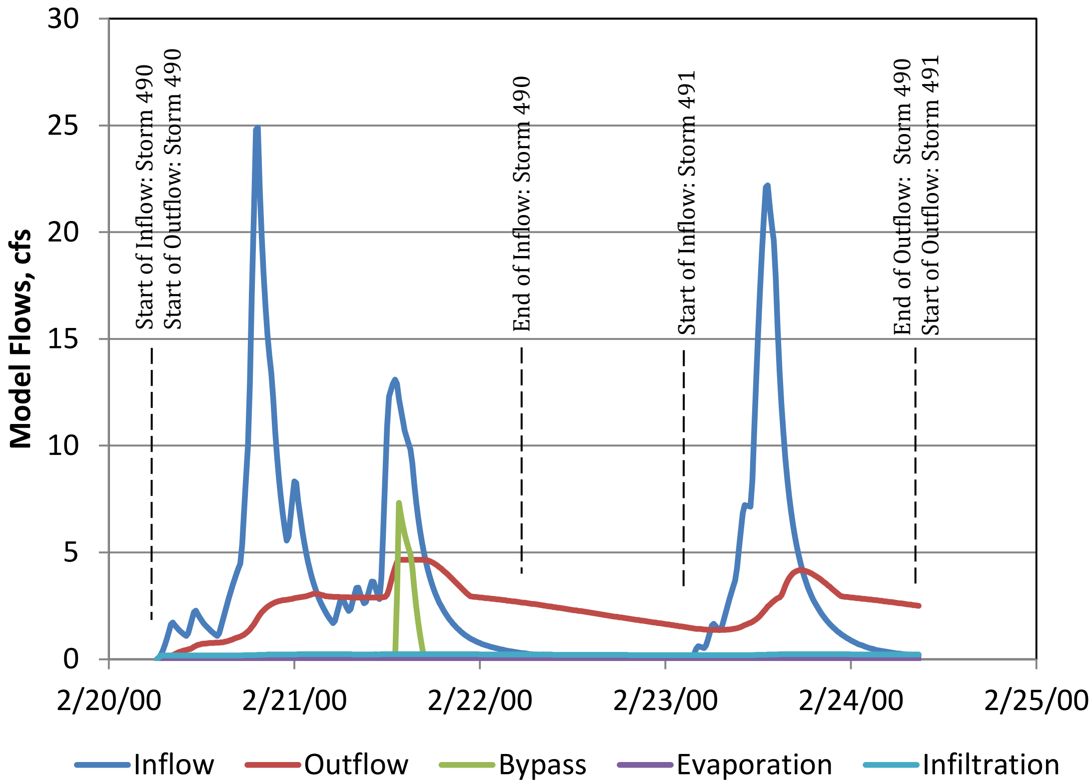
- Calculates and tracks inflows to BMPs, treated discharge, bypassed flows, evaporation, and infiltration at a user defined time step (e.g. 15 minutes);

- Distinguishes between individual runoff events by defining six-hour minimum inter-event time in the rainfall record, yet tracks inter-event antecedent conditions;
- Tracks volume through BMPs and summarizes and records these metrics by storm event; and
- Produces a table of each BMP's hydrologic performance, including concentration and load metrics by storm event, and consolidates these outputs on an annual basis.

Additionally, SBPAT has already been used for BMP identification within two high-priority subwatersheds within the SMB Watershed in the Beach Cities WMG area – the 28th Street Drain Subwateshed and the Herondo Drain Subwatershed. Modeling efforts from this previous work will be used for the RAA.

An example of the SBPAT (and EPA SWMM) hydrologic and watershed modeling approach is illustrated below in Figure 3-1.

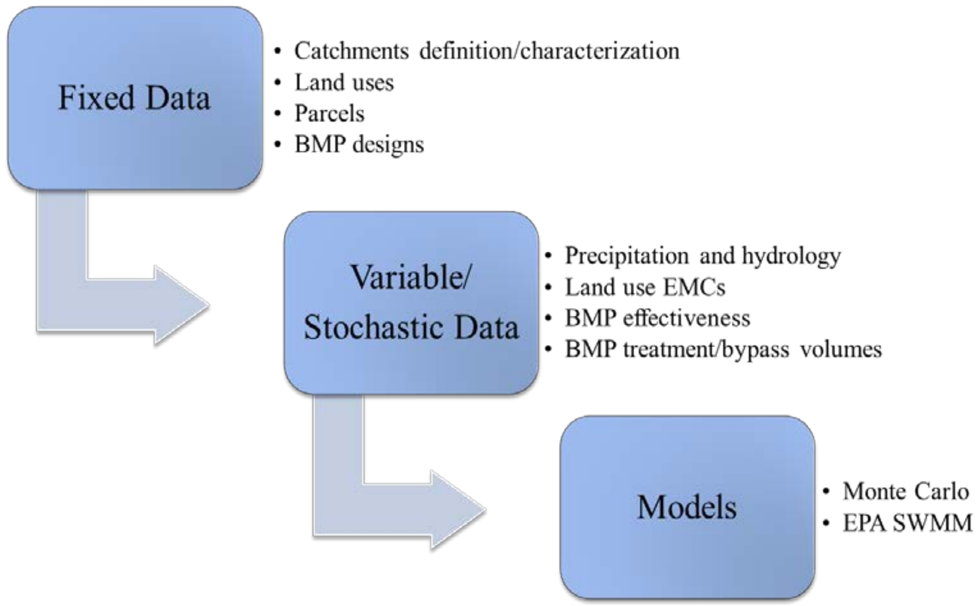
Figure 3-1. Example of SBPAT/SWMM Hydrologic Modeling Consideration of Storms in Long Term Record



Data used for the quantification/analysis module include both fixed and stochastic parameters. The model utilizes land use based EMCs, USEPA SWMM, USEPA/American Society of Civil Engineers/Water Environment Research Foundation (USEPA/ASCE/WERF) International BMP

Database (IBD) water quality concentrations, watershed/GIS data, and a Monte Carlo approach to quantify water quality benefits and uncertainties. Model data flow is provided below in Figure 3-2.

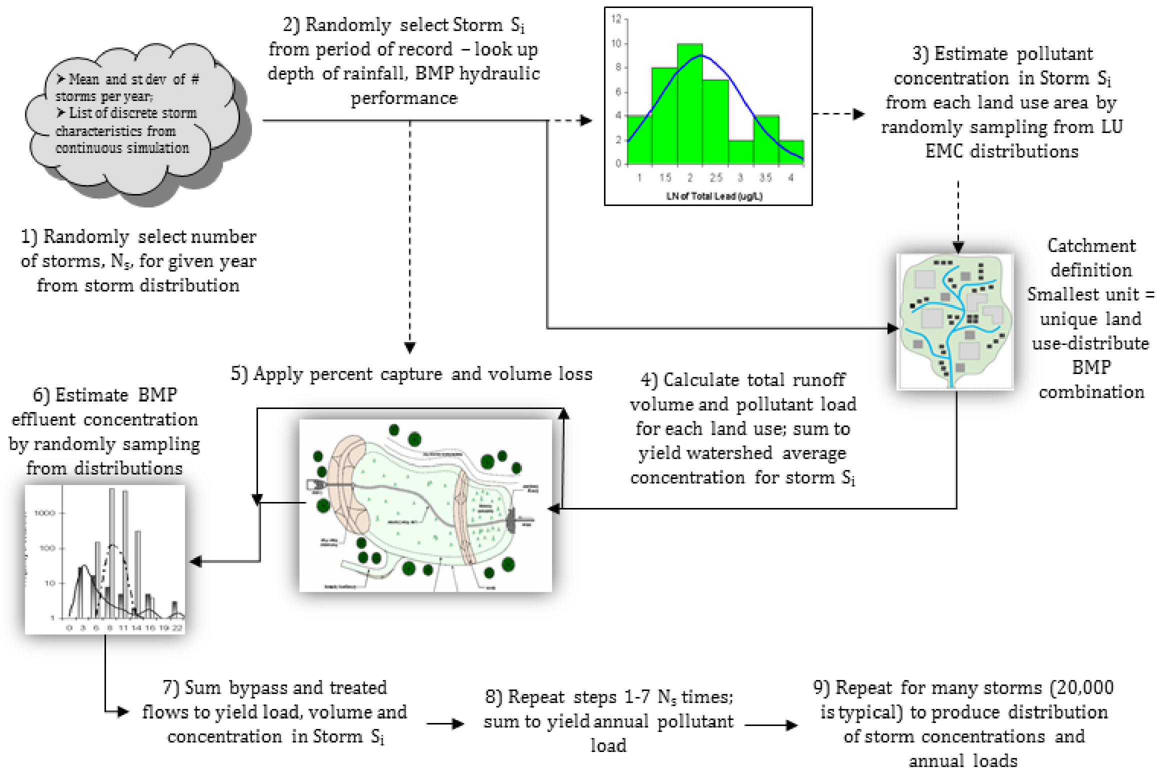
Figure 3-2. SBPAT Model Data Flow



Each model simulation integrates Monte Carlo methods that rely on repeated random sampling to obtain numerical results. Model simulations are run 10,000 times to calculate a distribution of outcomes that can support the definition of confidence levels and quantify variability. Consistent with the SBPAT usage, Monte Carlo methods are typically used in physical and mathematical problems and are most suited to be applied when it is difficult to obtain a closed-form expression or when a deterministic algorithm is not desired. A schematic of SBPAT's Monte Carlo process is provided in Figure 3-3.

Model documentation, as well as links to related technical articles and presentations, is provided at www.sbpat.net.

Figure 3-3. SBPAT Monte Carlo Method Components



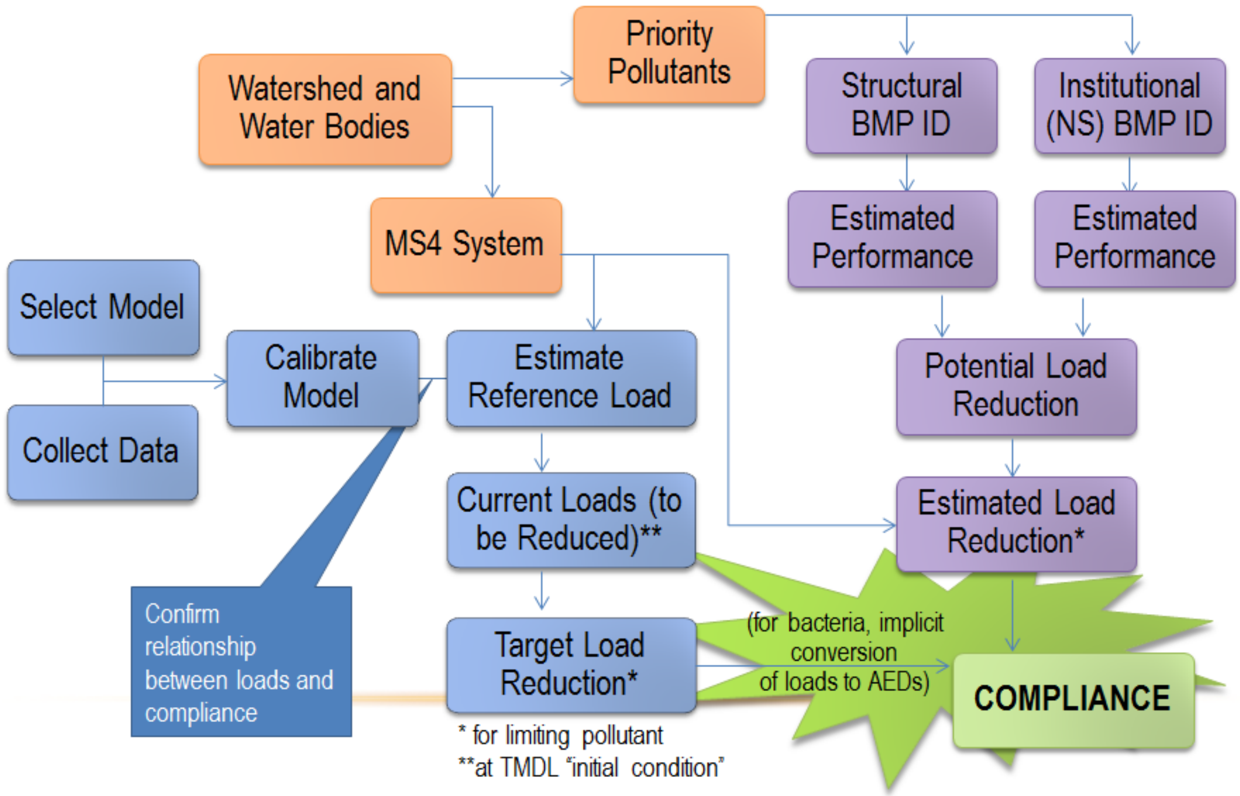
4 OVERVIEW OF RAA AND BMP SELECTION PROCESS

4.1 RAA Process

The RAA process, depicted in Figure 4-1, consists generally of the following steps:

- Identify water body-pollutant combinations for which the RAA will be performed;
- Identify the MS4 service area (exclude lands of agencies not party to this EWMP such as Federal land, State land, etc.);
- Develop target load reductions for at least the 90th percentile year (based on wet days) based on Regional Board guidance;
- Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future;
- Evaluate the performance of these BMPs in terms of annual pollutant load reductions, based on BMP performance data from the International BMP Database ;
- Compare these estimates with the targets; and
- Revise the BMP implementation scenario until targets are met.

Figure 4-1. RAA Process Overview for Beach Cities WMG Watersheds



Target load reductions represent a numerical expression of the Permit compliance metrics (e.g., bacteria allowable exceedance days (AEDs) for dry and wet weather) that can be modeled and can serve as a basis for confirming that the EWMP is in compliance with the Permit and that the efforts described therein, if appropriately implemented, will reasonably demonstrate and assure Permit compliance.

For bacteria in the SMB Watershed, an additional step will be taken using SBPAT to establish that, for a representative Beach Cities WMG subwatershed, modeled annual fecal coliform loads (from the subwatershed) are predictive of measured annual wet weather exceedance days (based on surf zone sampling data for all bacteria indicators). Target load reductions for bacteria during wet weather will then be established through the following steps:

- Calculate each subwatershed's baseline (natural condition) loading, assuming the land use distribution of the Arroyo Sequit subwatershed (approximately 95% open space) to represent an "allowable" annual load[4] that reflects the reference condition;

[4] The 90th percentile year (based on wet days) will be selected based on direction from the Regional Board.

- Calculate “existing” (pre-TMDL effective date) loading using existing land uses and BMPs to represent the current load; and
- Subtract the two load estimates to determine the target load reduction needed to achieve reference watershed conditions.

This approach for bacteria requires a new open space land use event mean concentration (EMC) dataset for fecal coliform that reflects wet weather freshwater samples collected from the SMB reference watershed, Arroyo Sequit. This new open space EMC dataset is shown in Table 4-1.

Table 4-1. Default and revised fecal coliform EMC statistics for open space/vacant land use category (arithmetic estimates of log mean and log standard deviation values shown)

	Mean (MPN/100 mL)	Standard Deviation (MPN/100 mL)
SBPAT Default based on Southern California Coastal Watershed Research Project (SCCWRP) 2007b (n=2)	6,310	1,310
Revised based on Arroyo Sequit samples (n=11)	484	806

Alternatively, fecal coliform target load reductions will be estimated using an SBPAT modeling approach where a hypothetical infiltration basin at each subwatershed outlet is iteratively sized until discharge frequency meets the AEDs, with the target load reduction values then set equivalent to the load reduction achieved by the hypothetical outlet infiltration basin.

In the Dominguez Channel watershed, target load reductions will be established using WMMS’ calibrated LSPC watershed model for the TMDL pollutants total copper, total lead, total zinc, and fecal coliform.[5] Land use EMCs for fecal coliform will be iteratively reduced in LSPC until daily average pollutant concentrations at the compliance modeling locations meet concentration-based limits for secondary contact recreation for days that do not qualify as high flow suspension days. Allowable loads for all other pollutants will be computed by multiplying relevant concentration-based water quality based effluent limitations (WQBELs) by SBPAT-derived runoff volumes for periods modeled. The target load reduction (TLR) will be the difference between baseline loads and allowable loads. TLRs will be expressed as a percent, representing the baseline load reductions necessary to meet the Permit limits and will be the target that SBPAT-modeled BMP benefits will be compared with.

For subwatersheds with SMB Beaches Bacteria TMDL compliance monitoring locations that have anti-degradation-based allowable exceedance days (summarized in EWMP Work Plan Appendix A), a target load reduction of zero will be assumed, consistent with the TMDL’s

[5] LSPC does not model E. coli (fecal coliform will be used as a surrogate).

approach which acknowledges that historic bacteria exceedance rates for each of these subwatersheds are lower than that of the reference beach, on average. Bacteria reductions may still be modeled using SBPAT in these subwatersheds, but modeling will not include a reference to a target load reduction; i.e., quantification would only serve to express the additional water quality benefits of any existing, planned, and proposed BMPs.

Zero target load reductions will be set for PCBs and DDT (with TSS as a surrogate for these particulate-associated pollutants), consistent with the USEPA TMDL which sets MS4 WLAs based on existing loads.

4.2 BMP Selection Process

The RAA modeling process will begin with the evaluation of new or enhanced, quantifiable non-structural BMPs and existing structural BMPs to assess water quality improvements (load reductions) which have occurred to date since the effective dates of applicable TMDLs. Next, if compliance is not met based on non-structural and existing BMPs, planned non-structural and structural BMPs will be modeled with consideration of scheduled completion in the context of the prioritized water body-pollutant combinations and compliance deadlines (including interim milestone dates). If compliance is still not achieved by the combination of both built and planned BMPs, additional BMPs will be discussed with the Beach Cities WMG Agencies in order to achieve compliance. These BMPs will be selected based on pollutants targeted, siting options, and maintenance preferences, among other criteria. Further details of this BMP selection process are provided in EWMP Work Plan Appendix B.

The water quality priorities defined in EWMP Work Plan Appendix A will be the emphasis of the RAA analysis, which will focus on quantifiable MS4-derived pollutants.

4.3 Scheduling

The Permit requires that RAA outcomes be linked to interim and final TMDL compliance dates. The steps described in Sections 4.1 and 4.2 are developed to demonstrate final TMDL compliance. Once the BMP implementation approach is developed for final compliance, a draft schedule for BMP implementation will be established within the context of local opportunities and constraints. It is expected that to assess compliance with interim milestones, the RAA analysis will need to be implemented for interim BMP implementation scenarios. These are expected to include different levels of non-structural BMPs, implemented over time (e.g., LID ordinance implementation). It is also recognized that in some cases there will be overlapping implementation efforts (e.g., non-structural outreach BMPs in areas where there are also structural BMPs). These instances will be evaluated on a case-by-case basis so that double-counting of water quality benefits is avoided.

Quantifiable non-TMDL (or non-303(d)) pollutants can also be addressed using SBPAT, but these pollutants may not include a reference to a target load reduction; i.e., their quantification would only serve to express the additional water quality benefits of the existing, planned, and proposed BMPs.

4.4 Uncertainty and Variability

The proposed RAA approach, which directly utilizes monitoring data to characterize natural variability, as well as Monte Carlo methods to develop stochastic relationships, is conducive to the production of metrics that quantify variability and confidence limits (which reflect the uncertainty of predicted output, such as average annual loads). These relationships are important in determining the level of BMP implementation and for the regulatory agencies to assess reasonableness. The SBPAT methods can provide statistics annualized over a longer period of record (e.g., 10-years) or can be conducted for numerous individual years. The structural BMP methodologies described herein are also easily paired with non-structural BMP quantification methods.

5 MODELING APPROACH

5.1 Spatial Domain

The spatial domain of the RAA will include the priority catchments within the Beach Cities WMG area, excluding drainage areas already addressed by regional EWMP projects (as defined in EWMP Work Plan Appendix B). Adjustments may be made to account for contributions from areas and agencies not party to this EWMP (e.g., industrial facilities, small MS4s, State/Caltrans, Federal, etc.). To account for these adjustments, shapefiles are needed depicting these areas.

GIS layers to be used in SBPAT and/or LSPC will include the following:

- Soils
- Catchments/subbasins
- Topography
- Impairments (TMDLs/303(d))
- Land use
- Watershed
- Catchment delineations
- Rain gage polygons (SBPAT)/weather stations (LSPC)
- Storm drains (SBPAT only)
- Parcels (SBPAT only)
- Calibration stations (LSPC only)
- Hydrologic response units (LSPC only)

- Stream reach (LSPC only)
- Point sources (LSPC only)

Other shapefiles such as BMP locations and BMP drainage areas will be used to extract background information, rather than as direct inputs to the model.

5.2 Hydrology

LSPC includes weather stations which can be assigned to each sub-basin using geoprocessing tools such as Thiessen polygons. The LSPC manual suggests that annual average precipitation coverages be used to support the weather station assignments.

SBPAT utilizes a customized version of SWMM for continuously simulating study area hydrology and BMP hydraulics. Long-term, hourly rainfall data and average monthly evapotranspiration values are used along with land use-linked catchment imperviousness and soil properties to estimate runoff volumes. Revised and recalibrated SBPAT database values and EWMP-defined BMP information are used to estimate the volume of runoff generated from watershed areas and captured by BMPs. Storm events are individually tracked for the entire simulation so that the volumes of runoff infiltrated, evapotranspired, captured, and released (if applicable) by BMPs are estimated for every storm event.

5.2.1 Calibration

The hydrology and water quality components in LSPC were calibrated by LACFCD using calibration stations and local data, as available. Comprehensive documentation of LSPC calibration can be found on Los Angeles County's WMMs portal under the Water Quality Part II (Appendix A to E) heading. (http://dpw.lacounty.gov/wmd/wmms/res.aspx)

The hydrology component of SBPAT was calibrated for SMB based on data for Topanga Creek[6], a HUC-12 subwatershed located within the eastern portion of the North Santa Monica Bay Coastal Watersheds. Since primary output for SBPAT includes annual volumes and pollutant loads, the calibration focused on accurate prediction of annual discharge volumes based on hourly rainfall data, as compared with stream flow data. The effective impervious percentage for the open space land use category and the saturated hydraulic conductivity of all mapped soil types served as calibration parameters. The resulting input parameter value adjustments are shown in Tables 5-1 and 5-2, respectively. Saturated hydraulic conductivities for all soil types

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[6] To conduct an appropriate calibration within SMB, a location was required that contained: hourly rainfall data, hourly streamflow data, a SMB CSMP compliance monitoring station, and daily point-zero bacteria data from the CSMP station. Topanga Canyon Creek was the only location within SMB that met all four criteria, and so was selected for the SBPAT calibration.

were adjusted to the lower end of the allowable range from the U.S Department of Agriculture National Engineering Handbook (2009). Figure 5-1 is a depiction of the hydrologic calibration results. The emphasis of the calibration effort focused on accurate, unbiased prediction of "non-extreme" annual conditions (i.e., annual volumes exceeding a 25-year return interval, 4% probability, were excluded from the calibration effort). Based on available data, the period of calibration was 7 years, between 2005 and 2011, with water year 2007 excluded due to outlying streamflow measurement results. The calibrated input parameter values will be used for the Beach Cities WMG RAA.

Table 5-1. SBPAT Calibration Adjustments: Effective Imperviousness

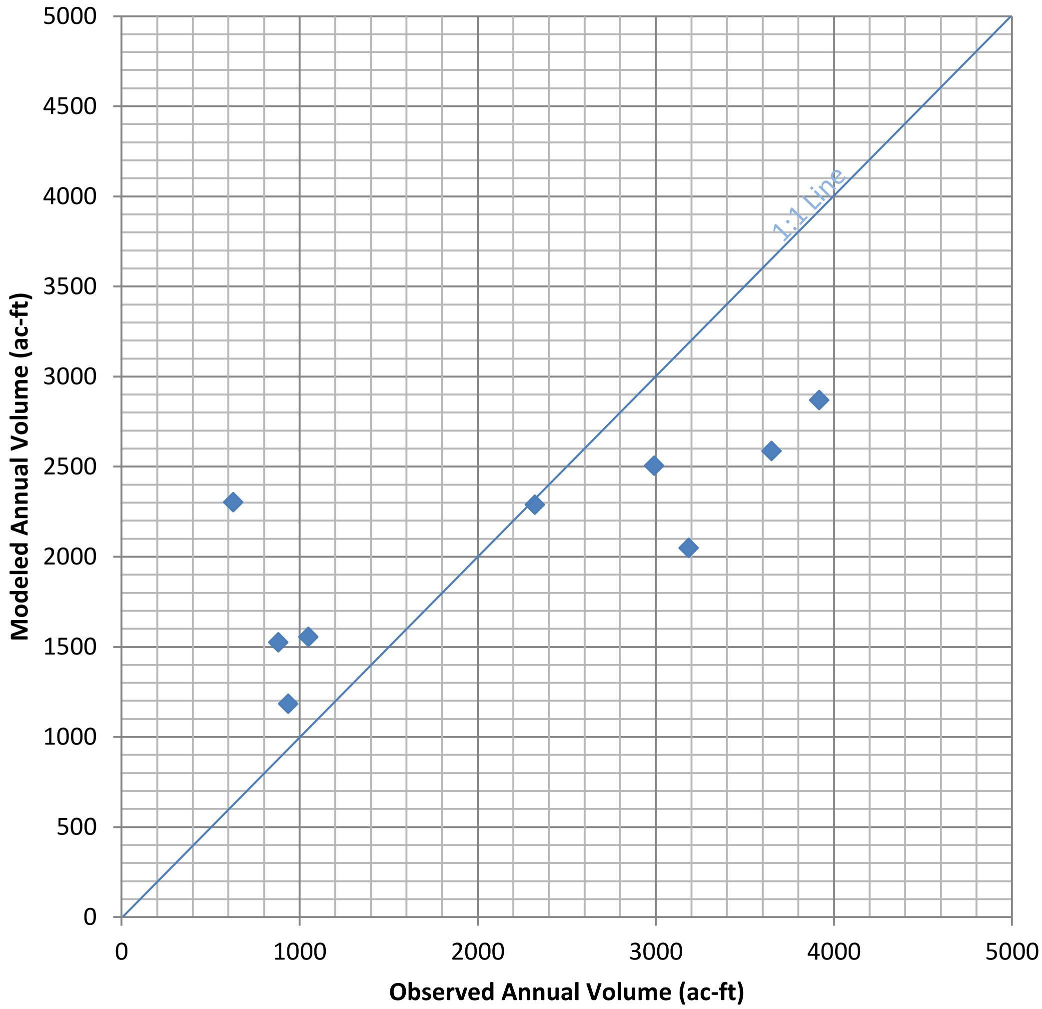
	Effective Impervious Percent	
Land Use	**Default**	**Calibrated**
Vacant/Open	1%	10%

Table 5-2. SBPAT Calibration Adjustments: Saturated Hydraulic Conductivity

	Saturated Hydraulic Conductivity[7] (in/hr)	
LA County Soil Number	**Default**	**Calibrated**
2	0.11	0.06
22	0.35	0.2
24	1.26	0.6
25	0.15	0.06
26	3.6	2
27	0.64	0.6
30	0.72	0.6
33	0.51	0.06
35	1.5	0.6
38	0.5	0.06
66	0.29	0.2

[7] U.S. Department of Agriculture (USDA), 2009. National Engineering Handbook (210-VI-NEH), Chapter 7. Natural Resource Conservation Service.
http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=22526.wba

Figure 5-1. Annual Runoff Volumes for Topanga Subwatershed: Modeled vs. Observed



Following calibration, average prediction error (or the average of the percent differences between each observed and modeled annual runoff volume) was calculated to be 2%. According to the Regional Board's RAA Guidance Document (which is based on Donigian, 2000), SBPAT model performance with respect to hydrology is in the "very good" category.

5.3 Water Quality

As described in EWMP Work Plan Appendix A, the priority water body-pollutant combinations for the Beach Cities WMG EWMP area, combined with data availability, will dictate which water body-pollutant combinations the RAA will address.

As previously described, SBPAT links the long-term hydrologic output from SWMM to a stochastic Monte Carlo water quality model to develop statistical descriptions of stormwater quantity and quality. Through this approach, the predicted runoff volumes for each storm are randomly sampled from the long-term storm event runoff volume record produced by SWMM. Land use-based wet weather pollutant EMC values (see Table 5-3 for summary statistics and Attachment A for a data summary) and BMP effluent concentrations (presented in EWMP Work Plan Appendix B) for each storm are then randomly sampled from their lognormal statistical distributions. The 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., difference between existing and post-BMP load estimates) for each randomly sampled storm event. This procedure is then repeated thousands of times, each time recording the volume, pollutant concentrations, loads, and load reductions for each randomly selected storm event. 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.

Table 5-3. Proposed SBPAT EMCs for Beach Cities WMG Watersheds – Arithmetic Estimates of the Lognormal Summary Statistics (means with standard deviations in parentheses)[a]

Land Use	TSS mg/L	TP mg/L	DP mg/L	NH3 mg/L	NO3 mg/L	TKN mg/L	Diss Cu ug/L	Tot Cu ug/L	Tot Pb ug/L	Diss Zn ug/L	Tot Zn ug/L	Fecal Col. #/100mL
Single Family Residential	124.2 (184.9)	0.40 (0.30)	0.32 (0.21)	0.49 (0.64)	0.78 (1.77)	2.96 (2.74)	9.4 (9.0)	18.7 (13.4)	11.3 (16.6)	27.5 (56.2)	71.9 (62.4)	31,100[b] (94,200)
Commercial	67.0 (47.1)	0.40 (0.33)	0.29 (0.25)	1.21 (4.18)	0.55 (0.55)	3.44 (4.78)	12.3 (10.2)	31.4 (25.7)	12.4 (34.2)	153.4 (96.1)	237.1 (150.3)	51,600 (173,000)[c]
Industrial	219.2 (206.9)	0.39 (0.41)	0.26 (0.25)	0.6 (0.95)	0.87 (0.96)	2.87 (2.33)	15.2 (14.8)	34.5 (36.7)	16.4 (47.1)	422.1 (534.0)	537.4 (487.8)	3,760 (4,860)
Education (Municipal)	99.6 (122.7)	0.30 (0.17)	0.26 (0.2)	0.4 (0.99)	0.61 (0.67)	1.71 (1.13)	12.2 (11.0)	19.9 (13.6)	3.6 (4.9)	75.4 (52.3)	117.6 (83.1)	11,800[c] (23,700)
Transportation	77.8 (83.8)	0.68 (0.94)	0.56 (0.82)	0.37 (0.68)	0.74 (1.05)	1.84 (1.44)	32.40 (25.5)	52.2 (37.5)	9.2 (14.5)	222.0 (201.7)	292.9 (215.8)	1,680 (456)
Multi-Family Residential	39.9 (51.3)	0.23 (0.21)	0.20 (0.19)	0.50 (0.74)	1.51 (3.06)	1.80 (1.24)	7.40 (5.70)	12.1 (5.60)	4.5 (7.80)	77.5 (84.1)	125.1 (101.1)	11,800[d] (23,700)
Agriculture (row crop)	999.2 (648.2)	3.34 (1.53)	1.41 (1.04)	1.65 (1.67)	34.40 (116.30)	7.32 (3.44)	22.50 (17.50)	100.1 (74.8)	30.2 (34.3)	40.1 (49.1)	274.8 (147.3)	60,300 (153,000)
Vacant / Open Space	216.6 (1482.8)	0.12 (0.31)	0.09 (0.27)	0.11 (0.25)	1.17 (0.79)	0.96 (0.9)	0.60 (1.90)	10.6 (24.4)	3.0 (13.1)	28.1 (12.9)	26.3 (69.5)	484[e] (806)

[a] EMC statistics are calculated based on 1996-2000 data for Los Angeles County land use sites (Los Angeles County, 2000), except for agriculture which are based on Ventura County MS4 EMCs (Ventura County, 2003) and fecal coliform which are based on 2000-2005 SCCWRP Los Angeles region land use data (SCCWRP, 2007b). These EMC datasets are summarized in the SBPAT User's Guide (Geosyntec, 2012).

[b] The fecal coliform EMC for the single-family residential land use is based on SCCWRP dataset for "low-density residential."

[c] The default log distribution best fit summary statistics for this land use-pollutant combination produced an unreasonably high deviation, therefore the arithmetic estimate of the log mean was held constant while the log summary statistics were recomputed based on the log CoV for SFR (SCCWRP's low-density residential EMC).

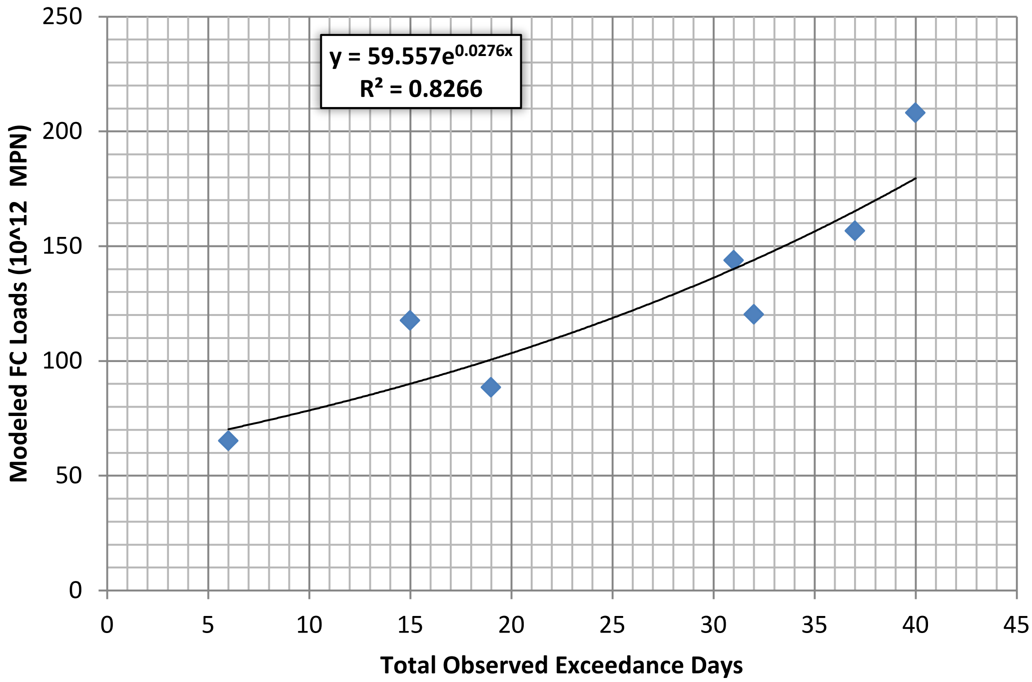
[c] Multi Family Residential EMC used since educational land use site not available in the SCCWRP fecal coliform dataset.

[d] The fecal coliform EMC for the multi-family residential land use is based on SCCWRP dataset for "high-density residential."

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

For bacteria modeling, verifying the linkage between modeled *fecal coliform loads* (i.e., discharged from the watershed outlets) and total observed wet weather *exceedance days* (in the ocean, based on REC1 daily maximum water quality objectives) is critical to establish reasonable assurance that the ocean monitoring locations will be in compliance with the Permit limits for the SMB Beaches Bacteria TMDL. To establish this linkage, an analysis was conducted using shoreline monitoring data at Topanaga Canyon[8] (SMB 1-18) between 2005 and 2013. Figure 5-2 illustrates a reasonable correlation between modeled annual fecal coliform loads and observed annual exceedance days.

Figure 5-2. Correlation between Modeled Fecal Coliform Loads and Observed Exceedance Days



5.4 Representation of Individual BMPs

SBPAT will be used to model all BMPs in the Beach Cities WMG to meet the target load reductions, both in the SMB Watershed as well as the Dominguez Channel Watershed.

[8] This watershed is 88% open space. This is a daily sampled compliance shoreline monitoring site.

5.4.1 Data to Support Model Set-Up

The International Stormwater BMP Database (IBD) is a comprehensive source of BMP performance information (www.bmpdatabase.org), comprised of data from a peer-reviewed collection of studies that have monitored the effectiveness of a variety of BMPs in treating water quality pollutants for a variety of land use types. Water quality performance data from the IBD were used to develop effluent concentrations (averages and standard deviations) of the BMPs and constituents listed in Table 5-4. A more detailed discussion of the BMP modeling data is provided in EWMP Work Plan Appendix B.

As with land use EMCs, the effluent quality of BMPs is highly variable. To account for this variability in SBPAT, effluent quality data were analyzed and descriptive statistics were generated for use in the Monte Carlo statistical sampling technique. A more detailed discussion of the BMP modeling data is provided in EWMP Work Plan Appendix B.

Table 5-4. BMPs and Constituents Modeled[a]

BMPs	Constituents
Constructed Wetland / Retention Pond (with Extended Detention)	Total suspended solids (TSS)
Constructed Wetland / Retention Pond (without Extended Detention)	Total phosphorus (TP)
Dry Extended Detention Basin	Dissolved phosphorus as P (DP)[b]
Hydrodynamic Separator	Ammonia as N (NH3)
Media Filter	Nitrate as N (NO3)
Subsurface Flow Wetland	Total Kjeldahl nitrogen as N (TKN)
Treatment Plant	Dissolved copper (DCu)
Bioswale	Total copper (TCu)
Bioretention with underdrain	Total lead (TPb)
Bioretention (volume reduction only)	Dissolved zinc (DZn)
Cistern (volume reduction only)	Total zinc (TZn)
Green Roof (volume reduction only)	Fecal Coliform (FC)
Porous Pavement (volume reduction only)	
Low Flow Diversion (volume reduction only)	

[a] All constituents are addressed for all BMPs that provide treatment (i.e., excluding those identified as "volume reduction only").

[b] Dissolved phosphorus and orthophosphate datasets were combined to provide a larger dataset and because the majority of orthophosphate is typically dissolved and many datasets either report dissolved phosphorus or orthophosphate, but not both.

5.4.2 MCMs and other Non-structural BMPs

Existing, recently-initiated non-structural BMPs (i.e., those not modeled in the initial establishment of the TMDLs and compliance requirements) and planned non-structural BMPs will be evaluated in terms of ability to reduce loads at each of the compliance modeling locations within the Beach Cities WMG area. Both wet and dry weather water quality benefits of these BMPs will be evaluated for all TMDL and 303(d) pollutants (excluding trash) where data are available to support such estimates.

Non-structural BMPs will be quantified with assumptions and references documented. For example, bacteria and dry weather runoff reduction BMPs will be quantified consistent with methodologies utilized in recent San Diego Combined Load Reduction Plans (examples available at http://www.sbpat.net/example.html).

5.4.3 Structural BMPs

The goal of this step will be to achieve the remaining target load reductions by utilizing structural BMPs in combination with the benefits of non-structural BMPs. The RAA will consider existing jurisdictional, sub watershed, and conveyance facility characteristics to delineate pollutant source, runoff control, and outfall monitoring strategies. This will involve a detailed review of existing conditions and datasets. This step will include the following components:

- Existing (i.e., implemented post-TMDL) and planned structural BMPs, which are identified in EWMP Work Plan Appendix B, will be described by the Agencies with sufficient conceptual design detail to support quantitative analysis. Based on agency input on BMP preferences, additional "proposed" structural BMP opportunities may be identified and prioritized using SBPAT's structural retrofit planning methodology, and these potential projects will be reviewed by the agencies prior to RAA modeling. The final TMDL compliance scenario will reflect the dates in which the final TMDL limits become effective[9].
- The water quality benefits (in terms of expected pollutant load reductions) associated with existing, planned, and proposed structural BMPs will be evaluated for wet weather using SBPAT, as described previously in this document.

5.5 Representation of Cumulative Effect of all BMPs and New BMP Selection Support

Following evaluation of the water quality benefits associated with non-structural and structural BMPs, additional pollutant load reductions necessary to achieve the target load reductions will be calculated to determine whether additional BMPs are needed to demonstrate reasonable assurance (see Figure 4-). To avoid double-counting of load reductions where non-structural and

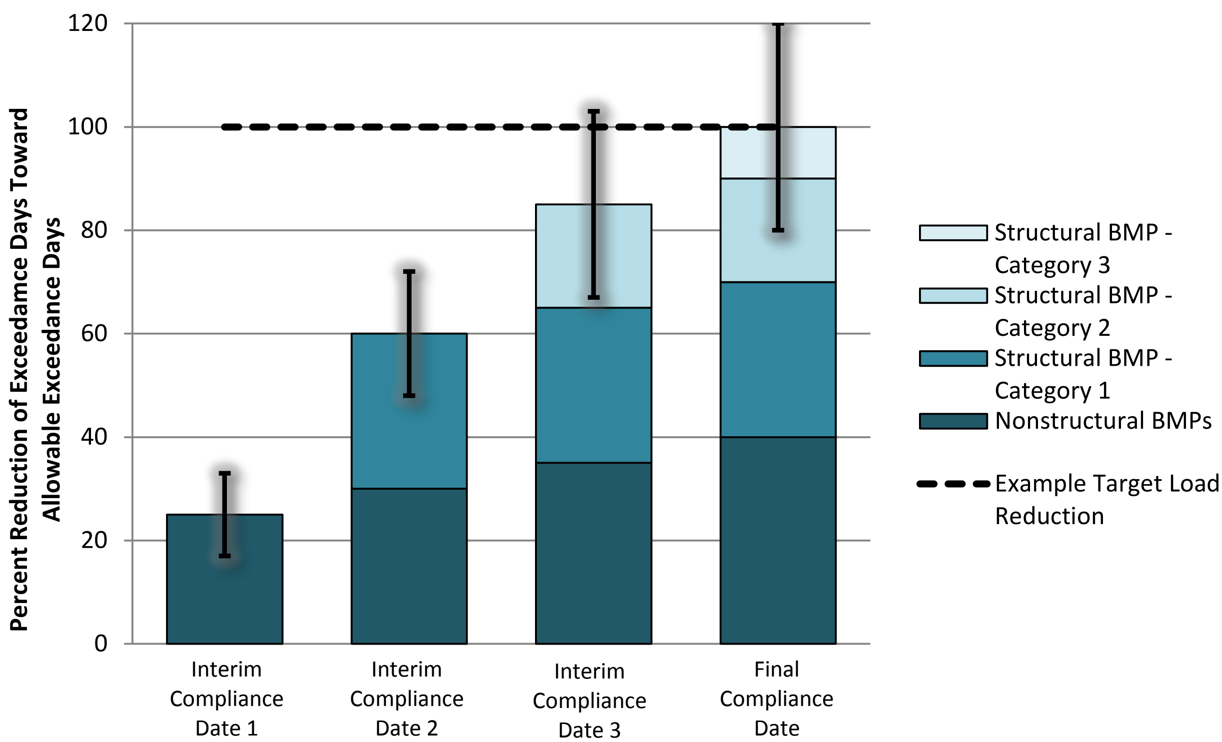
[9] TMDL compliance dates are summarized in EWMP Work Plan Appendix A, Water Quality Prioritization.

structural BMPs overlap (e.g., for a catchment where irrigation overspray reduction programs will be targeted and a downstream diversion to a regional BMP exists), the greater load reduction of each BMP will be applied, but load reductions will not be additive.

Estimated load reductions will be compared with the target pollutant load reductions and, for bacteria, will represent exceedance day-based compliance demonstration. Expected pollutant reduction ranges will be provided, thereby capturing the variability inherent in precipitation patterns, land use runoff concentrations, and BMP performance. The Beach Cities WMG Agencies may then use discretion, based on their specific compliance risk tolerance, to interpret "reasonable assurance" based on a number of statistical options, such as whether the target annual load reductions (which may correspond to a TMDL critical condition, such as a 90th percentile wet year) are met by the predicted average or 75th percentile annual load reductions (i.e., there is a 25% probability of compliance based on the modeling analysis).

Figure 5-3 depicts an example of a phased implementation approach to reach the desired target load reduction. In the case that BMPs address several pollutants simultaneously, this process will be evaluated for the limiting pollutant.

Figure 5-3. Conceptual Approach to Phased Implementation



5.6 Regional Project (85th Percentile Design) Definition

Regional EWMP projects meeting the 85th percentile design basis negate the need for RAA on their drainage areas. This design criterion can be met in a variety of ways. The simplest approach would be to design a single structural BMP to retain the 85th percentile, 24-hour design volume, which may be computed using the County's Modified Rational Method and design hydrology processes. This approach is the easiest to design, but the most difficult to construct due to the required facility capacity, land availability, and operations and maintenance constraints, among numerous other factors. An alternate approach to retain the 85th percentile storm would be to incorporate and account for the impacts of a combination of distributed BMPs upstream of the regional BMP. This would result in the effective design capacity of the regional BMP increasing over time as distributed BMPs are progressively implemented. Lastly, it may also be possible to meet the 85th percentile design criteria at a smaller regional BMP by incorporating a real-time controller in combination with infiltration and/or capture and use systems. This more innovative approach may require assumptions of different disposal options as future non-structural BMPs.

5.7 Dry Weather RAA Approach

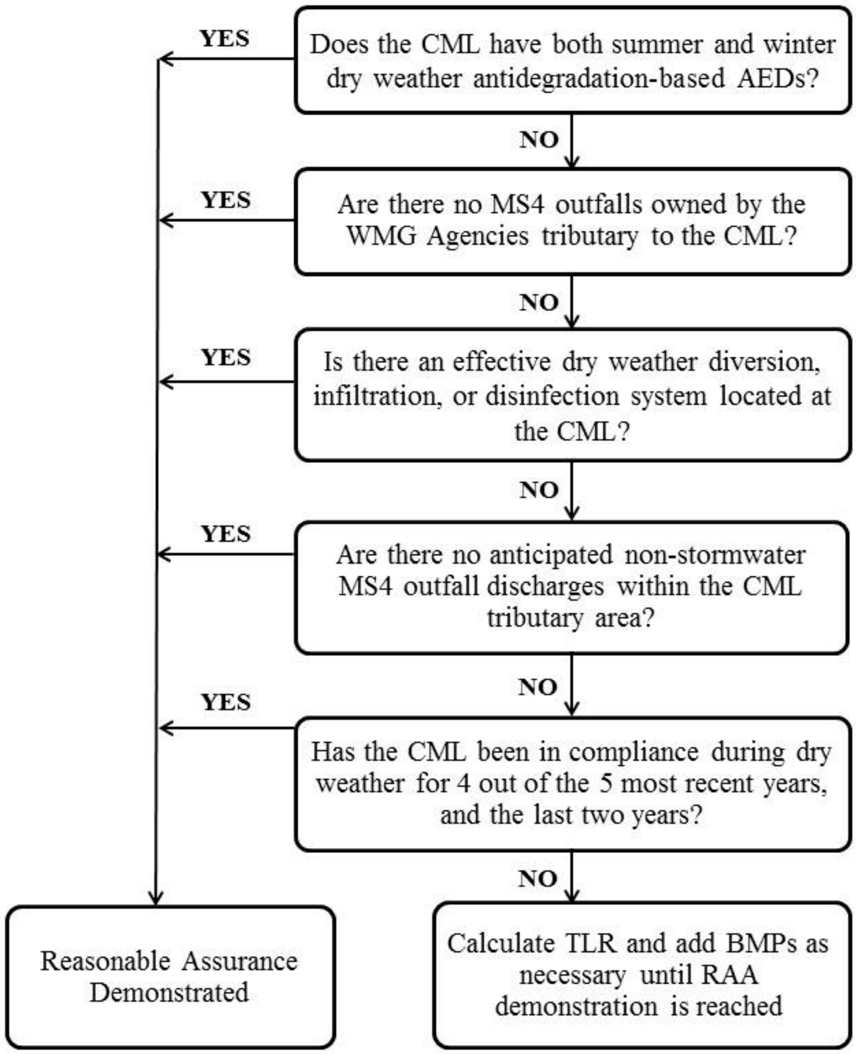
Demonstrating "reasonable assurance" of compliance with dry weather limits for the SMB Beaches Bacteria TMDL requires a methodology that accounts for many factors which cannot be modeled using the types of models contemplated for RAA. Therefore, to perform the RAA for dry weather for the Beach Cities WMG area, a semi-quantitative methodology has been developed to follow a permit compliance structure. Because fecal indicator bacteria are considered the "controlling" pollutants of concern during dry weather in the Beach Cities WMG (i.e., if MS4 discharges are compliant for bacteria during dry weather, they will be compliant for all TMDL and 303(d) pollutants during dry weather), the methodology was developed based on bacteria. The following series of questions form the proposed dry weather RAA methodology. Each question is to be answered for each Coordinated Shoreline Monitoring Plan (CSMP) compliance monitoring location (CML). If one question is affirmative then "reasonable assurance" is considered to be demonstrated. This methodology is illustrated in Figure 5-4.

1. Are the allowed dry weather (summer and winter) single sample exceedance days based on an antidegradation approach at the CML?
2. Are there no MS4 outfalls owned by the Beach Cities WMG Agencies within the CML's drainage area, and therefore MS4 discharges could not be contributing to pollutant concentrations at the CML?
3. Is a dry weather diversion, infiltration, or disinfection system located at the CML? To meet this criterion, any such system should have records to show that it is consistently operational, well maintained, properly sized, and effectively removing bacteria in the

treated effluent (in the case of disinfection facilities) so that it is effectively eliminating freshwater surface discharges to the surf zone during year-round dry weather days. If all dry weather storm drain flows tributary to the CML are known to be captured, infiltrated, diverted, or disinfected prior to discharging at the beach, reasonable assurance is assumed to be demonstrated.

4. Are there no non-stormwater MS4 outfall discharges within the CML's drainage area? For this criterion to be met, supporting records from the non-stormwater outfall screening program should be supplied.
5. Have the allowed dry weather (summer and winter) single sample exceedance days been met in four of the past five years *and* during the last two years, based on monitoring data?

Figure 5-4. Dry Weather RAA Methodology Outline



For all CMLs which have not demonstrated reasonable assurance by the steps above, the total load reduction required to meet the applicable receiving water limit will be calculated based on historic monitoring data. This is accomplished by iteratively applying a reduction fraction to the historic bacteria concentration dataset until the receiving water limit (in allowable exceedance days) is met during all years. This reduction fraction will then be compared with expected dry weather BMP load (or volume) reductions within the tributary watershed. If the calculated BMP load reduction exceeds the total required load reduction, then reasonable assurance has been demonstrated.

If the calculated BMP load reduction is less than the necessary load reduction, additional BMPs (non-structural and/or structural) will be iteratively implemented in the tributary watershed until reasonable assurance can be demonstrated (i.e., until the calculated BMP load reduction exceeds the total load reduction required). Where necessary and feasible, it may be assumed that structural BMPs (such as permeable street gutters and catch basin dry wells) will be implemented to a level to eliminate existing significant non-stormwater MS4 discharges (as defined in the Beach Cities CIMP).

6 Proposed Approach for RAA Output

6.1 Jurisdictional Responsibilities

This RAA approach was developed with an emphasis on encouraging collaborative, watershed-based planning within the jurisdictional planning departments of the Beach Cities WMG EWMP Group members. Pollutant load reduction opportunities will be determined irrespective of jurisdictional boundaries. Once high priority areas and sources are identified, the Beach Cities WMG EWMP Agencies will identify the most feasible and effective BMPs to maximize pollutant removal and meet target load reduction requirements.

6.2 Example Output/Format

Tables 6-1 and 6-2 illustrate examples of SBPAT output for the parameters modeled. This list will be limited to the identified Category/Priority 1, 2, and 3 water body-pollutant combinations identified in EWMP Work Plan Appendix A for the actual RAA.[10] This output will include non-structural and phased structural BMPs so that target load reductions can be expected to be met for the scheduled compliance dates. Ranges of results will also be reported (e.g., load with predicted ranges). Results may be broken down by jurisdiction at the discretion of the EWMP Group.

[10] If monitoring data collected as part of the CIMP demonstrate that additional water body-pollutant combinations should be identified due to MS4 contributions, the RAA will be updated accordingly to include these water body-pollutant combinations.

Table 6-1. Example SBPAT Output for Each Compliance Assessment Site

Constituent	Units	Average Annual MS4 Loads and Volumes			% of MS4 Load Removed	
		Pre-BMP	w/ Dist. BMPs	w/ Dist. + Reg. BMPs	w/ Dist. BMPs	w/ Dist. + Reg. BMPs
Total runoff volume	Acre-ft	220	172	172	22%	22%
DCu	lbs	8.8	6.9	6.8	22%	23%
DP	lbs	170	125	118	27%	30%
DZn	lbs	163	73	63	55%	62%
FC	10^12 MPN	52.8	35.4	24.3	33%	54%
NH3	lbs	435	276	190	37%	56%
NO3	lbs	500	384	378	23%	25%
TCu	lbs	18.9	10.7	8.1	43%	57%
TKN	lbs	1645	1257	1194	24%	27%
TPb	lbs	7.63	4.18	3.54	45%	54%
TP	lbs	235	140	98	41%	58%
TSS	Tons	42	19	12	54%	71%
TZn	lbs	218	101	66	54%	70%

Table 6-2. Example Bacteria Output for Different TLRs Including Non-Structural BMPs

Subwatershed	Pollutant	Target Load Reduction	Sum of NS Load Reductions (low-high range)	Sum of Structural Load Reductions (low-high range)	Total Estimated Load Reductions (low-high range)
1	Fecal coliform	100	17 (12-20)	60 (40-85)	77 (52-105)
2	Fecal coliform	75	15 (11-19)	60 (40-85)	75 (51-104)

7 CONCLUSIONS

Multiple modeling approaches are described in the Permit. For the Beach Cities WMG EWMP, a wet weather modeling approach that utilizes LSPC and SBPAT in the Dominguez Channel Watersheds, and SBPAT in the SMB Watersheds, is proposed with the rationale, analytical basis, and process described herein. SBPAT and LSPC meet Permit requirements and provide the informational submittal elements required by the Regional Board. It is also compatible with non-structural BMP analytical approaches and provides information with respect to variability that is important for the Beach Cities WMG EWMP Group to establish reasonable assurance. The drainage areas within the City of Torrance in the Dominguez Channel watershed will be modeled using the PLAT tool, which is described in Attachment B. A separate dry weather RAA methodology has also proposed in this document to meet Permit requirements.

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Attachment A

SBPAT Land Use EMC Dataset

Table A-1: Data Summary for SBPAT Default LA County Land Use EMC Datasets[a]

Land Use		TSS	TP	DP	NH3	NO3	TKN	Diss Cu	Tot Cu	Tot Pb	Diss Zn	Tot Zn	Fecal Col.
Commercial	Count	31	32	33	33	33	36	40	40	40	40	40	5
	% ND	0%	3%	3%	21%	21%	3%	15%	0%	45%	10%	0%	20%
Industrial	Count	53	55	56	57	56	57	61	61	61	61	61	6
	% ND	0%	5%	9%	19%	5%	0%	15%	0%	43%	7%	0%	0%
Transportation	Count	75	71	71	74	75	75	77	77	77	77	77	2
	% ND	0%	1%	4%	27%	20%	0%	1%	0%	52%	6%	0%	0%
Education	Count	51	49	49	52	51	51	54	54	54	54	54	NA
	% ND	0%	0%	2%	35%	24%	0%	19%	0%	76%	39%	9%	NA
Multi-Family Residential	Count	45	38	38	46	46	50	54	54	54	54	54	7
	% ND	2%	3%	3%	24%	26%	0%	37%	7%	72%	41%	9%	0%
Single Family Residential	Count	41	42	42	44	43	46	48	48	48	48	48	4
	% ND	0%	0%	0%	16%	30%	0%	40%	4%	52%	81%	44%	0%
Agriculture (row crop)	Count	20	18	18	21	19	17	18	21	21	21	21	5
	% ND	0%	0%	0%	0%	5%	0%	0%	0%	0%	10%	0%	0%
Vacant / Open Space	Count	48	46	44	48	50	50	52	52	57	52	52	11
	% ND	2%	41%	57%	67%	2%	0%	90%	38%	88%	96%	77%	0%

[a] EMC data are based on 1996-2000 data for Los Angeles County land use sites (Los Angeles County, 2000), except for agriculture which are based on Ventura County MS4 EMCs (Ventura County, 2003) and fecal coliform which are based on 2000-2005 SCCWRP Los Angeles region land use data (SCCWRP, 2007b). These EMC datasets are summarized in the SBPAT User's Guide (Geosyntec, 2012). Open space fecal coliform EMC based on 2004-2006 SCCWRP data for Arroyo Sequit reference watershed, taken from (SCCWRP, 2005) and (SCCWRP 2007a).

Attachment B

RAA Approach for Modeling within the City of Torrance

Attachment B
(Appendix C of Beach Cities EWMP Work Plan)

Reasonable Assurance Analysis (RAA) Approach for Modeling within the City of Torrance

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DRAFT May 28, 2014

1. INTRODUCTION

The National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Order No. R4-2012-0175 (Permit) was adopted on November 8, 2012 by the Los Angeles Regional Water Quality Control Board (LARWQCB) and became effective December 28, 2012. The purpose of the Permit is to ensure the MS4 systems in Los Angeles County are not causing or contributing to exceedances of water quality objectives set to protect the beneficial uses in the receiving waters in the Los Angeles region. The Permit provides direction for Permittees to collaboratively develop an Enhanced Watershed Management Program (EWMP). The EWMP allows collaboration among agencies on multi-benefit regional projects to retain both non-stormwater and stormwater runoff, as well as to facilitate flood control and water supply.

The Beach Cities Watershed Management Group (Beach Cities WMG), which includes the City of Torrance, Redondo Beach, Manhattan Beach, and LACFCD, are collaboratively developing an EWMP to comply with requirements in their MS4 Permit. The Beach Cities WMG agreed to collaborate on the development of an EWMP for both the Santa Monica Bay (SMB) Watershed and Dominguez Channel Watershed areas within their jurisdictions.

As required in the Permit, permittees electing to develop an EWMP are required to submit a Reasonable Assurance Analysis (RAA) as part of their draft EWMP to demonstrate that applicable water quality based effluent limitations (WQBELs) and receiving water limitations shall be achieved through implementation of the watershed control measures proposed in the EWMP. The RAA will involve the identification and evaluation of potential best management practice (BMP) implementation scenarios with respect to the Permit-specified effluent and receiving water limitations for the priority pollutants of concern for the Beach Cities WMG. The RAA must demonstrate achievement of appropriate water quality standards as developed through applicable TMDLs and other Permit limitations for each water body-pollutant combination addressed in the EWMP. The identification and numeric expression of these effluent and receiving water limitations are not addressed explicitly in this memorandum but will be included in other EWMP deliverables and will be evaluated as part of the final RAA.

This Attachment to Appendix C of the Beach Cities EWMP Work Plan summarizes the modeling approach for performing RAA for portions of the SMB and Dominguez Channel watersheds within the City of Torrance (Torrance). The RAA modeling approach for the other areas within the jurisdiction of the Beach Cities WMG is documented in the main portion of Appendix C.

2. WATERSHED MANAGEMENT AREA

The Beach Cities WMG area is located in three HUC-12 watersheds: SMB Watershed, Dominguez Channel Watershed, and Machado Lake Watershed. This TM focuses solely on portions of SMB and Dominguez Channel watersheds within Torrance. Torrance has developed a separate BMP Implementation Plan to address Machado Lake Nutrient and Toxics TMDLs and therefore Machado Lake Watershed is not part of this EWMP.

Torrance drains to three watersheds as shown on Figure 1. Each drainage basin has a system of conveyance facilities to collect and dispose runoff. Six of Torrance's detention basins shown on Figure 1 are a part of the SMB watershed. Portions of Torrance within the SMB Watershed total about 3 square miles and represent about 8 percent of the SMB Watershed and about 15 percent of Torrance's total surface area. Three of Torrance's basins, the Amie Avenue Detention Basin (Amie Basin), the Henrietta Detention Basin (Henrietta Basin), and the Entradero Detention Basin (Entradero Basin), drain into a LACDPW storm drain, called the Herondo Drain, which conveys stormwater into City of Redondo Beach and Santa Monica Bay.

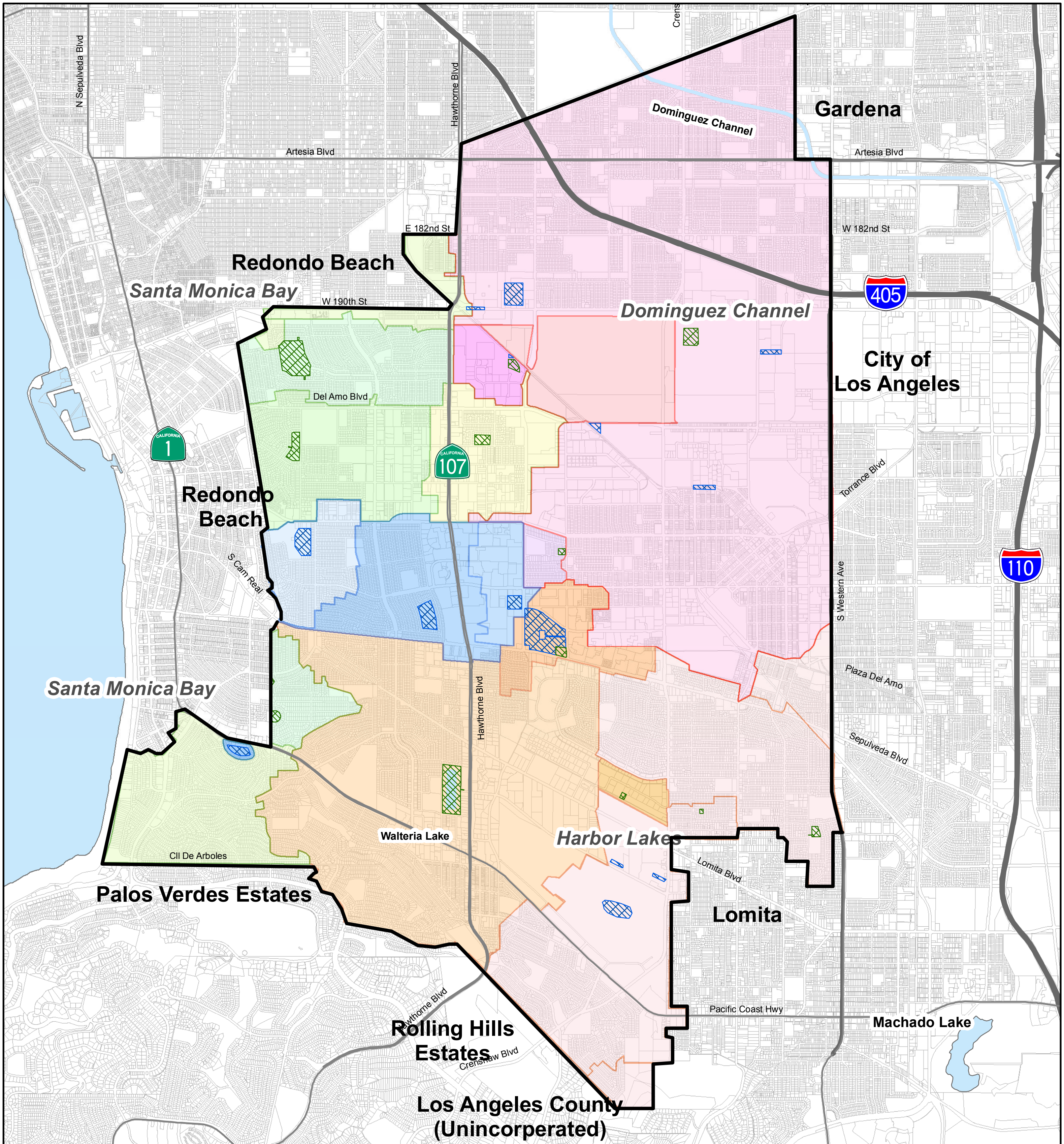
The Dominguez Channel Watershed covers about 133 square miles of land and water, with about 9 square miles residing within the boundary of Torrance (excluding the Harbor Lakes/Machado Lake sub-watershed). Portions of Torrance within the Dominguez Channel Watershed represent about 6.7 percent of the Dominguez Channel Watershed (excluding the Harbor Lakes/Machado Lake sub-watershed) and about 44 percent of Torrance's total surface area. Stormwater generated from portions of Torrance within the Dominguez Channel Watershed is collected and discharged to the Dominguez Channel, which traverses the northeast corner of Torrance as shown on Figure 1. The channel is under the jurisdiction of Los Angeles County Flood Control.

3. MODEL SELECTION FOR RAA ANALYSIS

The permit requires that a RAA be conducted for each water body-pollutant combination identified as a water quality priority for the EWMP area using a peer-reviewed model in the public domain. The Regional Water Quality Control Board (RWQCB) has provided clarification of the permit requirements regarding the RAA along with recommended criteria for the permittees to follow to prepare an appropriate RAA for Regional Board approval (RWQCB, 2014). This section provides a discussion of the model selected for the RAA and the steps that will be taken to set up or update the model to meet the permit requirements, a description of the process for evaluating BMP performance, and the process that will be used to demonstrate the EWMP will achieve WQBELs and receiving water limitations (RWQCB, 2014)

3.1 Model Description

Torrance developed a Stormwater Quality Master Plan (SQMP) in 2011 to address increasingly stringent regulatory requirements and stormwater related issues caused by continued development pressure. As part of the SQMP, the portion of the Dominguez Channel Watershed within Torrance was modeled utilizing a tool referred to as the Pollutant Loading and Analysis Tool (PLAT), a module linking a number of publicly available models including: USEPA's PLOAD, the Program for Predicting Pollution Particle Passage thru Pits, Puddles, & Ponds (P8), and USEPA's SUSTAIN. WMMS and N-SPECT model (Nonpoint Source Pollution and Erosion Comparison Tool) were used to validate PLAT model results. The PLAT was initially calibrated to WMMS model output obtained from the Los Angeles County. The portion of Torrance within the SMB is not included in the PLAT model.



LEGEND

Watersheds

Groundwater Replenishment
- Bishop Montgomery
- Del Amo
- Ocean
- Vista Del Parque

Dominguez Channel
- Surface Drainage
- El Dorado
- Mobil
- Pioneer

Santa Monica Bay
- Surface Drainage
- Amie
- Doris
- Entradero
- Henrietta

Harbor Lakes
- Surface Drainage
- 237th St.
- Madrona Marsh
- Walteria

Others
- Bodies of Water
- Parcels
- Detention Basins
- Retention Basins

Figure 1
City of Torrance Watershed and Basin Layout
City of Torrance

N

0 1 Miles

There are many models that might be suitable for use in conducting the RAA for portions of the Dominguez channel watershed. Because Torrance has previously used PLAT as a watershed modeling and basin planning tool, the RAA modeling approach will utilize PLAT for the portions in the Dominguez Channel watershed. In addition, the PLAT modules were selected based on the following model capabilities:

- Dynamic continuous long-term simulation for modeling runoff and pollutant loadings and concentrations in discharges and receiving waters from lands in a watershed system
- Can represent rainfall, runoff , and groundwater processes of urban and natural watershed systems
- Can represent variability in pollutant loadings, based on land use, soil hydrologic group, and slope among other parameters
- Employs a BMP process based approach or empirically based BMP approach
- Includes decision support to evaluate cumulative BMP performance on a watershed scale

3.1.1 Pollutant Loading and Analysis Tool (PLAT)

Even though PLAT was developed before the guidelines (RWQCB, 2014) for developing a RAA was published, only few enhancements need to be made to meet the requirements for performing this RAA. The general concept of PLAT methodology is presented on Figure 2. PLAT is based on spatially distributed inputs derived from high-resolution satellite imagery. PLAT methodology is comprised of three main evaluations:

1. Model Calibration/verification – In the absence of field data specific to Torrance, LA County WMMS and N-SPECT models were used to calibrate/validate some modules of PLAT.

2. Annual load estimation and initial BMP Screening. – impervious cover information derived from satellite imagery, event mean concentration (EMC) and PLOAD model were used to compute annual pollutant load, characterize pollutant hotspots, and perform initial BMP screening analysis to select BMPs for detailed aevaluation.

3. Detailed Load and BMP Evaluation – Uses EPA SWMM 5, P8 and SUSTAIN models for comprehensive water quality modeling to identify priority subbasins based on BMP need, BMP sizing and optimization, and evaluation of management alternatives.

The following paragraphs summarize the modules used in PLAT.

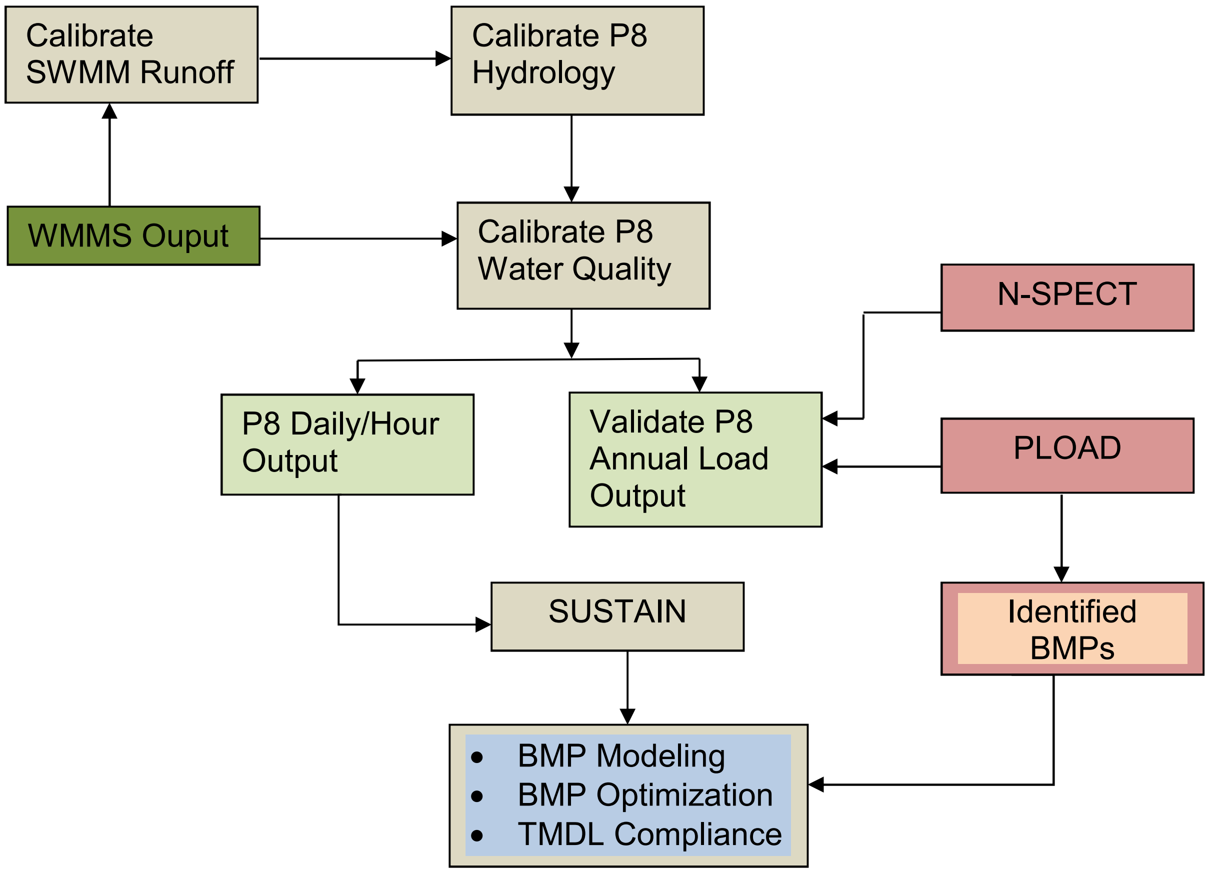


Figure 2 PLAT Layout and Data Flow

3.1.1.1 PLOAD

Annual load estimation and initial BMP screening by PLOAD offers a quick and reasonably accurate way to estimate pollutant load, characterize pollutant hot spots, and identify potential BMPs for further evaluation. Satellite remote sensing imagery, land use/cover, and EMCs are the primary source of data used in this analysis.

The PLOAD model was originally developed to calculate pollutant loads for urban and suburban watersheds, which was subsequently adopted by the United States Environmental Protection Agency (USEPA) for watershed management planning and was integrated into the EPA BASINS model (USEPA 2001). PLOAD is among one of the models that is most commonly used to estimate pollutant loadings on an annual average basis for any user-specified pollutant. PLOAD determines pollutant load from a watershed based on watershed land-use data, percent imperviousness, and pollutant export coefficients or event mean concentrations (EMC) values based on either observed data or available literature.

However, PLOAD does not have the ability to estimate conveyance, e.g., it cannot evaluate changes in peak flow or water quality due to transport. The model also cannot accurately be applied to assess loading for short time intervals. Unlike other models such as P8, it also cannot be used to locate and size Best Management Practices (BMPs). Therefore, this module of PLAT was mainly used to identify pollutant hot spot and potential BMPs for detailed evaluation. The EMC data for LA County within the last 10 years was used in PLOAD. The EMC data is listed in Appendix C of the Beach Cities Work Plan. The land use data developed by Torrance in 2005 was used in the analysis. The impervious data used in PLOAD was derived from WorldView-2 imagery of Torrance acquired in 2010.

Digital Globe's WorldView-2, the world's newest high-resolution commercial color imaging satellite, was launched on October 8, 2009 from Vandenburg Air Force Base in California. WorldView-2 is the first high-resolution satellite with 8-multispectral imaging bands. It can simultaneously collect panchromatic imagery (black and white) at 0.46 m grid resolution and multispectral imagery at 1.84 m grid resolution. The combination of WorldView-2's increased agility and high altitude enables it to typically revisit any place on earth in 1.1 days. Figure 3 shows WorldView 2010 imagery for Torrance. Figure 4 shows impervious cover derived from WorldView-2 imagery for a portion of Torrance. The percentage of impervious surface area is depicted as a continuous variable, ranging from 0 to 100 percent imperviousness based on redness. Areas shaded in deep red have the highest percentage of imperviousness, while areas shaded in gray have the lowest percentage of imperviousness.

To confirm that satellite imagery can be used to accurately classify the percent impervious surface area, the satellite estimates were compared to measurements made from aerial photographs provided by Torrance. Figure 5 shows the correlation between the percent imperviousness between these two sources for the twenty-one randomly selected samples portion of Torrance shown on Figure 4. The results indicate that there is a strong relationship between aerial photograph measurements and satellite-derived estimates.

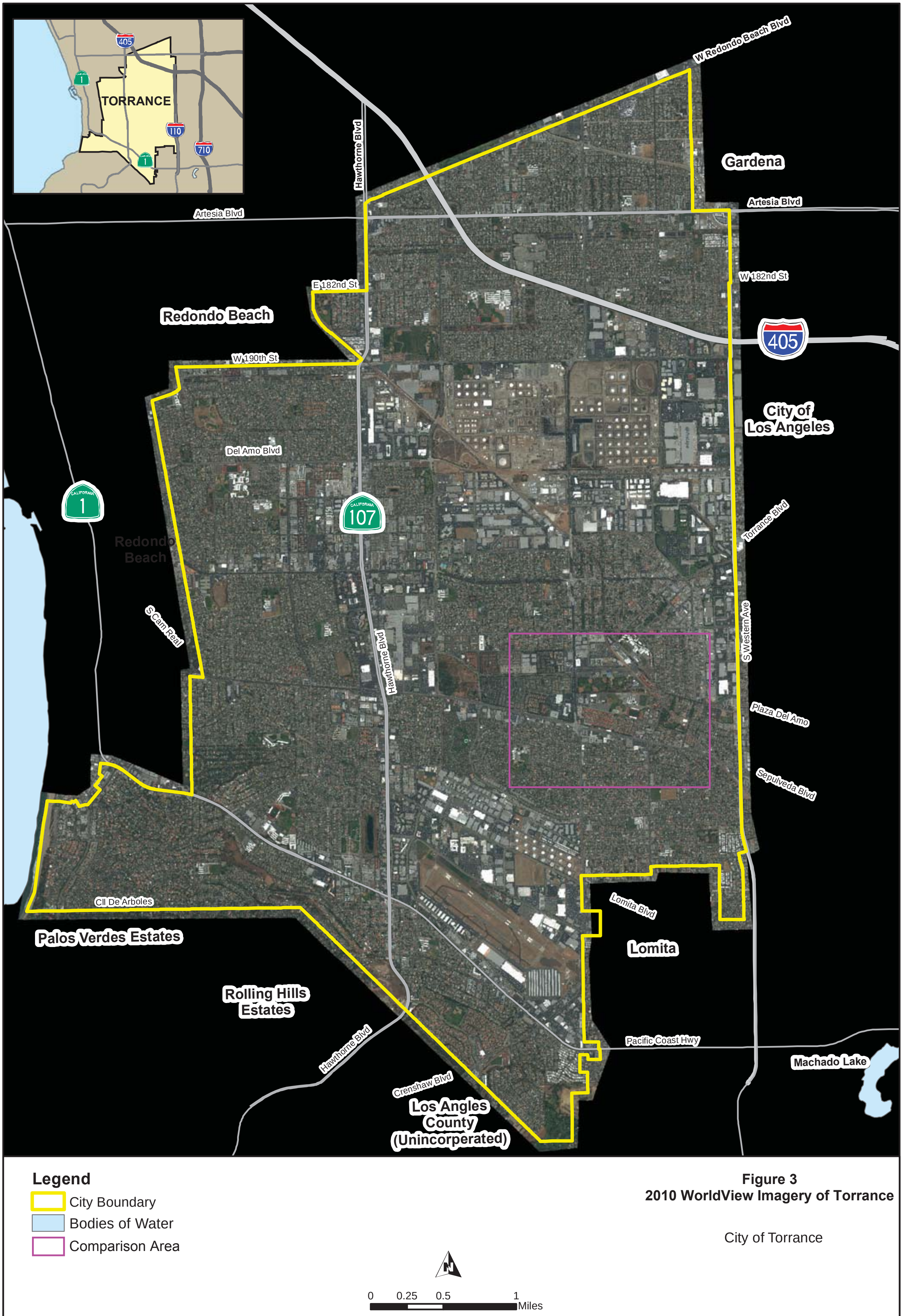


Figure 3
2010 WorldView Imagery of Torrance

City of Torrance

Satellite Imagery from WorldView for July 10, 2010

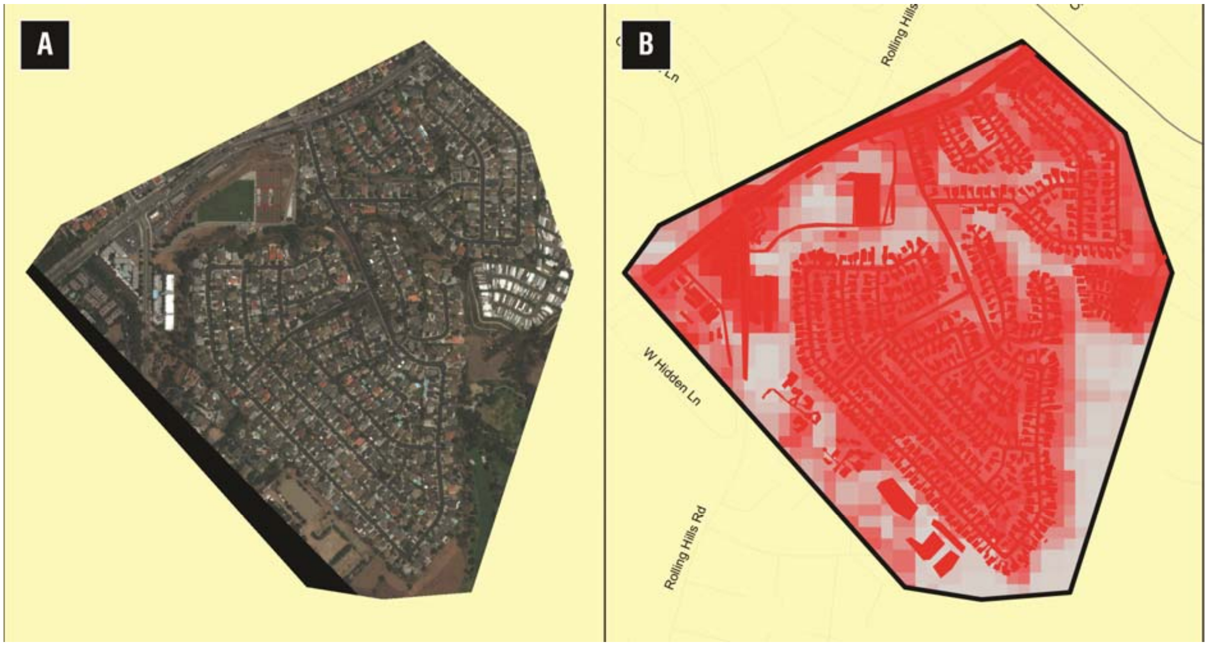


Figure 4 Impervious Cover (IC) derived from WorldView-2 imagery.

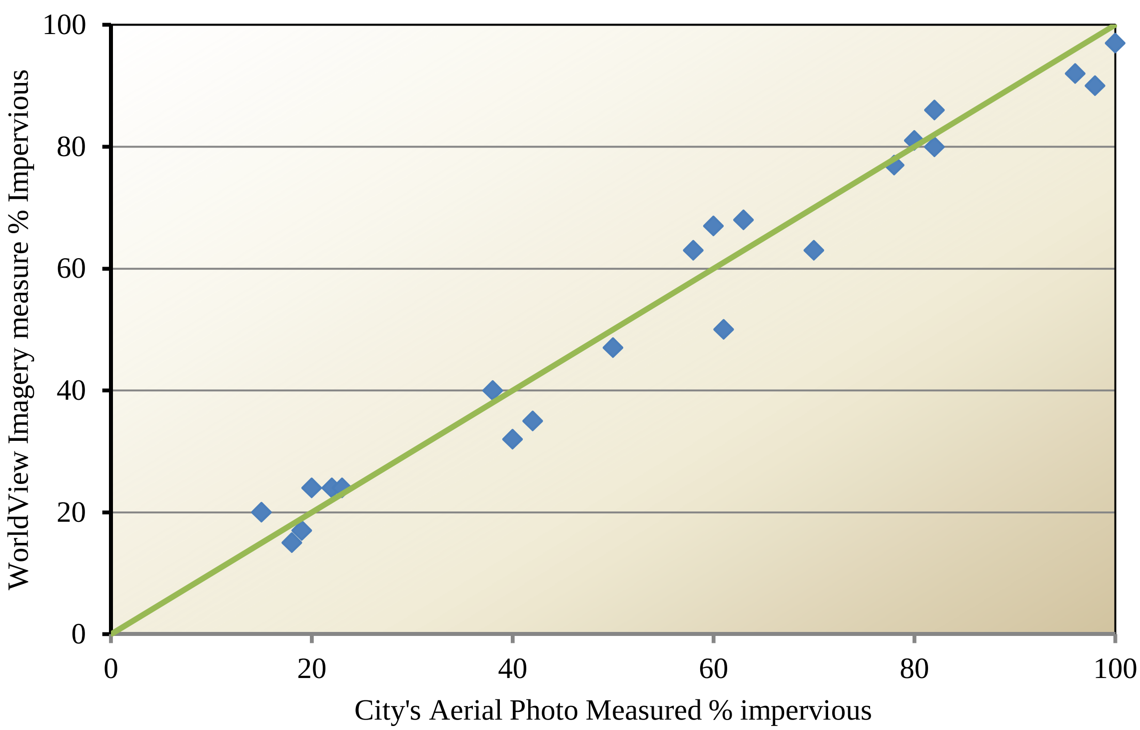


Figure 5 Comparison of percent impervious cover derived from satellite imagery and aerial photo

3.1.1.2 PLAT Detailed Load and BMP Evaluation Modules

The main objective of the Detailed BMP Evaluation is to overcome the limitations of PLOAD. The Detailed BMP Evaluation modules use the results of the initial BMP Screening by PLOAD to limit computational time by avoiding modeling BMPs that may not work.

Under the current PLAT structure, subcatchment hydrology must be simulated externally. For this project, an external surface water management model (XP-SWMM) was developed to simulate hydrographs for the study basins, and these hydrographs were subsequently imported into the P8 and SUSTAIN models. Torrance's XP-SWMM model was exported to SWMM 5 for use in this analysis to meet the RAA modeling requirement. This section describes the linkages between the SWMM, P8 and SUSTAIN models, and provides a step-by-step process of the modeling methodology.

The general steps for model development and calibration are listed below and illustrated on Figure 6.

1. Converted XP-SWMM model EPA SWMM 5 model to simulate runoff and routing for study basins.
2. Calibrated SWMM model runoff volume and timing to flow data extracted LA County WMMS model .
3. Using the calibrated SWMM model, developed unit-area surface water hydrographs (not including stream baseflow) to characterize runoff from each subcatchment by land use (commercial, residential, or forest) and land cover (pervious or impervious) for the 1-year calibration period.
4. Developed unit-area pollutographs for the calibration period by applying event mean concentrations (EMCs) from each land use to the unit-area hydrographs (not including stream baseflow).
5. Built P8 and SUSTAIN land and conveyance module using unit-area hydrographs, pollutographs, and calibrated routing parameters from the SWMM model for the 1-year calibration period.
6. Confirmed flow calibration was maintained by comparing runoff files from calibrated SWMM model to those from P8 and SUSTAIN.

EPA SWMM 5.0

The original XP-SWMM model runoff volume and timing was calibrated to one year flow data extracted from WMMS. XP-SWMM is not a public domain software and therefore the model will be converted to EPA SWMM 5.0. The conversion will not result in any significant loss of accuracy since they computationally use similar engines. EPA SWMM 5.0 (SWMM) is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from user-prescribed land uses. SWMM has been widely used, since its initial development in 1971. GIS is used for the spatial component of the analysis in addition to visualization.

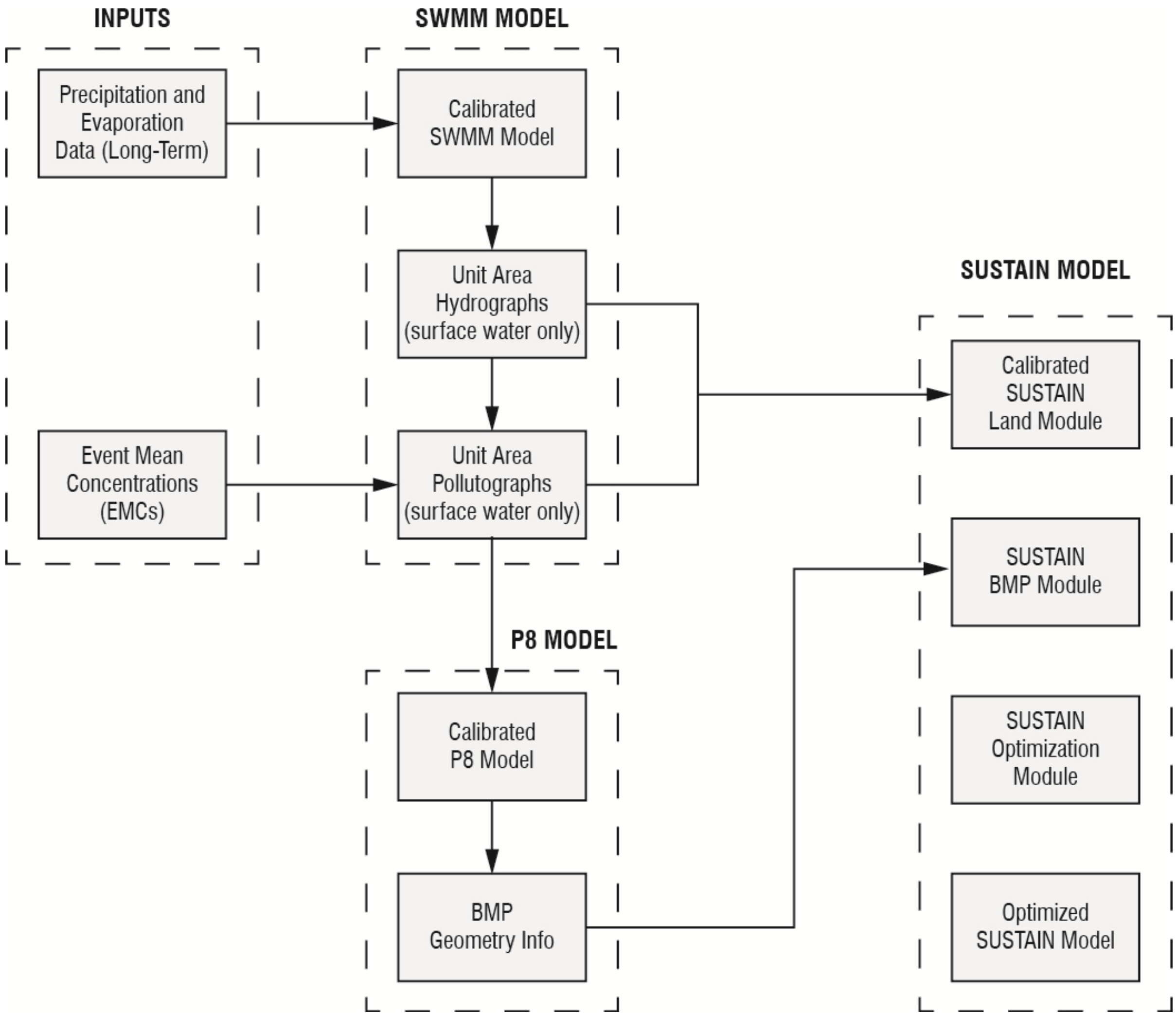


Figure 6 SWMM, P8 and SUSTAIN Model Development and calibration Process

Infiltration was simulated in the XP-SWMM model using the Horton Infiltration equation. This equation is used to represent the exponential decay of infiltration capacity of the soil that occurs during rainfall or snowmelt events. The soil infiltration capacity is a function of the following variables: Fo (maximum or initial value of infiltration capacity), Fc (minimum or ultimate value of infiltration capacity), k (decay coefficient), and time. These infiltration parameters are used for the generation of runoff from the individual sub-drainage basins.

The actual values of Fo, Fc, and k are dependent upon soil, vegetation, and initial moisture conditions prior to a rainfall or snowmelt event. Because it was not feasible to obtain this detailed information for each sub-drainage basin through field samples, infiltration assumptions were made based on the soil types throughout the study area. Composite infiltration parameters (Fo and Fc) were calculated for each sub-drainage basin based on the fraction of each soil type within each individual sub drainage basin. Global databases containing the infiltration parameters for each sub-drainage basin were developed and imported into the XP-SWMM model.

The values of Fo, Fc, and k applied for each Hydrologic Soil Group are summarized in Table 1. The values shown in the table are based on suggested values in the *Storm Water Management Model, Version 4: User's Manual*, U.S. EPA, 1988. The Fo and Fc values were determined for each sub-drainage basin by calculating a weighted average based on the given soil groups within each basin.

Table 1 Horton Infiltration Parameters

Hydrologic Soil Group	F_o (in/hr)	F_c (in/hr)	k (1/sec)
A	5.0	0.38	0.00115
B	3.0	0.23	0.00115
C	2.0	0.10	0.00115
D	1.0	0.03	0.00115

P8

The P8 is a publicly available watershed model designed to predict the generation and transport of runoff pollutants in urban watersheds. It consists mainly of methods derived from other tested urban runoff models, including SWMM, HSPF, D3RM, and TR-20. The P8 model was developed to design and evaluate development runoff treatment control combinations for pollutant removal efficiency. Although, due to its simplicity, the P8 model has inherent limitations, this model is highly suitable for planning level studies and scenario testing. Model components include stormwater runoff assessment, surface water quality analysis, and routing through structural controls.

In P8, continuous water balance and mass balance calculations are performed on a user-defined system consisting of watersheds, devices (runoff storage/treatment areas, BMPs), particle classes, and water quality components. Simulations are driven by continuous hourly rainfall and daily air temperature time series data. The model simulates pollutant transport and removal in a variety of treatment devices (BMPs), including swales, buffer strips, detention ponds (dry, wet, and extended), flow splitters, and infiltration basins (offline and online), pipes, and aquifers.

The key P8 input parameters are watershed area, total impervious fraction, weighted SCS curve number and stormwater device information. The NURP50 particle file was used. The NURP50 particle file was developed as part of the Nationwide Urban Runoff Program (NURP), a research program conducted by the U.S. Environmental Protection Agency, and provides default parameters for several water quality components, based upon calibration to median, event-mean concentrations reported by NURP (Athayede et al., 1983).

The P8 model was calibrated to match runoff volumes from the XP-SWMM model for the 2010 annual year at the same calibration points used in the water budget model analysis. To calibrate the runoff volumes, the impervious fraction and weighted curve number for each of the subwatersheds were adjusted.

SUSTAIN

To overcome the limitations of P8, the SUSTAIN model is employed to comprehensively size and place BMPs, perform optimization analysis, and assess TMDL compliance. Input for SUSTAIN is derived by P8 and SWMM.

The SUSTAIN model is public domain software developed by USEPA. SUSTAIN includes algorithms for simulating urban hydrology, pollutant loading, and treatment processes packaged from multiple models that individually address such processes. Users have the option to import time series data from external watershed models (e.g., Hydrologic Simulation Program Fortran (HSPF) or SWMM instead of performing new land simulations in SUSTAIN.

4 OVERVIEW OF RAA AND BMP SELECTION

4.1 RAA Process

The RAA process summarized into the following steps:

- Identify water body-pollutant combinations for which the RAA will be performed;
- Identify the MS4 service area (exclude lands of agencies not party to this EWMP such as Federal land, State land, etc.);

- Develop target load reductions for at least the 90th percentile year (based on wet days) based on Regional Board Guidance;
- Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future;
- Evaluate the performance of these BMPs in terms of annual pollutant load reductions during the 90th percentile year;
- Compare these estimates with the targets; and
- Revise the BMP implementation scenario until targets are met.

Target load reductions represent a numerical expression of the Permit compliance metrics (e.g., bacteria allowable exceedance days (AEDs) for dry and wet weather) that can be modeled and can serve as a basis for confirming that the EWMP is in compliance with the Permit and that the efforts described therein, if appropriately implemented, will reasonably demonstrate and assure Permit compliance.

In the Dominguez Channel watershed, target load reductions will be established using calibrated LSPC watershed model for the TMDL pollutants listed in the Beach Cities EWMP Work Plan for consistency. Allowable loads for the pollutants with the exception of fecal coliform will be computed by multiplying relevant concentration-based water quality based effluent limitations (WQBELs) by PLAT-derived runoff volumes for periods modeled. The target load reduction (TLR) will be the difference between baseline loads and allowable loads. TLRs will be expressed as a percent, representing the baseline load reductions necessary to meet the Permit limits and will be the target that PLAT-modeled BMP benefits will be compared with.

Zero target load reductions will be set for PCBs and DDT (with TSS as a surrogate for these particulate-associated pollutants), consistent with the USEPA TMDL which sets MS4 WLAs based on existing loads.

4.2 BMP Selection Process

The RAA modeling process will begin with the evaluation of new or enhanced, quantifiable non-structural BMPs and existing and proposed structural BMPs to assess water quality improvements (load reductions) which have occurred to date since the effective dates of applicable TMDLs. Next, if compliance is not met based on non-structural and existing BMPs, planned non-structural and structural BMPs will be modeled with consideration of scheduled completion in the context of the prioritized water body-pollutant combinations and compliance deadlines (including interim milestone dates). If compliance is still not achieved by the combination of both built and planned BMPs, additional BMPs will be discussed with the Beach Cities WMG Agencies in order to achieve compliance. These BMPs will be selected based on pollutants targeted, siting options, and maintenance preferences, among other criteria.

4.3 Scheduling

The Permit requires that RAA outcomes be linked to interim and final TMDL compliance dates. The steps described in Sections 4.1 and 4.2 are developed to demonstrate final TMDL compliance. Once the BMP implementation approach is developed for final compliance, a draft schedule for BMP implementation will be established within the context of local opportunities and constraints. It is expected that to assess compliance with interim milestones, the RAA analysis will need to be implemented for interim BMP implementation scenarios. These are expected to include different levels of non-structural BMPs, implemented over time (e.g., LID ordinance implementation). It is also recognized that in some cases there will be overlapping implementation efforts (e.g., non-structural outreach BMPs in areas where there are also structural BMPs). These instances will be evaluated on a case-by-case basis so that double-counting of water quality benefits is avoided.

Quantifiable non-TMDL (or non-303(d)) pollutants can also be addressed using Watershed Treatment Model (WTP, 2013), but these pollutants may not include a reference to a target load reduction; i.e., their quantification would only serve to express the additional water quality benefits of the existing, planned, and proposed BMPs.

4.4 Uncertainty and Variability

The long-term average concentration output of PLAT will incorporate the coefficient of variation (CV) so as to take variability into account. Thus, for this type of critical condition, the reported pollutant loading in each subwatershed will be established by using a variability factor for model-predicted. The procedures for the detailed calculation of variability factors for different probability distributions are described in Appendix E of the Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001, March 1991) will be followed. It is anticipated that log-normal distributions will be assumed.

5 MODELING APPROACH – DOMINGUEZ CHANNEL

This section addresses the modeling approach within Torrance that is tributary to Dominguez Channel. The portion of Torrance that is tributary to Redondo Beach and Santa Monica Bay will be addressed using the same model assumptions and methods described in Appendix C of the Beach Cities EWMP Work Plan, and will build off SWMM modeling and analyses previously conducted as part of the studies supporting Santa Monica Bay Bacteria TMDL (Jurisdictional Groups 5 and 6) implementation activities. Design and as-built information on Torrance detention basins will be utilized to update previous studies as appropriate.

5.1 Spatial Domain

The spatial domain of the RAA will include the priority catchments located in the Dominguez Channel watershed within Torrance. To account for this, shapefiles are needed depicting these area.

GIS layers to be used in PLAT will include the following:

- Soils
- Catchments/subbasins
- Topography
- Impairments (TMDLs/303(d))
- Land use
- Watershed
- Catchment delineations
- Storm drains (SWMM only)
- Parcels (PLOAD only)
- Calibration stations
- Stream reach
- Point sources

Other shapefiles such as BMP locations and BMP drainage areas will be used to extract background information, rather than as direct inputs to the model.

5.2 Hydrology

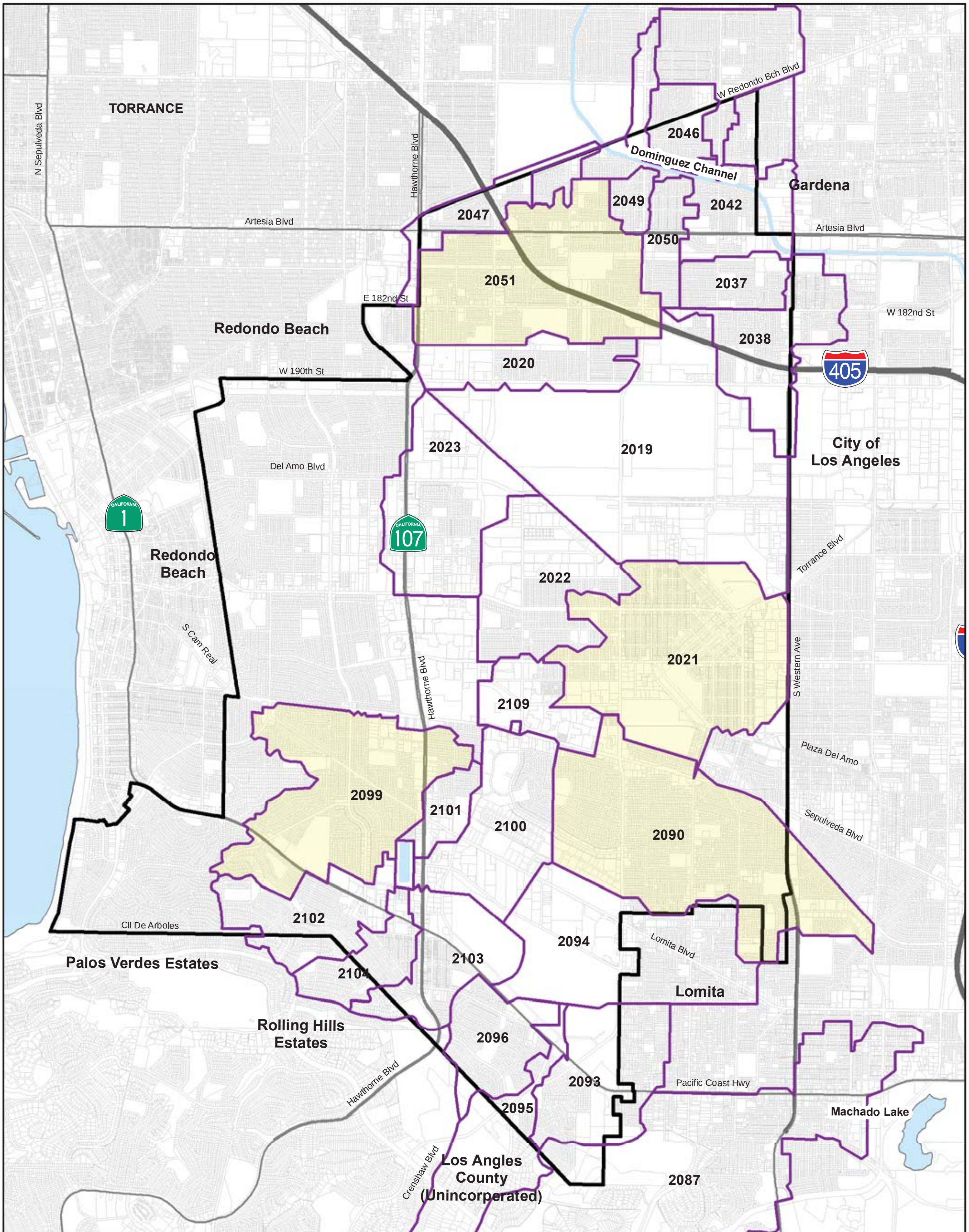
SWMM runoff module will be used for hydrological analysis. Both event-based design storm and long-term rainfall data will be simulated. Long-term, hourly rainfall data and average monthly evapotranspiration values are used along with land use-linked catchment imperviousness and soil properties to estimate runoff volumes. Revised and recalibrated PLAT database values and EWMP-defined BMP information are used to estimate the volume of runoff generated from watershed areas and captured by BMPs. Storm events are individually tracked for the entire simulation so that the volumes of runoff infiltrated, evapotranspired, captured, and released (if applicable) by BMPs are estimated for every storm event.

5.2.1 Calibration

In the absence of field data during PLAT development, WMMS' LSPC's output was used to adjust PLAT input parameters. This process is referred to as calibration in this Attachment to Appendix C. The hydrology component of PLAT was calibrated to WMMS' LSPC output for the entire City of Torrance excluding portion of SMB within Torrance. The calibration was performed using WMMS' LSPC output (2005 and 2006 simulation results) received from the Los Angeles County. Since primary output for PLAT includes annual volumes and pollutant loads, the calibration focused on accurate prediction of annual discharge volumes based on hourly rainfall data, as compared with stream flow data (2005 and 2006). The effective impervious percentage for the open space land use category and the Horton's infiltration parameter of all mapped soil types served as calibration parameters. The resulting input parameter value adjustments are shown in Tables 2. Figure 7 is a depiction of the hydrologic calibration results. Figure 7a shows the subbasin delineation used in WMMS.

Based on available data, the period of calibration was 2 years, between 2005 and 2006. The calibrated input parameter values will be used for the Beach Cities WMG RAA.

Following calibration, average prediction error (or the average of the percent differences between each observed and modeled annual runoff volume) was calculated to be about 5%.



Legend

- Los Angeles County WMMS Model Subbasins (Labeled by Subbasin ID)
- Subbasins Selected for Calibration
- City Boundary
- Freeway
- Major Roads

0 0.25 0.5 1 Miles

Figure 7a
Calibration Subbasin Comparison

City of Torrance

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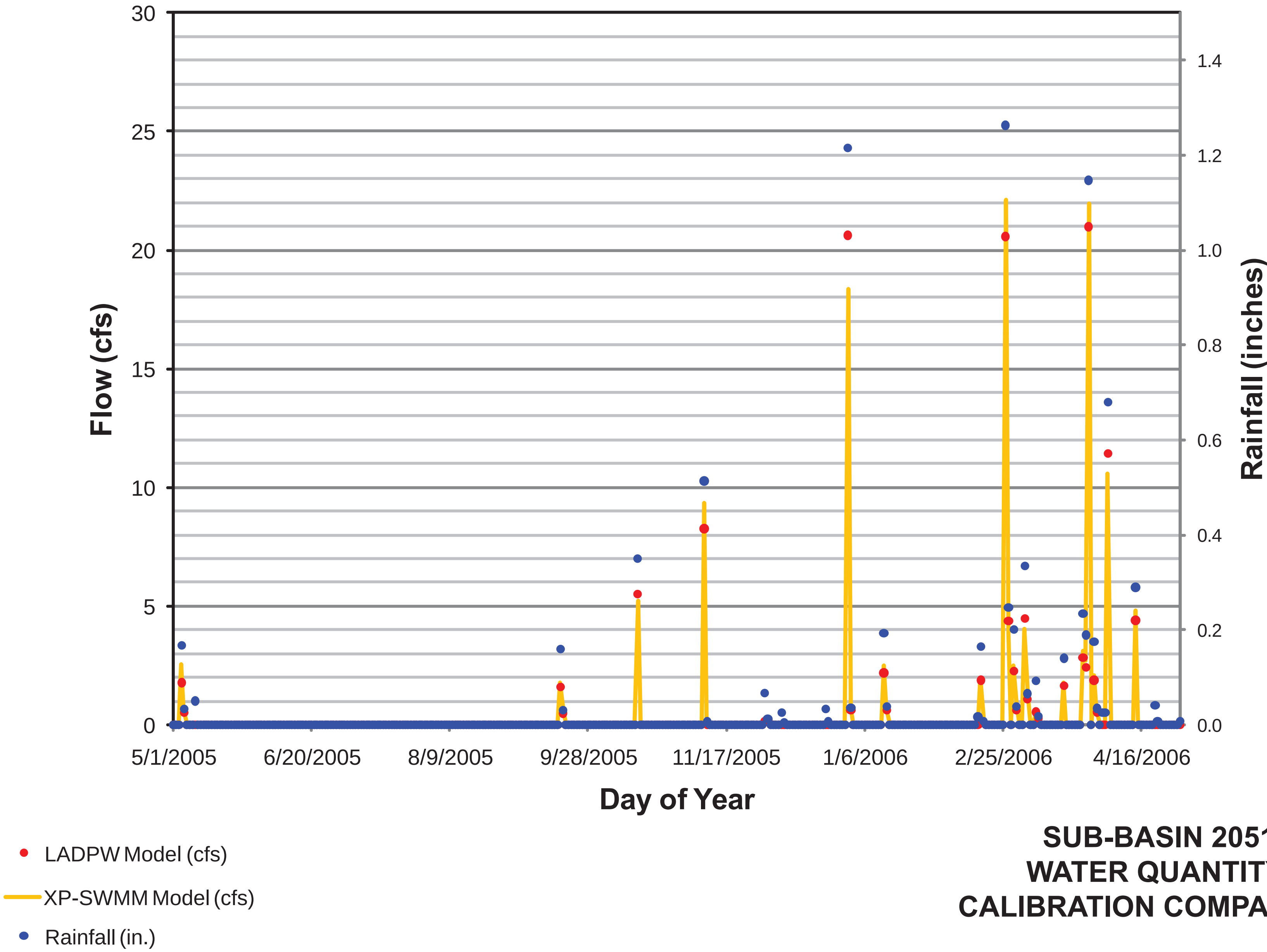
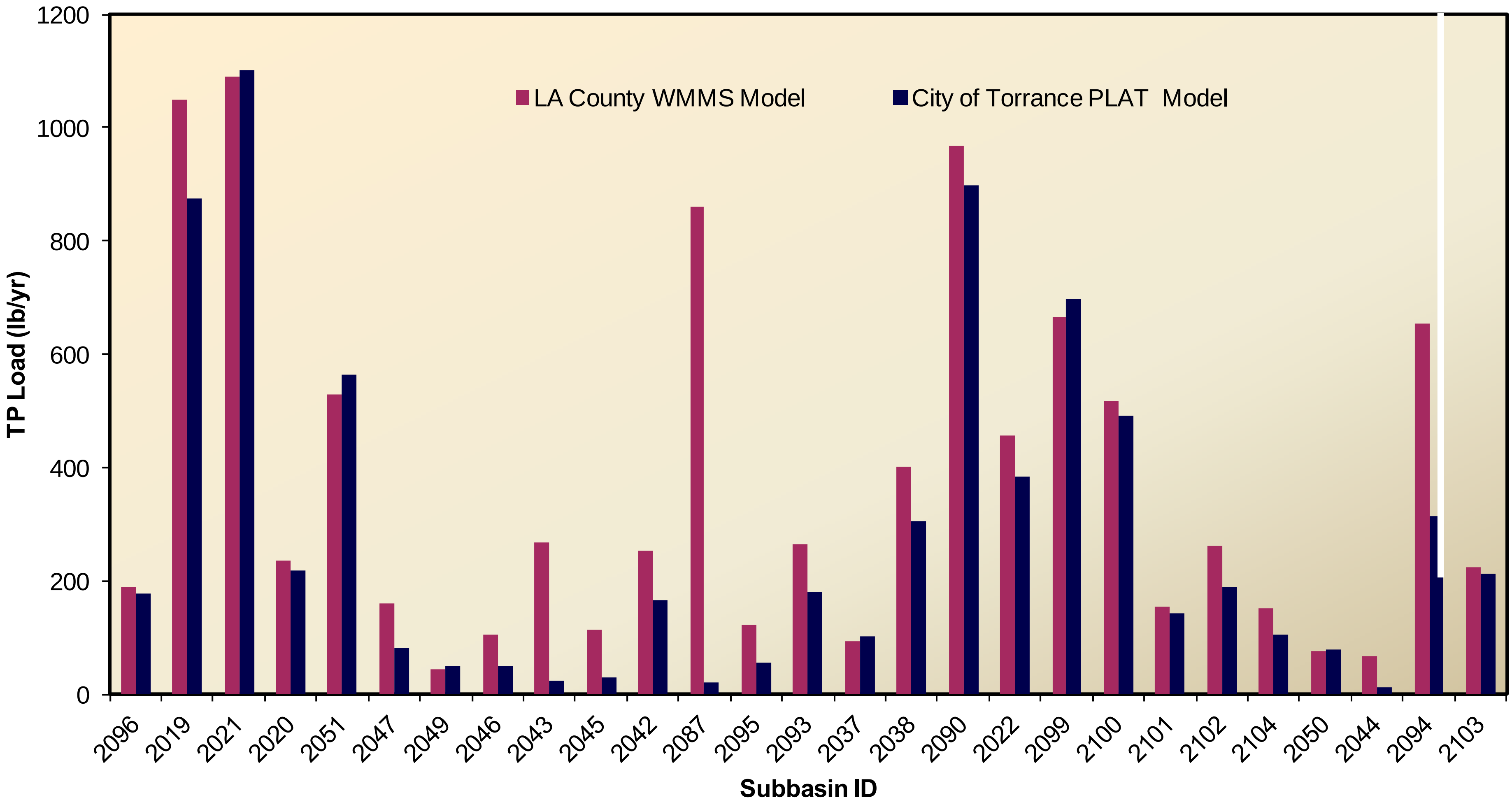


SUB-BASIN 2051
WATER QUANTITY
CALIBRATION COMPARISON

FIGURE 7b



WATER QUALITY CALIBRATION COMPARISON

FIGURE 7C

5.3 Water Quality

As described in Appendix A, the priority water body-pollutant combinations for the Beach Cities WMG EWMP area, combined with data availability, will dictate which water body-pollutant combinations the RAA will address.

Long-term simulation out from PLAT will be used to develop statistical descriptions of stormwater quantity and quality. The statistics results will be 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.

SUSTAIN will be used to simulate pollutant transport and removal throughout the study basins. The steps for the evaluation of BMP scenario performance and optimization are listed below:

1. Converted XP-SWMM model EPA SWMM 5 model to simulate runoff and routing for study basins.
2. Calibrated SWMM model runoff volume and timing to flow data extracted LA County WMMS' LSPC model .
3. Using the calibrated SWMM model, developed unit-area surface water hydrographs (not including stream baseflow) to characterize runoff from each subcatchment by land use (commercial, residential, or forest) and land cover (pervious or impervious) for the 1-year calibration period.
4. Developed unit-area pollutographs for the calibration period by applying event mean concentrations (EMCs) from each land use to the unit-area hydrographs (not including stream baseflow).
5. Built P8 and SUSTAIN land and conveyance module using unit-area hydrographs, pollutographs, and calibrated routing parameters from the SWMM model for the 1-year calibration period.
6. Repeat steps 3 and 4 from above to develop hydrographs and pollutographs for at least a 10-year period
7. Input long-term hydrographs and pollutographs into calibrated SUSTAIN model
8. Develop a SUSTAIN BMP module and integrate with land and conveyance modules
9. Use calibrated SUSTAIN model to optimize placement of water quality treatment BMP across basin based on performance and cost.

5.4 Representation of Individual BMPs

PLAT will be used to model all BMPs in the portions of Dominguez Channel watershed in Torrance. The portions of Torrance in the Santa Monica Bay watershed will be modeled consistent with the other Beach Cities' RAA.

5.4.1 Data to Support Model Set-Up

The International Stormwater BMP Database (IBD) is a comprehensive source of BMP performance information (www.bmpdatabase.org), comprised of data from a peer-reviewed collection of studies that have monitored the effectiveness of a variety of BMPs in treating water quality pollutants for a variety of land use types. Water quality performance data from the IBD modeled by others will be used to develop effluent concentrations (averages and standard deviations) of the BMPs and constituents listed in Table 2.

As with land use EMCs, the effluent quality of BMPs is highly variable. To account for this variability in PLAT, effluent quality data will be analyzed and descriptive statistics generated for further statistical analysis.

5.4.2 MCMs and other Non-structural BMPs

Existing, recently-initiated non-structural BMPs (i.e., those not modeled in the initial establishment of the TMDLs and compliance requirements) and planned non-structural BMPs will be evaluated in terms of ability to reduce loads at each of the compliance modeling locations within the Torrance study area. Both wet and dry weather water quality benefits of these BMPs will be evaluated for all TMDL and 303(d) pollutants (excluding trash) where data are available to support such estimates. Non-structural BMPs will be quantified with the WTP model. All assumptions and references will be documented.

5.4.3 Structural BMPs

The goal of this step will be to achieve the remaining target load reductions by utilizing structural BMPs in combination with the benefits of non-structural BMPs. The RAA will consider existing, sub watershed, and conveyance facility characteristics to delineate pollutant source, runoff control, and outfall monitoring strategies. This will involve a detailed review of existing conditions and datasets. This step will include the following components as detailed by Geosyntec Consultants:

- Existing (i.e., implemented post-TMDL) and planned structural BMPs, which are identified in Technical Memorandum 2.2 and SQMP, will be described by the Agencies with sufficient conceptual design detail to support quantitative analysis. Based on city's input on BMP preferences, additional "proposed" structural BMP opportunities may be identified and prioritized using PLAT.
- The water quality benefits (in terms of expected pollutant load reductions) associated with existing, planned, and proposed structural BMPs will be evaluated for wet weather using PLAT, as described previously in this Technical Memorandum.

5.5 Representation of Cumulative Effect of all BMPs and New BMP Selection Support

Following evaluation of the water quality benefits associated with non-structural and structural BMPs in Torrance, the cumulative effect of all BMP proposed in the Beach Cities area will be evaluated for the EWMP.

Table 2 BMPs and Constituent Modeled[1]	
BMP	**Constituent**
Constructed Wetland / Retention Pond (with Extended Detention) Constructed Wetland / Retention Pond (without Extended Detention) Dry Extended Detention Basin Hydrodynamic Separator Media Filter Subsurface Flow Wetland Treatment Plant Bioswale Bioretention with underdrain Bioretention (volume reduction only) Cistern (volume reduction only) Green Roof (volume reduction only) Porous Pavement (volume reduction only) Low Flow Diversion (volume reduction only)	Total suspended solids (TSS) Total phosphorus (TP) Dissolved phosphorus as P (DP)[2] Ammonia as N (NH3) Nitrate as N (NO3) Total Kjeldahl nitrogen as N (TKN) Dissolved copper (DCu) Total copper (TCu) Total lead (TPb) Dissolved zinc (DZn) Total zinc (TZn) Fecal Coliform (FC)
[1]All constituents are addressed for all BMPs that provide treatment (i.e., excluding those identified as "volume reduction only"). [2]Dissolved phosphorus and orthophosphate datasets were combined to provide a larger dataset and because the majority of orthophosphate is typically dissolved and many datasets either report dissolved phosphorus or orthophosphate, but not both.	

5.6 Regional Project (85th Percentile Design) Definition

No EWMP-defined (85th percentile) Regional Projects have been identified within Torrance.

5.7 Dry Weather RAA Approach

The dry weather RAA approach will be performed by Geosyntec Consultants as described in Technical Memorandum 2.3.

6 Proposed Approach for RAA Output

The model output from PLAT will be organized to meet the model output format proposed in Appendix C of the Beach Cities EWMP Work Plan.

7 CONCLUSION

For portions of the Dominguez Channel Watersheds within Torrance, a wet weather modeling approach that utilizes LSPC and PLAT is proposed with the rationale, analytical basis, and process described herein. PLAT and LSPC meet Permit requirements and provide the informational submittal elements required by the Regional Board. It is also compatible with non-structural BMP analytical approaches and provides information with respect to variability that is important for the Beach Cities WMG EWMP Group to establish reasonable assurance. The drainage areas within Torrance in both watersheds will be modeled using the PLAT tool, which will be described in a future attachment to this memorandum.

For portions of the Santa Monica Bay Watershed within Torrance, work will be coordinated with other Beach City EWMP group members and will build off previous SWMM studies and current design information, consistent with other assumptions presented in Appendix C of the Beach Cities EWMP Work Plan.

The dry weather RAA approach within Torrance will be performed as described in Appendix C of the Beach Cities EWMP Work Plan.

8 LIMITATION

The professional opinions and recommendations expressed in this report are made in accordance with generally accepted standards of practice and were based largely on source information provided by others. This source information was not necessarily checked or verified by Carollo as part of this work.

No other warranty is either expressed or implied. Carollo is responsible for the conclusions and recommendations contained in this report based on the data and information relating only to the specific project and location discussed herein. Carollo is not responsible for use of the information contained in this report for purposes other than those expressly stated in this report namely the RAA Approach for the Beach Cities WMG EWMP WP. In the event that there are changes in the available data as described herein, Carollo is not responsible for these changes. Carollo is not responsible for any conclusions or recommendations made by others based upon the data or conclusions contained herein unless given the opportunity to review them and concur with them in writing.

9 REFERENCES

Regional Water Quality Control Board (RWQCB), 2014. Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program, including an Enhanced Watershed Management Program. March.

Center for Watershed Protection Association, 2013. Watershed Treatment Model (WTP 2013).

APPENDIX D

Machado Lake TMDL BMP

Special Study Work Plan

City of Torrance, California

MACHADO LAKE NUTRIENT TOTAL MAXIMUM DAILY LOAD

SPECIAL STUDY WORK PLAN

May 18, 2011

3031 Torrance Boulevard • Torrance, California 90503 • Phone: 310.618.5880 • Fax: 310.618.5891

City of Torrance, California

MACHADO LAKE
NUTRIENT TOTAL MAXIMUM DAILY LOAD

SPECIAL STUDY WORK PLAN

May 18, 2011

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) presents the approach and procedures to implement stormwater sampling activities in 2011 for a Special Study of the City of Torrance (City) storm drains discharging stormwater into Machado Lake. The field study sampling procedures, methods, and analyses for stormwater are described in this document.

1.1 Background

The City is subject to the requirements of the Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) Total Maximum Daily Load (TMDL) per the Los Angeles Regional Quality Control Board's (Regional Board's) Resolution R08-006. Under the Regional Board's resolution, the City shall submit to the Regional Board's Executive Officer a Monitoring and Reporting Plan (MRP) within 1 year of the effective date of the resolution or propose a Special Study Work Plan following the requirements of one of three optional studies. This Special Study Work Plan details the approach proposed by the City to perform Optional Study No. 3, to assess compliance with the Waste Load Allocations (WLA) on a mass basis for total nitrogen and total phosphorus originating from the City's watersheds. The Special Study Work Plan proposes a pre-Best Management Practices (BMP) Implementation Study including field sampling and data collection to be followed by submittals to the Regional Board including a BMP Evaluation and Selection Report, a MRP, and a BMP Implementation Report to be provided at a later date.

Machado Lake is identified on the 1998 and 2002 Clean Water Act 300(d) list of impaired water bodies as impaired due to eutrophic conditions, algae, ammonia, and odors. Resource agencies, local governments, project implementers, the scientific community, environmental groups, decision-makers at the city, county, state, and federal levels, and many others have continued to take meaningful steps towards the restoration of Machado Lake and its basin. Among these efforts, restoration activities are expanding through continued implementation of erosion control, stormwater management, and riparian restoration projects, development of the Machado Lake Nutrient TMDL that is providing a quantitative, science-based approach for pollutant reduction, and a strong research/monitoring effort to evaluate key ecological processes and response to water quality improvement projects.

The Machado Lake Nutrient TMDL allows for the establishment of annual mass-based WLAs for total phosphorus (TP) and total nitrogen (TN) equivalent to monthly average concentrations of 0.1 mg/L TP and 1.0 mg/L TN, based on approved flow conditions. When the concentration based WLAs are met under the approved flow condition of 8.45 hm3, the annual mass of the TP discharged to the lake will be 845 kg and the annual mass of TN discharged to the lake will be 8,450 kg. The City of Torrance mass-based WLA will be proportional to the City owned area in the sub-watershed. The City of Torrance area accounts for 35.6% of the Machado Lake Watershed. Table 1 lists the interim and final WLAs based on this area.

Table 1 Waste Load Allocations

Responsible Party	Years after TMDL Effective Date	TP (kg)	TN (kg)
City of Torrance	5	3,760	7,370
	9.5 (final WLAs)	301	3,008

1.2 Site Conditions and Characteristics

1.2.1 Study Site Location

The City is located about 15 miles south of Downtown Los Angeles (LA), in southern LA County, just north of the Palos Verdes Hills. The City was incorporated on May 12, 1921, and is just over 20.5 square miles in area. The City is bounded by Redondo Beach on the west and north, Lawndale and Gardena on the north, LA on the east, Lomita to the southeast, and Rolling Hills Estates and Palos Verdes Estates on the south. The City is also bounded by approximately 4,000 feet of Santa Monica Bay coastline. The City's storm conveyance systems are interconnected with neighboring city systems. Neighboring cities located at generally higher elevation such as Rolling Hills Estate and Palos Verde Estate discharge stormwater into the City's and/or LA County's storm conveyance systems located within the City's boundaries. Figure 1 shows a regional location map of the City.

1.2.2 Hydrology and Hydraulics

The Machado Lake subwatershed is located in the southwestern area of the Dominguez Watershed and includes portions of the Cities of Los Angeles, Torrance, Lomita, Rolling Hills, Rolling Hills Estates, Carson, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, and the communities of unincorporated Los Angeles County, including Wilmington and Harbor City. However, much of the Machado Lake watershed consists of the hilly regions of Rolling Hills Estates and Rolling Hills. This portion of the watershed is unique, as it consists of relatively steep hills with drainage into the canyons. The Machado Lake Watershed covers an area of approximately 20 square miles and is itself divided into six primary subdrainage areas. These subdrainages are the Walteria Lake, Project 77/510, Wilmington Drain, Project 643 (72-inch Storm Drain), Project 643 (Figueroa Drain), and Private Drain 553.

Machado Lake, about 40 acres in area and the Machado Lake Wetlands (64 acres) are located within the Ken Malloy Harbor Regional Park in the southeastern corner of the Machado Lake Watershed. Both Machado Lake and the Machado Lake wetlands serve as flood retention basins for the Machado Lake Watershed.

1.2.2.1 Storm Drain

As the area is highly urbanized, drainage is primarily conducted through an extensive network of underground storm drain facilities. The Los Angeles County Department of Public Works maintains the system of storm drains in the City of Rolling Hills Estates. The primary use of the Dominguez Channel and all other open channels in the Dominguez Watershed (including Wilmington Drain, Machado Lake, and Madrona Marsh) is flood protection.

Machado Lake receives urban and storm water runoff from a complex network of storm drain systems. The first of three primary storm drain channels that flow into Machado Lake is the Wilmington Drain. Approximately 65 percent of the runoff from the Machado Lake Watershed flows through the Wilmington Drain into Machado Lake. The other two primary storm drain channels are the Project No. 77 Drain and the Harbor City Relief Drain. Several smaller storm drains also discharges into Machado Lake, including Project No. 643's Figueroa Street Outlet and a 72-inch storm drain outlet. Machado Lake discharges at the southern end by overflowing a concrete dam into the Machado Lake wetland. Water discharges from the wetland through the Harbor Outflow structure and into the West Basin of the Los Angeles Harbor.

The Walteria Lake, located within the City's boundaries, is owned and operated by LA County. It is approximately 1,005 acre-feet in capacity and receives raw stormwater mainly from Rolling Hills Estates and Palos Verdes Estates. Effluent from the lake is pumped at a maximum rate of 57 cubic feet per second (cfs) through a force main system into a 54-inch drain line that lies under Skypark Drive. The discharge eventually leaves the City near the intersection of Crenshaw Boulevard and Amsler Street.

Figure 2 shows the drainage basins and stormwater conveyance infrastructure in the City. The figure also shows nearby communities discharging stormwater into the City's drainage system.

1.2.3 Land Use

The City of Torrance is predominantly residential land use, with concentrations of industrial and commercial uses. This reflects the City's history as a "company town," where homes were built to house the local work force of industries. Residential development covered almost half of the City's land area. Industrial uses occupied the second largest land area, at 22 percent. Commercial and Public/Quasi-Public/Open Space uses represent the third largest land uses in the City, about 12 percent each. Torrance also had a limited supply of vacant land mostly within commercial and industrial areas. Given the built-out character of the community, only minor land use changes from baseline year 2010 conditions will occur over the long term.

Residential uses are located throughout Torrance at varying development densities. The highest residential densities occur along major streets and near major transportation corridors, in older neighborhoods, and in apartment or condominium developments and Planned Development communities around Sepulveda Boulevard and Plaza Del Amo between Hawthorne and Crenshaw Boulevards. The lowest residential densities are largely located in the western and southern portions of the City. Figure 3 identifies the land uses in Torrance.

1.2.4 Water Quality Issues

Machado Lake, located in the Dominguez Channel watershed in southern LA County, is identified on the 1998 and 2002 Clean Water Act 303(d) list of impaired water bodies as impaired due to eutrophic conditions, algae, ammonia, and odors. The Machado Lake eutrophic, algae, and odor impairments are caused by excessive loading of nutrients, including nitrogen and phosphorus, to Machado Lake (Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL, Revised Draft – April 2008). Ammonia is found to be at levels below the toxicity standards, but nevertheless, these concentrations contribute to the total nitrogen loading in the Lake. Table 2 provides a summary of the quantifiable loads entering Machado Lake on an annual basis (Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL, Revised Draft – April 2008). Nutrient flux from the sediments and atmospheric nitrogen deposition are the two directly quantifiable non-point sources included as part of the total nutrient load. The total annual nitrogen and phosphorus loads are estimated to be 24,327 kg and 10,421 kg, respectively.

Machado Lake is located in the Ken Malloy Harbor Regional Park (KMHRP), which is a 231 acres LA City Park serving the Wilmington and Harbor City areas. As shown on Figure 4, the park is located west of the Harbor freeway (110) and east of Vermont Avenue between the Tosco Refinery on the south and the Pacific Coast Highway on the North. Machado Lake is one of the last lake and wetland systems in LA; the area is approximately 103.5 acres in total size. The upper portion, which includes the open water area, is approximately 40 acres and the lower wetland portion is about 63.5 acres. Machado Lake is a shallow polymictic lake; the depth is generally 0.5 to 1.5 meters; the *average* depth is approximately 1.0 meter. The lake was originally developed as part of Harbor Regional Park in 1971 and intended for boating and fishing. Over the years water quality generally declined; boating was stopped and signs were posted warning of the risk of eating fish from the lake.

Table 2 Total Annual Nutrient Load Entering Machado Lake[1]

Source	Total N (kg)	Total P (kg)	Ortho-P (kg)	Inorg-N (kg)
External Load	7,587	3,260	737	3,736
Sediment Flux	16,520	7,161	4,963	16,520
Atmospheric Deposition	220			
Total Annual Load	**24,327**	**10,421**	**5,700**	**20,256**

Notes:
1. Source: Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL, Revised Draft - April 2008.

The dominant land use in the Machado Lake Watershed is high-density single-family residential, accounting for approximately 45 percent of the land use. Industrial, vacant, retail/commercial, multi-family residential, transportation, and educational institutions each account for 5 to 7 percent of the land use, while "all other" accounts for the remaining 23 percent. Machado Lake is a receiving body of urban and stormwater runoff from a network of storm drains throughout the watershed. As indicated on Figure 4, there are three discharge points into Machado Lake from the following storm drain channels:

- Wilmington Drain.
- Project No. 77.
- Harbor City Relief Drain.

Approximately 88 percent of the Machado Lake Watershed drainage area flows through the Wilmington Drain into Machado Lake.

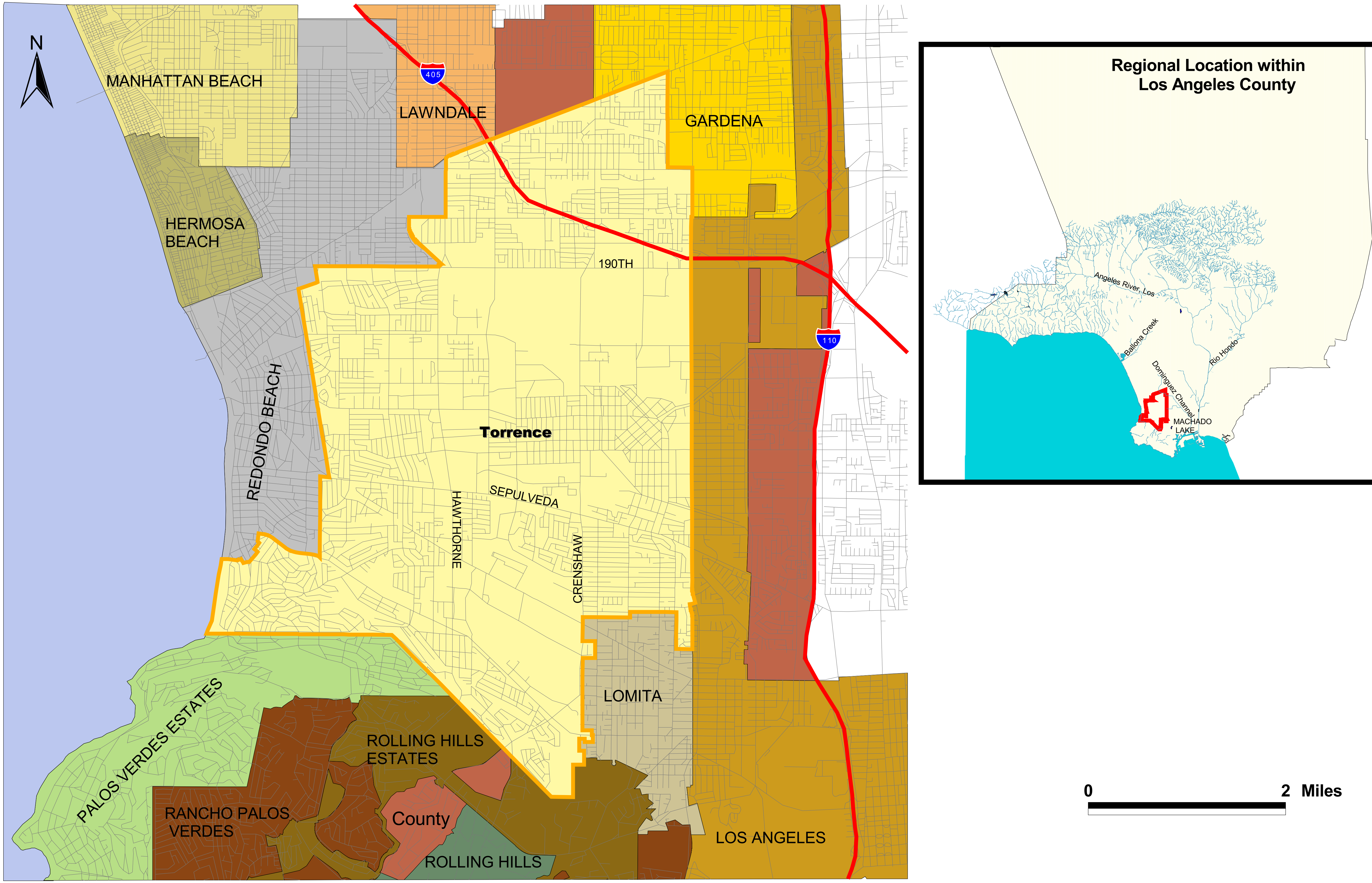


Figure 1 Regional Map of Torrance

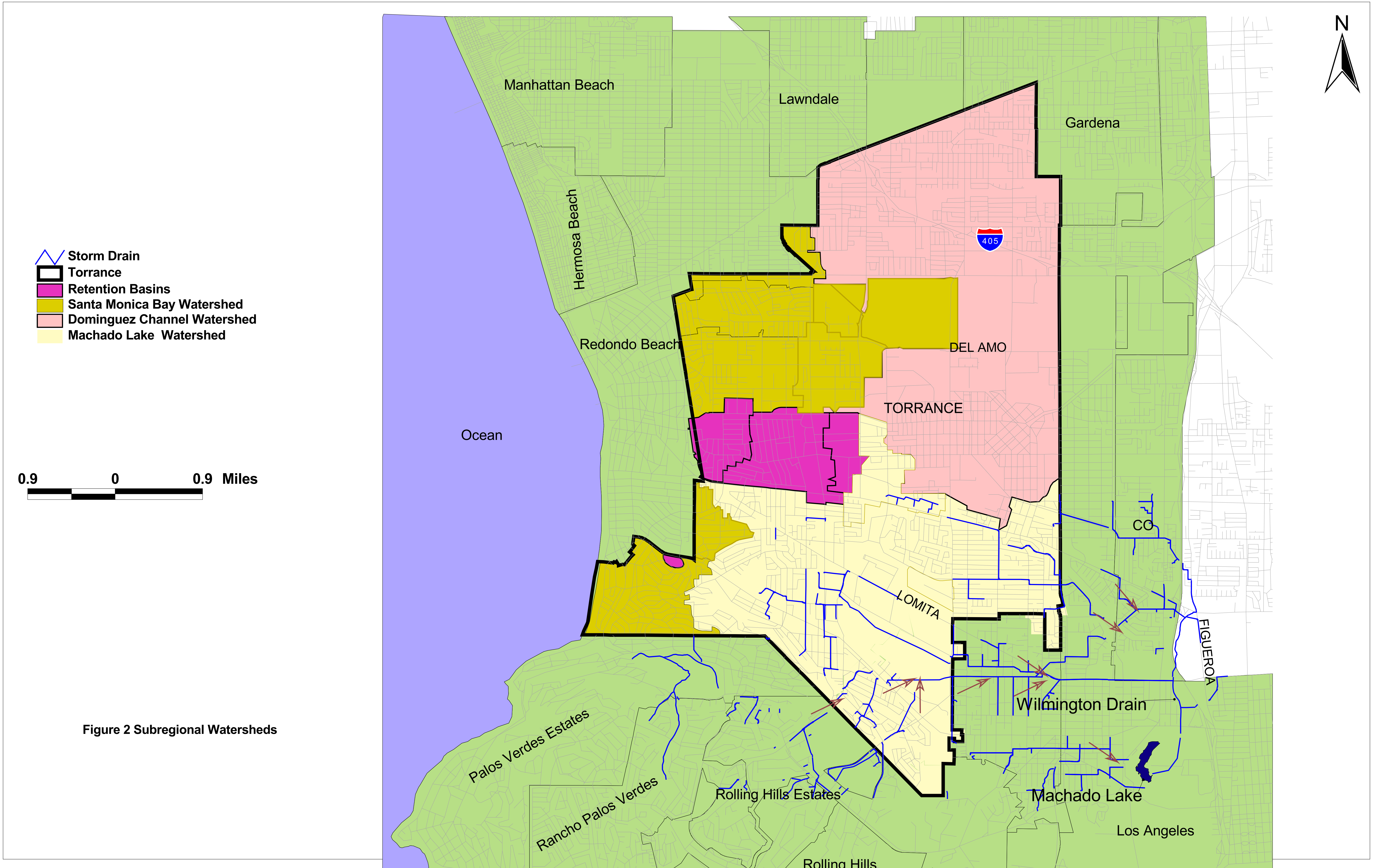


Figure 2 Subregional Watersheds

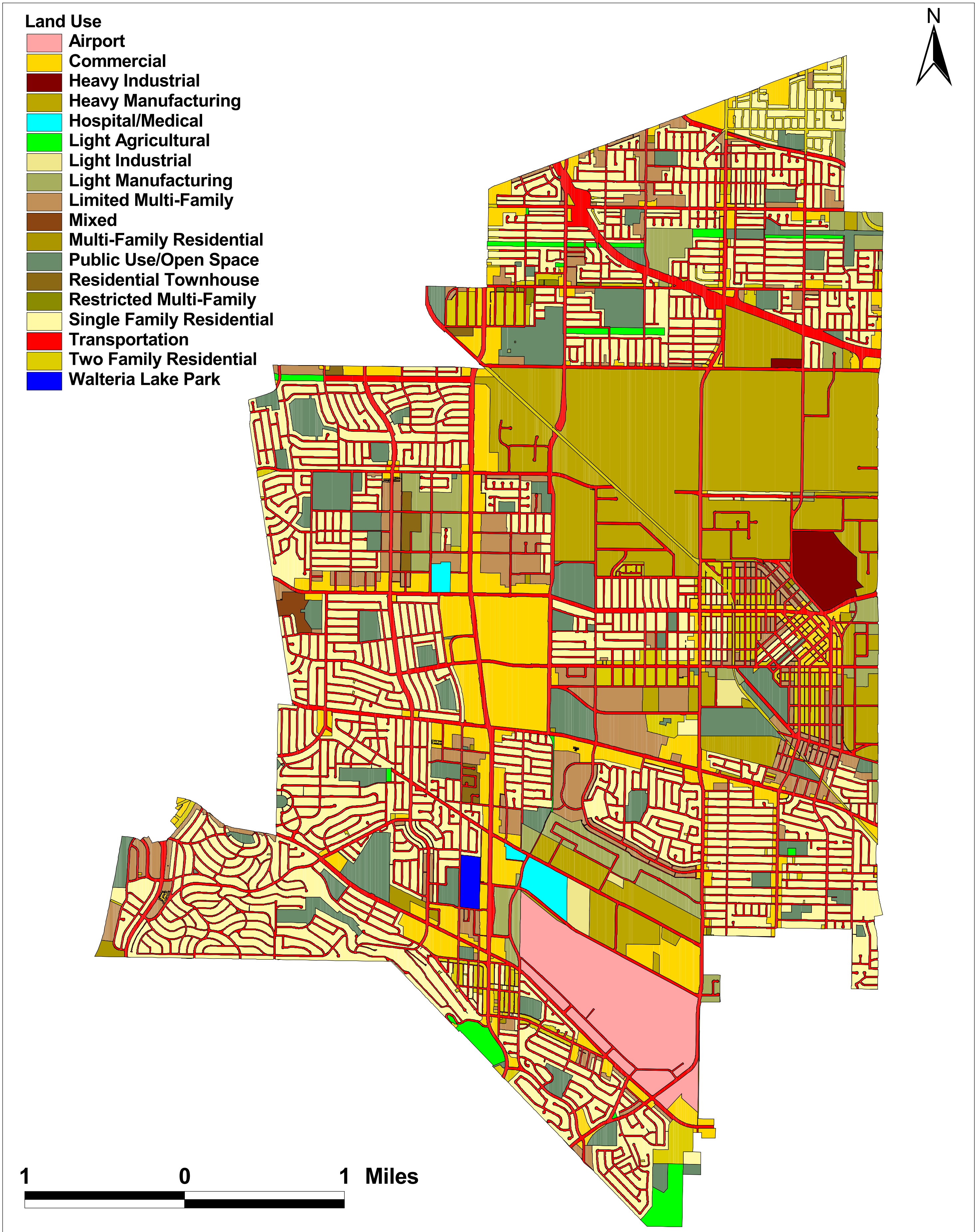


Figure 3 Existing Land Use of Torrance

Figure 4 2007 Satellite Imagery of Machado Lake and Ken Malloy Harbor Park Overview

1.3 Special Study Work Plan

This document provides the overall structure of the Special Study Work Plan with submittals to the Regional Board, as well as providing the initial Pre-BMP Implementation Study Plan (including a proposed field data collection and sampling plan). The Special Study Work Plan addresses the requirements of Optional Study No. 3 to assess compliance with WLAs for total nitrogen and total phosphorus originating from the City's watersheds. The scope of work for this plan includes the following:

- Pre-BMP Implementation Study Period - Including conducting dry weather sampling as outlined within this submittal as well as reviewing water quality models developed by LA County for wet weather events and Machado Lake.
- BMP Evaluation and Selection Study Report - This study report is to be submitted at a later date (see proposed schedule of work plan elements), and will summarize the collected field data and the applicable results obtained from the regional water quality model being developed by LA County for wet weather conditions. The field data and the water quality model data will be used to assess compliance with WLAs under the TMDL. Based on the assessment of compliance, the BMP and Selection Study Report will identify and screen structural BMPs for mitigation to bring the City into compliance with the TMDL.
- Monitoring and Reporting Plan - Subsequent to acceptance by the Regional Board of the findings and conclusions of the City's BMP Evaluation and Selection Study Report, the City will submit an MRP specific to the needs for assessment of future compliance with the TMDL.
- BMP Implementation Report - This report will summarize the monitoring data collected after 12 months of BMP implementation and will provide to the Regional Board an assessment of the success of the structural BMPs implemented by the City to support compliance with the TMDL.

The actual start date for the sampling will be determined following the Regional Board's approval of this Special Study Work Plan. Other conditions that may affect the sampling schedule are weather and equipment conditions and availability. The schedule for the work plan is summarized in Table 3.

The Special Study Work Plan identifies the proposed tasks the City agrees to perform, their timelines, and the roles and responsibilities of various parties in completing the work. The purpose of this document is to serve as a starting point for work planning discussions between the City and the Regional Board.

Table 3	Schedule or Work Plan Elements	
ID	**Work Plan Element**	**Schedule**
1	Special Study Work Plan	May, 2011 (submittal)
2	Regional Board Review/Approval	June, 2011 (approval)
3	Pre-BMP Implementation Study	July, 2011 – July, 2012 (field sampling)
4	BMP Evaluation, Monitoring and Reporting Plan	September, 2011 (submittal)
5	Regional Review/Approval	August, 2012 (approval)
6	BMP Implementation	Nov., 2012 (implementation)
7	BMP Implementation Report	Nov., 2013 (submittal)

2.0 PRE-BMP IMPLEMENTATION STUDY

2.1 Introduction

The Pre-BMP Implementation Study includes a 12-month FSP and evaluation of regional water quality models for wet weather conditions and Machado Lake to assess the City's current compliance with WLAs. The FSP covers sample collection methods, analytical procedures, data analysis and reporting, and health and safety aspects. The FSP will generate a variety of data including discharge rates and flow volumes, the concentrations of chemical parameters, and the measurement of physical parameters. Utilizing the mass balance approach, the data will be used to estimate the mass of nutrients originating from the City as well as nearby agencies discharging stormwater into the City's storm drain system. The data will also be examined for patterns and trends, comparing stormwater quality between different sampling locations over time.

The Pre-BMP Implementation Study will be undertaken once approval is obtained from the Regional Board for the Special Study Work Plan.

The remaining sections of this document contain the FSP providing field sampling methods and analytical procedures that will be used to collect dry weather water quality data and continuous flow data.

2.2 Objectives of the Pre-BMP Implementation Study

The Pre-BMP Implementation Study will provide the City data needed to assess water quality impacts to the City's drainage network. The objective of this study is to support the City's compliance with the Machado Lake Nutrient TMDL by performing Special Study No. 3. Data and information elements that are part of the Pre-BMP Implementation Study include:

1. Dry weather flow data including calculation of continuous volume data and water quality data obtained through field monitoring and sampling (data to be collected by implementing the FSP included within this document).

2. Estimates of wet weather stormwater quality impacts identified using an integrated water quality model developed by the City of Torrance. The water quality model is described in Section 2.2.1.
3. Identification of BMPs that will be implemented by the City to mitigate observed water quality impacts in the City's outflows to Machado Lake.

2.2.1 Pollutant Loading and Analysis Tool (PLAT)

In order to estimate wet weather stormwater quality impacts, the City has developed an integrated watershed modeling tool to simulate watershed hydrology, nutrient, sediment, and contaminant dynamics. This tool called Pollutant Loading and Analysis Tool (PLAT), incorporates existing and commonly used watershed models. The main models used by PLAT are PLOAD, Program for Predicting Polluting Particle Passage thru Pits, Puddles, and Ponds (P8), and U.S EPA SUSTAIN model. PLAT is based on spatially distributed inputs derived from high resolution satellite imagery. PLAT has four main components: pollutant hot-spots characterization, BMP screening, continuous simulation, and BMP design, optimization, and placement. The SUSTAIN model provides an optimization routine that helps identify the appropriate size of BMPs for treating stormwater runoff from respective source areas to meet TMDL reduction goals. The tool has been validated with results from the LA County Watershed Management Model System (WMMS).

3.0 FIELD SAMPLING PLAN

The 12-month FSP is designed to collect continuous flow data and discrete dry weather water quality data to support the overall study objectives summarized in Section 2.

3.1 Sampling Locations and Access

Site selection is a major challenge, given the scarcity of funding for sampling and laboratory analysis. The number of locations to be sampled was decided based on the program objectives, regulatory requirements, and the size and complexity of the drainage sub-basins and conveyance system. In addition, the frequency of sampling at each location was considered.

As a first step in the selection process, the City's watersheds, sub-basins and drainage system network were reviewed. Based on this review, nine locations were identified that could be used to characterize the flows in and out of each subbasin. Four of these locations are needed at a minimum to characterize the flows conveyed to Machado Lake. The final selection of sample locations was based on factors such as site permission, access, clustering, personal safety, equipment safety, and the likelihood that stormwater would flow at the location. Table 4 summarizes the proposed stormwater sampling locations, types, and characteristics. The general sampling locations are depicted on Figure 5. Appendix A shows detailed characteristics of each sampling location.

At a minimum, four sampling locations will meet the objectives of this program. However, the City will sample five additional locations, Tor-S3, Tor-S6, Tor-S7, Tor-S8, and Tor-S9 as shown on Figure 4 because the results will support critical decisions including identifying sources originating outside of the City's boundaries or sources not under the direct control of the City. The sampling locations Tor-S6, Tor-S7, Tor-S8, and Tor-S9 are discharge points for Rolling Hills and Palos Verdes Estates.

The sampling locations are described below.

Tor-S1

This site is located 40 ft north and 80 ft east of the intersection of Plaza Del Amo and Western Avenue. The total upstream drainage area is approximately 63 acres. The drainage area is mainly residential and commercial land use. Residential and commercial land uses represent 36 percent and 33 percent, respectively, of the drainage area. This site is easily accessible and safe for conducting sampling during both dry and wet weather conditions. The storm sewer conveying stormwater to this site is a 36-inch reinforced concrete pipe. This site is one of the four sites that will provide information on the amount of pollutants leaving the City limits.

Sampling Site: TOR-S1

Table 4 Sampling Location Characteristics

Sampling Location Name	Description	Land Use	GPS Coordinates	Associated Upstream Storm Drain Name	Diameter (in) and Material
Tor-S1	Located 40 ft north and 80 ft east of the intersection of Plaza Del Amo and Western Avenue. .	Residential/ commercial	33° 49.3572’ 118° 18.5208’	City	36 RCP
Tor-S2	Approximately 50 ft west of 246th Place and Pennsylvania Avenue intersection.	Mixed	33°48.093’ 118° 19.5252’	City	33 RCP
Tor-S3	Effluent of Walteria Lake, approximately 100 ft east of Madison St. and Skypark Drive intersection.	Mixed	33°48.6312 118° 20.8674’	Walteria Lake	54
Tor-S4	Approximately 210 ft north and 85 ft east of 236th Street and Western Avenue intersection.	Mostly residential	33° 48.7056’ 118° 18.5196’	City	9’-2”Wx11’H RCB
Tor-S5	About 25 ft west of intersection of Bani Avenue and 250th Street (two pipes intersect from south and west).	Residential/ Airport	33° 47.8956’ 118° 19.6872’	City	8’-9”Wx9’-7”H RCB
Tor-S6	Approximately 600 ft east of Estates Lane and Crenshaw Boulevard.	Mostly residential	33° 47.1822’ 118° 20.43’	Rolling Hills Estates	36 RCP
Tor-S7	About 160 ft south and 280 ft east of Rolling Hills Road and Hawthorne Blvd. intersection. Will monitor dry weather flow originating from Rolling Hills Estates.	Mostly residential	33° 47.6826 118° 20.9232’	Rolling Hills Estates	10’x10’ RCB
Tor-S8	About 500 ft northwest of Paseo De Las Tortugas and Mesa St. intersection. Will monitor dry weather flow originating from Rolling Hills Estates.	Mostly residential	33° 48.0522’ 118° 21.4254’	Rolling Hills Estates	24 RCP
Tor-S9	About 830 ft east and 120 ft south of Paseo de las Tortugas and Vista Montana intersection. Will monitor dry weather flow originating from Palos Verdes Estates.	Mostly residential	33° 48.2742’ 118° 21.7776’	Palos Verdes Estates	42 RCP

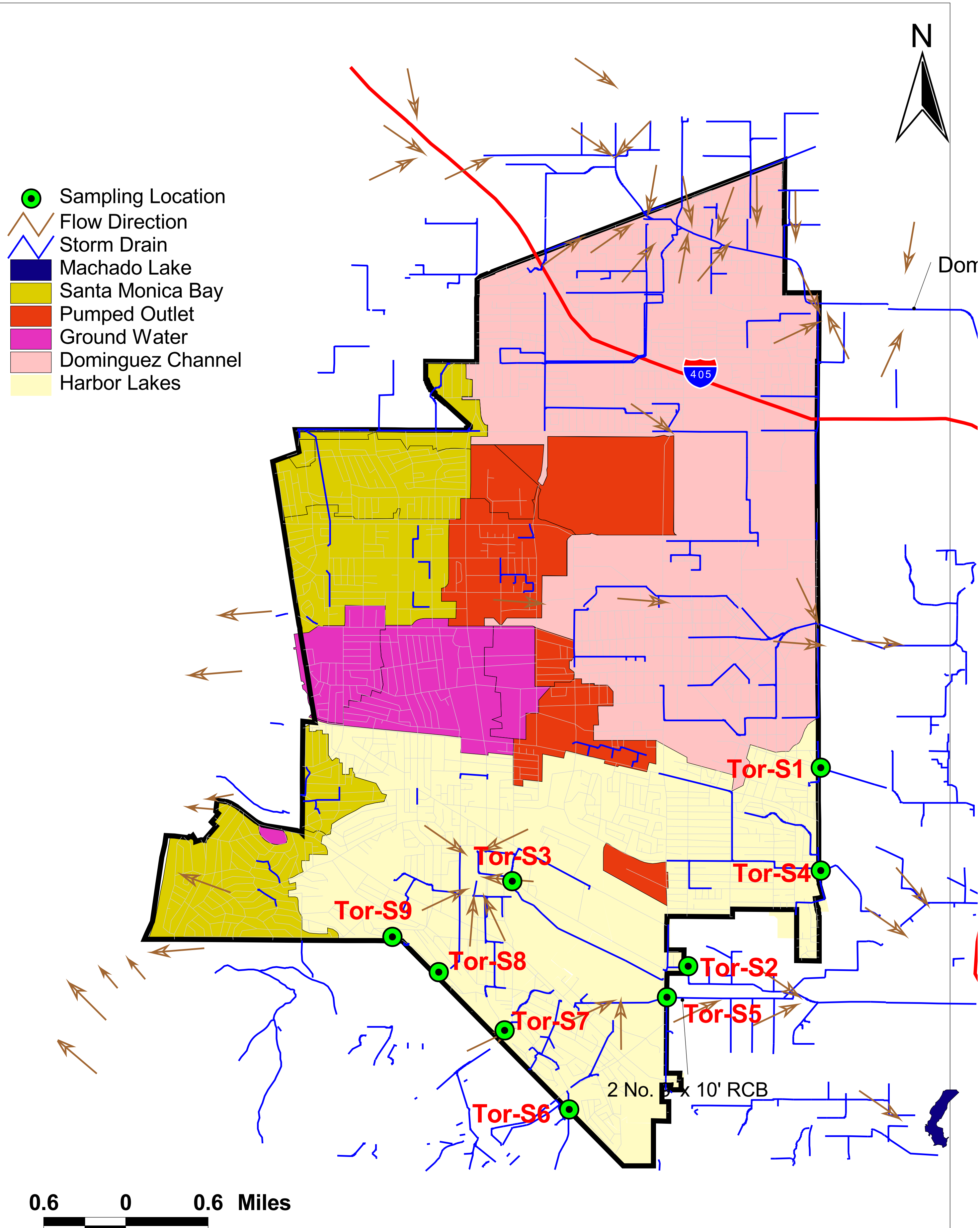


Figure 5 General Location Map of Sampling Locations

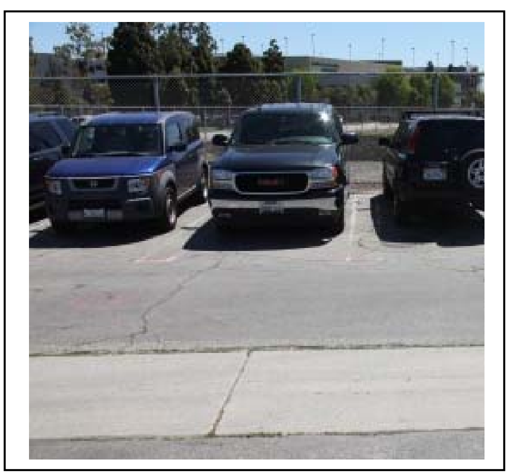
Tor-S2

Tor-S2 is approximately 50 ft west of the intersection of 246th Place and Pennsylvania Avenue. The total upstream drainage area is about 2,605 acres. The drainage area is a mixed land use, about 32 percent residential, 10 percent commercial and 11 percent industrial. The Torrance Airport accounts for 12 percent of the drainage area. Tor-S2 is easily accessible and safe for conducting sampling during both dry and wet weather conditions. Stormwater is conveyed to this site through an 8' x 7' reinforced concrete box. This site is one the four sites that will provide information to quantify the amount of pollutants leaving the City limits.

Sampling Site: TOR-S2

Tor-S3

This site, which is approximately 100 ft east of Madison St. and Skypark Drive intersection, will assist the City in characterizing discharges from Walteria Lake. The total upstream drainage area is approximately 2,285 acres. This site is upstream of Tor-S2. Land use is mixed with 37 percent residential, 10 percent commercial and 9 percent industrial. A 54-inch pipe conveys stormwater to this site. The site is easily accessible and safe for all weather sampling.



Sampling Site: TOR-S3

Tor-S4

Tor-S4 is approximately 210 ft north and 85 ft east of 236th Street and Western Avenue intersection. The total drainage area upstream of this sampling location is approximately 1,014 acres. Residential land use represents nearly 60 percent of the drainage area. Commercial and industrial land uses represent only 9 percent of the drainage area. The storm drain serving this site is a 9'-2" x 11' RCB. The site is safe for all weather sampling and it is easily accessible.

Sampling Site: TOR-S4

Tor-S5

This site is about 25 ft west of the intersection of Bani Avenue and 250th Street (two pipes intersect from south and west). This sampling site serves an upstream drainage area of approximately 661 acres. This site is mainly residential and airport land use; residential and airport land uses represent 43 and 24 percent of the drainage area, respectively. The storm drain discharging stormwater to this site is an 8'-9" x 9'-7' RCB. This site is easily accessible and safe for sampling activities.

Sampling Site: TOR-S5

Tor-S6

Tor-S6 is located at approximately 600 ft east of Estates Lane and Crenshaw Boulevard. This site will monitor flow entering the City's storm drain from Rolling Hills Estate. The sampling site is safe and easily accessible.

Sampling Site: TOR-S6

Tor-S7

This site is about 160 ft south and 280 ft east of Rolling Hills Road and Hawthorne Blvd. intersection. It will monitor dry weather flow originating from Rolling Hills Estates. The site is easily accessible and safe for sampling at all weather conditions.

Sampling Site: TOR-S7

Tor-S8

This site is located at about 500 ft northwest of Paseo De Las Tortugas and Mesa St. intersection. It will monitor dry weather flow originating from Rolling Hills Estates. The site is easily accessible and safe for sampling at all weather conditions.

Sampling Site: TOR-S8

Tor-S9

Tor-S9 is about 830 ft east and 120 ft south of Paseo de Las Tortugas and Vista Montana intersection. This site will monitor dry weather flow originating from Palos Verdes Estates. The site is accessible and safe for sampling activities.

Sampling Site: TOR-S9

3.2 Sample Collection Frequency

The City's sampling program consists of three major elements:

1. Monthly sampling during dry weather conditions for all sampling locations. Grab samples will be collected from each sampling location. Dry weather conditions must be preceded by at least 24 hours of no greater than trace precipitation or have an intensity of less than 0.1 inches of rain in a 24-hour period.

2. Samples will be collected from Tor-S3 during four discrete storm events and anytime time the LA County pumps stormwater from the Walteria Lake into the 54-inch storm drain. Pumping schedule will be obtained from LA County.

3. Continuous recording of stage or flow depth during dry weather periods for flow estimation will be collected from the proposed sample locations during dry weather flow conditions.

Regarding Tor-S3, one grab sample for each of the four storm events will be collected under the following conditions:

1. Sampling will occur during a storm event with at least 0.1 inch of precipitation (defined as a "measurable" event). Weather forecasts will be evaluated before deciding whether or not to sample a particular rain event. The monitoring manager will periodically establish a modem connection with each sampling unit to monitor rainfall, flow rates, and sampling activity. The monitoring manager will download stored data from the National Weather Service as needed.
2. Sampling will not occur at a frequency greater than once every 72 hours.
3. Sampling will not occur unless there has been at least 72 hours of continuous dry weather immediately preceding the "measurable" event.
4. Grab samples will be collected from this location during approximately the first 30 minutes to 1 hour of stormwater discharge (where possible).

The intention of the sample collection frequency and stormwater event requirements described above is to collect samples that are representative of runoff conditions from Tor-S3. No samples will be collected from the remaining eight sampling locations during storm events. The City's Pollutant Loading and Analysis Tool (PLAT) will be used to estimate nutrient loading for these sampling location during storm events.

3.3 Selection of Analytical Parameters

The City proposes to use a mass based WLA compliance option to evaluate TMDL compliance. Samples submitted for nutrients will be tested for ammonia-N (NH_3^+), ammonium, nitrite (NO_2), nitrate (NO_3), total Kjeldahl nitrogen (TKN), total phosphorus (TP), and phosphate (PO_4). Water samples submitted for conventional water parameters (general chemistry) will be tested for alkalinity, pH, chloride, total suspended solids (TSS), total solids, dissolved solids, turbidity, dissolved organic carbon (DOC), total organic carbon (TOC), and standard metals. The constituents to be sampled are listed in Table 5.

Table 5 Monitoring Constituents

Analyte	Method of Analysis	Detection Limits
NH_3^+	SM 4500-NH_3-H	0.02 mg/l
NO_3	SM 4500-NO_3-F	0.02 mg/l
NO_2	SM 4500-NO_3-F	0.01 mg/l
TKN	EPA 351.3	0.1 mg/l
TP	EPA 365.4	0.06 mg/l
PO_4	SM 4500-P-F	0.01 mg/l
TSS	EPA 160.2	0.5 mg/l
Turbidity	n/a	0.01 NTU

3.4 Continuous Flow Monitoring

Accurate assessment of flow is crucial to pollutant loads assessments and analysis. Continuous flow data will be collected as part of this sampling effort for all nine sampling locations. The primary benefit of these continuous monitoring sites is the ability to gauge the increase in flow due to a storm event and apply concentration data to calculate pollutant loading.

Global Water's FL16 Water Flow Logger will be used for flow data collection. The FL16 Water Flow Loggers will record over 81,000 depth, temperature, water flow and velocity readings in the drainage pipes. The specially engineered, non-fouling water level sensor works in depths as little as ½ inch and allows for deployment in manholes and other difficult to access areas without the need to enter the confined space.

FL16 Water Flow Recorder's user-friendly Windows-based software is tailored specifically for calculating water flows in partially filled sewer and drainage pipes using the Manning's Equation, with pull-down menus for selecting and entering the necessary information. The Water Flow Recorder software has a unique calibration feature which allows users to view calculated water velocity, compare this to actual measured data, and adjust the water flow parameters to calibrate for the water flow conditions of a specific application.

The flow measuring systems will be calibrated before data collection begins and that these will be re-calibrated monthly.

3.5 The Sampling Team

Grab samples from the nine sampling locations will be collected by a contract lab retained by the City. Pre-labeled sample bottles will be provided by the certified laboratory that will be conducting the analyses. The Sampling Team will be responsible for ensuring that all required equipment is ready for field operation. They are also responsible for performing the entire field sampling activities and most of the sampling preparation. Any member of the Sampling Team may recommend canceling sampling if the predicted conditions do not materialize or if health or safety of the team could be imperiled due to site conditions or extreme weather.

4.0 SAMPLE COLLECTION PROCEDURES

This section describes the sampling procedures, record keeping, sample handling, storage, and field quality control procedures that will be used during stormwater sampling.

4.1 Preparation for conducting the sampling

Several things will be done to prepare to conduct stormwater sampling. First, the laboratory to analyze the samples will be contacted. The following information will be sought from the lab:

- Type and size of bottles needed
- Procedures to filling the bottles
- Sample volume requirements
- Labels or additional forms required
- Explanation of the chain of custody form
- Sample preservation requirements and/or holding time restrictions
- Means of sample delivery to the lab
- Overnight delivery requirements
- Costs

Once a lab has been selected the sampling equipment (sampling bottles from a lab, sampling instruments, and personal safety equipment) will be made ready, as well as the field sheet to document the required information. Table 6 lists constituents and sample container requirements.

Field personnel will complete a field condition data sheet. The following items will be listed on the field sampling sheet and included in the stormwater discharge monitoring report:

- Person who conducted the sampling
- Date and time of discharge
- Length of storm event
- Time between sampled storm event and previous storm event (at least 72 hrs)
- Total rainfall during storm event
- Photo documentation

A field data sheet is attached as Appendix B.

4.1.1 Sampling Equipment

Monitoring equipment will be gathered ahead of time because opportunities to sample during rainfall events often come with little advanced notice. The following equipments will be required for the sampling efforts:

- Field forms
- Waterproof pens
- Permanent markers

- Powder-free nitrile gloves
- Clear glass jar for visual examinations
- Sample containers
- Sample preservatives
- Sample container labels
- COC forms
- COC seals
- Ice chests
- Ice
- Foul-weather gear
- Manhole sampler

Table 6 Monitoring Constituents and Sample Container Requirements

Analyte	Container	Volume	Preservation	Holding Time
NH_3^+	Plastic	50 ml	≤ 6°C H2SO4 PH < 2	28 days
NO_3	Plastic	50 ml	≤ 6°C, H2SO4 PH <2	48 hours
NO_2	Plastic	50 ml	≤ 6°C, H2SO4 PH <2	48 hours
TKN	Plastic	50 ml	≤ 6°C, H2SO4 PH <2	28 days
TP	Plastic	50 ml	≤ 6°C, H2SO4 PH <2	28 days
PO_4	Plastic	50 ml	≤ 6°C	48 hours
TSS	Plastic	200 ml	≤ 6°C	7 days

4.2 Sampling Method

Water samples will be collected from storm sewer manhole and outfall sites. All samples will be collected as individual grabs. Samples will be collected directly into sample containers or with a laboratory-supplied container attached to a pole with duct tape or other means. Sampling containers will be held with container openings facing upstream to prevent contamination during sampling. Field personnel will wear powder-free nitrile disposable gloves. Each sample will be given a field identification, tagged, and kept cool at 4 degrees C. Chain-of-custody (COC) procedures will be observed and samples delivered to the laboratory within the allowable holding times for each parameter.

It is assumed that sampling locations will have well-mixed conditions so that single grabs are representative of water quality. Field personnel will record the degree of turbulence or quiescence as well as the dimensions of the conveyance sampled and/or a description of water flowing in the conveyance. Field personnel will also record the date and time of sample collection and the flow rate.

Sampling containers for direct grabs (either by hand or with pole attached to laboratory supplied container) will be pre-cleaned by the laboratory. It will be made certain that if a sample is transferred (either for collection purposes or to form grab-composite samples), that only laboratory-supplied containers are permitted to come in contact with the sample.

4.3 Personal Safety

A Health and Safety Plan approved by the contract lab will be reviewed by the all field personnel before the sampling operations covered in this monitoring plan begin. Personal safety will be of primary concern while conducting all stormwater sampling related activities. All persons involved in the sampling operation will be made aware of the hazards associated with monitoring and should freely voice any concerns if potential hazards become apparent. The Occupational Safety and Health Administration (OSHA) provides regulations and guidance on occupational safety, many of which are directly applicable to the types of activities involved in stormwater monitoring. It is the direct responsibility of each person involved in the monitoring program to read the Health and Safety Plan and adhere to its requirements. The following list provides a few basic health and safety procedures that will help to create a safer sampling environment.

- Do not sample alone, a minimum of two-person field crews will be used for stormwater sampling.
- Do not enter a confined space without proper training, equipment, and surface support.
- Never remove or replace manhole covers with your bare hands or feet.
- Never leave an open manhole unattended.
- Do not start staging or sampling until traffic control has been established.

4.4 Clean Sampling Techniques

Clean sample collection techniques will be followed to minimize the potential for contamination of stormwater runoff samples. Care will be taken during all sampling operations to avoid contamination of the water samples by human, atmospheric, or other potential sources of contamination. The monitoring team should prevent contamination of any of the following items: composite bottles, lids, sample, tubing, and strainers.

4.5 Sample Packing and Shipping

Monitoring personnel will deliver the samples to the laboratory. Sample bottles will be placed in coolers or some other package that is rigid enough to provide protection of the samples and is insulated to keep samples cold. During packing, the sample from one monitoring location will not be separated into separate shipping containers unless bottles of one size need to be shipped together because of container size. If samples from a location are separated a copy of the field-sampling sheet pertaining to the bottles will be enclosed in each shipping container. Prior to shipping, all sample bottles will be recorded on the packing lists, which will include the shipping date and the method of transporting the samples. Samples will be delivered to the analytical laboratory within 4 hours of sampling to ensure the maximum holding time for bacteria of 6 hours is not exceeded.

4.6 Chain of Custody

After samples have been obtained and the collection procedures properly documented, a written record of the COC of each sample will be made. This record ensures that samples will not be tampered with or inadvertently compromised in any way, and it also tracks the requested analysis for the analytical laboratory. COC refers to the documented account of changes in possession that occur for samples.

The COC record tracks the sampling path from origin through laboratory analysis. Information necessary in the COC includes:

- Name of the persons collecting the sample(s).
- Date and time of sample collection.
- Location of sample collection.
- Names and signatures of all persons handling the samples in the field and in the laboratory.
- Laboratory analysis requested and control information (e.g., duplicate or spiked samples etc.) and any special instructions (e.g., time sensitive analyses).

To ensure that all necessary information is documented a COC form will accompany each sample or set of samples. COC forms will be printed on multipart carbonless paper so that all personnel handling the samples may obtain a copy. A COC record should accompany all sample shipments and the sample originator will retain a copy of the forms. When transferring custody of samples the transferee will sign and record the date and time of each transfer. Each person who takes custody will complete the appropriate portion of the chain of custody documentation. A sample COC form to be used for this field sampling is attached as Appendix C.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

5.1 Data Quality Objective

The quality assurance/quality control (QA/QC) program will be implemented to satisfy the data quality objectives of the monitoring program. The primary data quality objectives are to obtain defensible data of acceptable sensitivity and quality to:

- Evaluate the stormwater management program.
- Evaluate stormwater quality.
- Evaluate of BMP as corrective measure.

The analytical laboratory selected for this study will evaluate the accuracy of its sample extraction and/or analytical procedures using spiked samples, which may include matrix spikes (MS), laboratory control samples (LCS) and surrogate spikes. Acceptable spike recoveries must fall within statistically derived laboratory “control limits.” Precision is the agreement among a set a replicate measurements of the same parameter. The analytical laboratory will evaluate precision by performing matrix spike duplicate (MSD), laboratory control sample duplicate (LCSD) and duplicate stormwater sample analyses (typically performed for inorganic parameters only). The data quality objectives also include obtaining data that are comparable and representative of the water quality conditions at each monitoring location. Comparable data will be collected if comparable sampling, analysis, QA/QC and reporting procedures are implemented throughout the monitoring program. Representative samples will be collected by performing sampling activities compliant with the procedures described in this monitoring plan. Duplicate samples will be collected and the results will be used to evaluate representativeness. Comparability expresses the confidence with which one data set can be compared to another. Data are comparable if collection techniques, measurement procedures, methods, and reporting are equivalent for the samples within a sample set. Data quality assurance objectives are summarized in Table 7.

Table 7 Quality Assurance Objective

Analyte	Units	Precision	Accuracy	Reporting Limit	Completeness
NH_3^+	mg/l	±20%	±30%	0.10 mg/l	90%
NO_3	mg/l	±20%	±30%	0.1 mg/l	90%
NO_2	mg/l	±20%	±30%	0.1 mg/l	90%
TKN	mg/l	±20%	±30%	0.1 mg/l	90%
TP	mg/l	±20%	±30%	0.1 mg/l	90%
PO_4	mg/l	±20%	±30%	0.025 mg/l	90%
TSS	mg/l	±20%	±30%	1 mg/l	90%

5.1.1 Field Quality Control Samples

Field quality control samples will be collected at a 10% frequency in order to provide quality performance information for the sampling program. One in ten samples submitted for analysis will be one of three field QC sample types: field blank; field duplicate; and/or performance evaluation blank. Table 8 lists the quality performance goals that each of the three types of field QC sample types is intended to address.

Table 8 Field Quality Control Sample Types

Quality Performance Goal	Field Blank	Field Duplicate	Performance Evaluation Blank
Minimize false positive results	X		X
Sample bottles free of contamination	X		
No contamination introduced by sampling process	X		
Measurement error attributable to sample inhomogeneity		X	

5.2 Field Quality Assurance/Quality Control

This section summarizes the QA/QC procedures that will be implemented by field personnel to evaluate sample contamination, sampling precision, and matrix interference.

5.2.1 Equipment Blanks

After the intermediate sample container or scoop is cleaned, an equipment blank will be collected by pouring reagent-grade water into the apparatus. The water will be transferred into sample bottles and analyzed for the full analytical suite.

5.2.2 Field Duplicate Samples

Field duplicate samples will be collected to evaluate the precision and representativeness of the sample collection procedures as well as sample homogeneity. The duplicate sample will be collected using the specified manual grab sampling techniques. Twice the volume required for the analytical suite will be collected with each duplicate sample. For grab samples, intermediate sample containers will be used, and the volume collected will be apportioned equally between the intermediate containers. The water in each intermediate container will be poured into a discrete set of sample bottles. One set of bottles will be labeled with fictitious sample identification and submitted “blind” to the laboratory.

5.2.3 Matrix Spike Samples

MS and MSD analyses will be performed by the laboratory using project samples. Field crews will submit twice the required sample volume for the sample selected as the matrix spike sample. Field personnel will identify the MS/MSD sample on the COC form.

5.3 Laboratory Quality Control

This sub-section summarizes the QC procedures the laboratory will perform and report with the analytical data packages. These procedures are not inclusive of the QA/QC that is required for compliance with the analytical method.

5.3.1 Method Blanks

A method blank is prepared using reagent-grade water, and is extracted and analyzed with each sample batch (typically 20 samples extracted and/or analyzed on a given day). Method blank results are used to identify potential sources of sample contamination resulting from laboratory procedures. Target analytes should not be detected in the method blank above the practical quantitative limit.

5.3.2 Matrix Spike and Laboratory Control Samples

MS, MSDs, LCS, and LCSDs will be performed by the laboratory to evaluate the accuracy of the sample extraction and analysis procedures. MS/MSDs will also be performed to evaluate matrix interference. Matrix interference is the effect of the sample matrix on the analysis, which may partially or completely mask the response of the analytical instrumentation to the target analyte(s). Matrix interference may affect the accuracy of the extraction and/or analysis procedures to varying degrees, and may bias the sample results high or low. The

MS/MSD is prepared by adding known quantities of target analytes to a sample. The sample is then extracted and/or analyzed as a typical environmental sample, and the results are reported as percent recovery.

6.0 DATA MANAGEMENT AND REPORTING

The sampling results will be reported by the laboratory as hard copy and as electronic files. Hard copy data will be entered into an electronic format, and checked at least once by a different person. Electronic submittal of results will be discussed with the analytical laboratory in advance of delivery and its format arranged. A separate record will be generated for each sample analysis.

In addition, the key information such as station ID, sample date and time, name of sampler, name of constituent, all results, units, detection limits, methods used, name of the laboratory, and any field notes will be entered into the database. Additional information, such as compositing of multiple samples, or the use of grab will also be included.

When reporting the laboratory results for each stormwater sample the following information will be provided:

- Sample site.
- Sample date and time.
- Sample number (or identification).
- Sampling technician(s).
- Detection limit and reliability limit of analytical procedure(s).
- Sample results with clearly specified units.

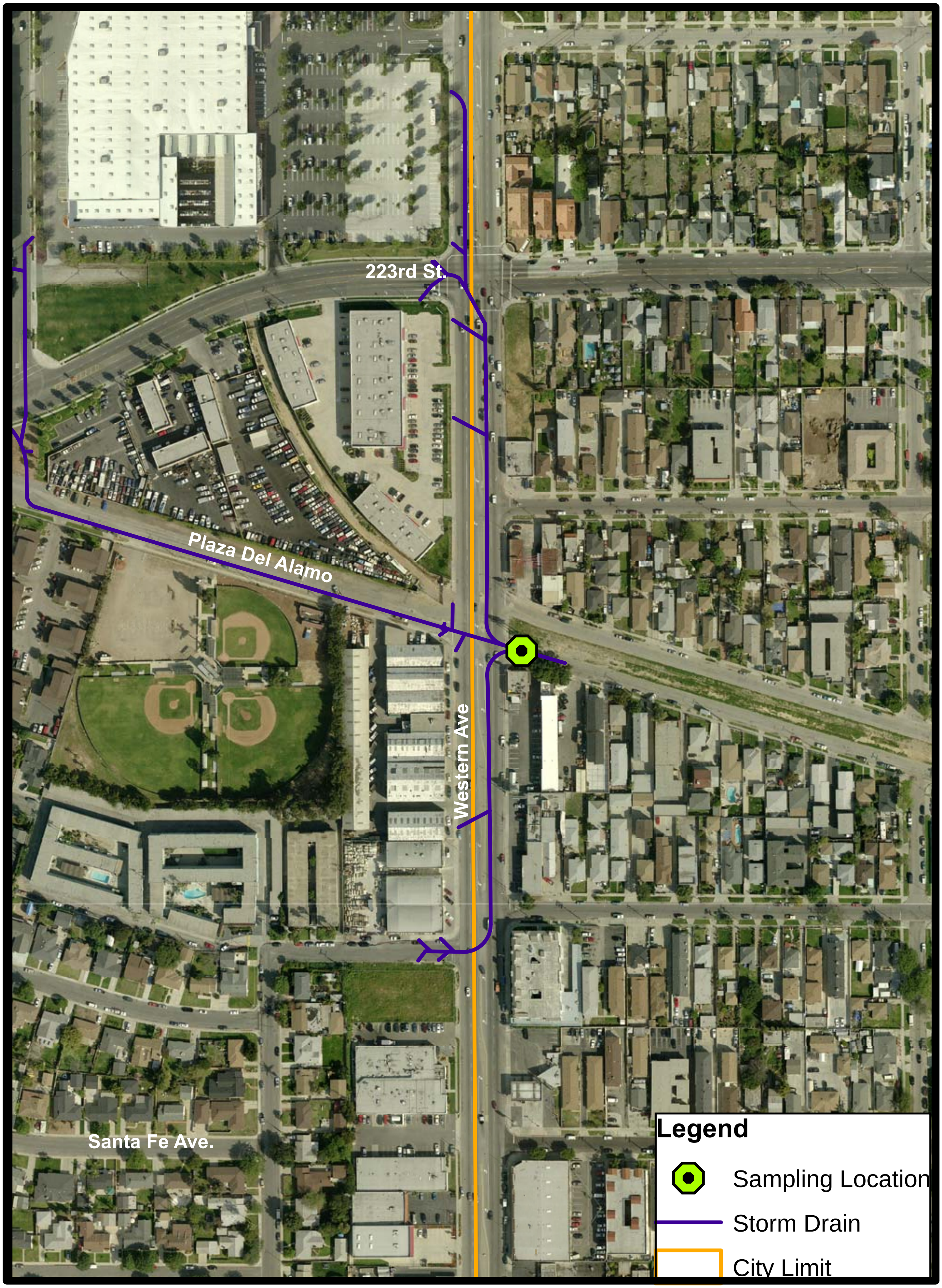
The results of all samples collected under this plan will be submitted to Regional Board in a monitoring report. Monitoring report will include:

- Introduction and background information
- Documentation and summary of each sampling event, including photos
- Electronic copies of field conditions data sheets
- Summary discussion of results
- Tabular results of all samples, including quality assurance quality control samples, in electronic format, (Excel)
- Evaluation data quality based on QAPP requirements.

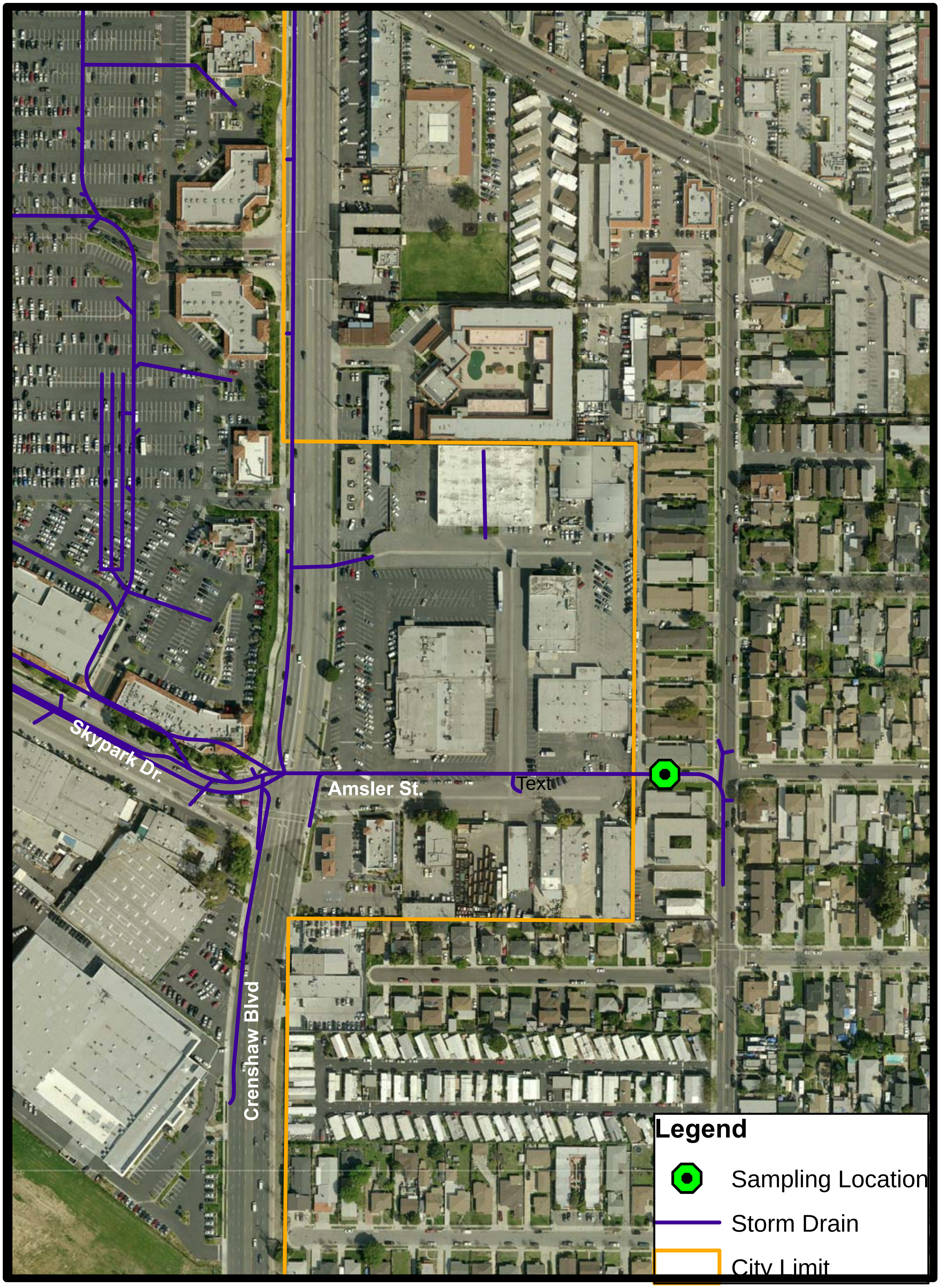
APPENDIX A

Detailed Maps of Sampling Locations

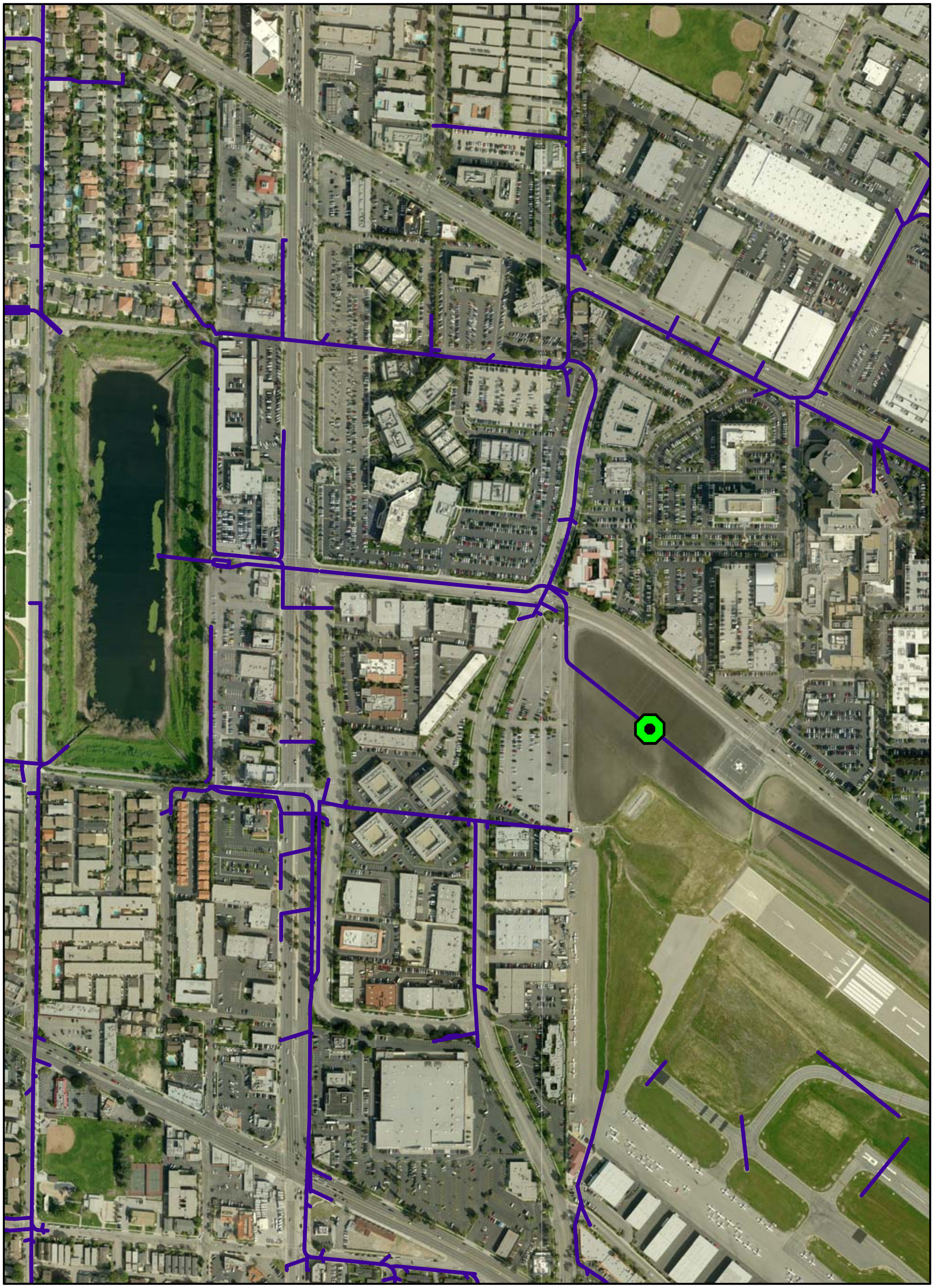
Stormwater Sampling Location - Tor-S1



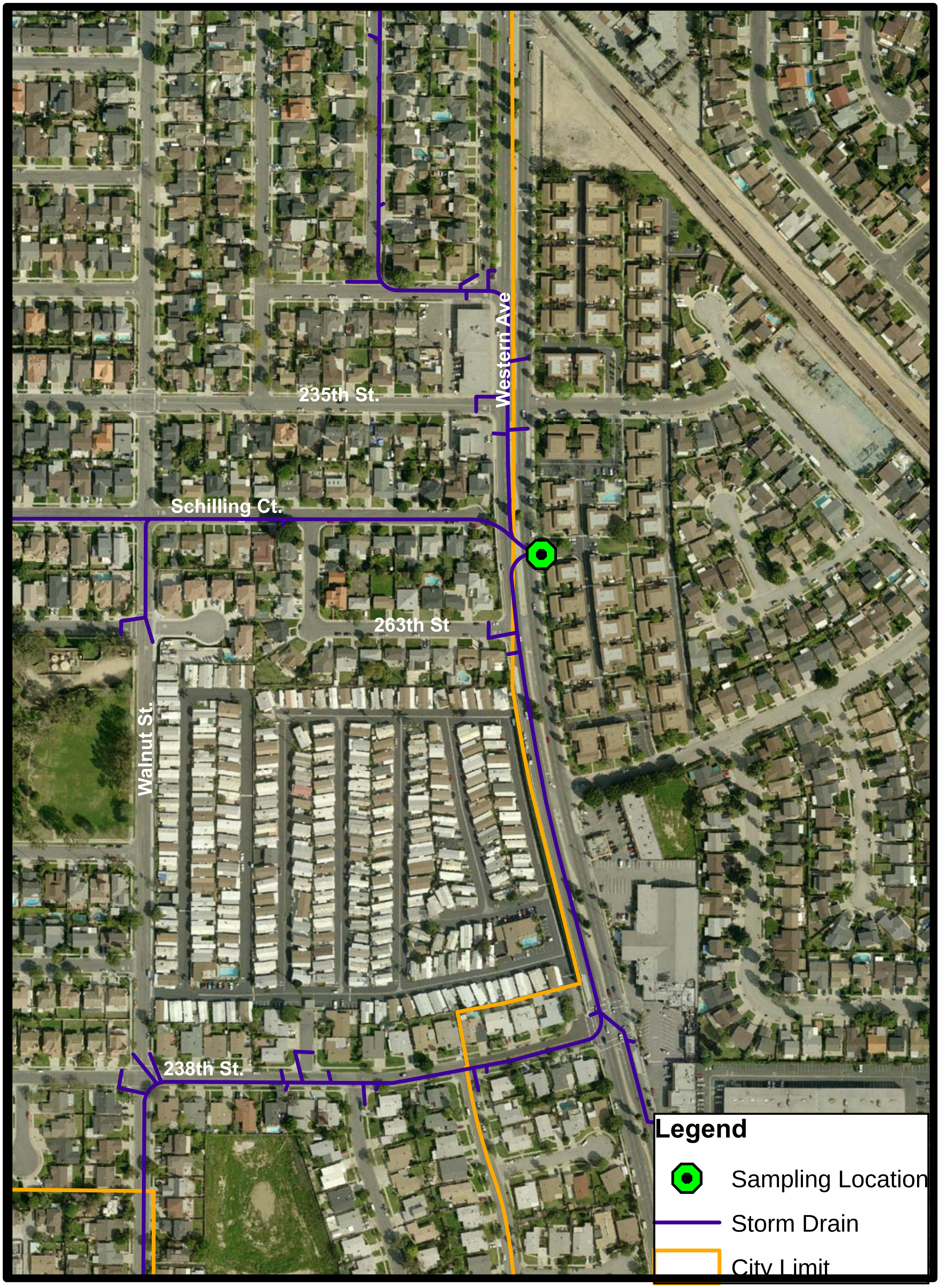
Stormwater Sampling Location - Tor-S2



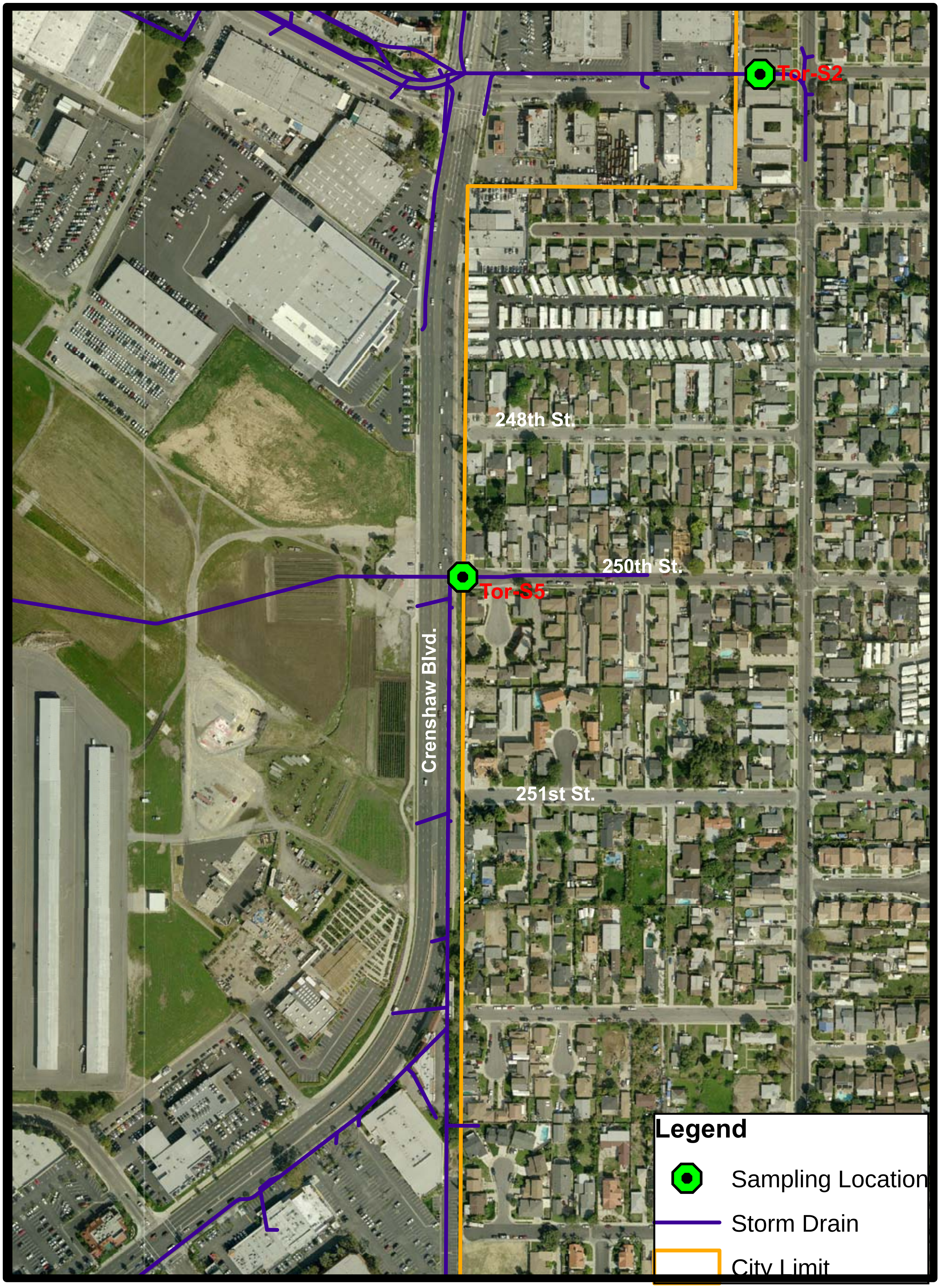
Stormwater Sampling Location: Tor-S3



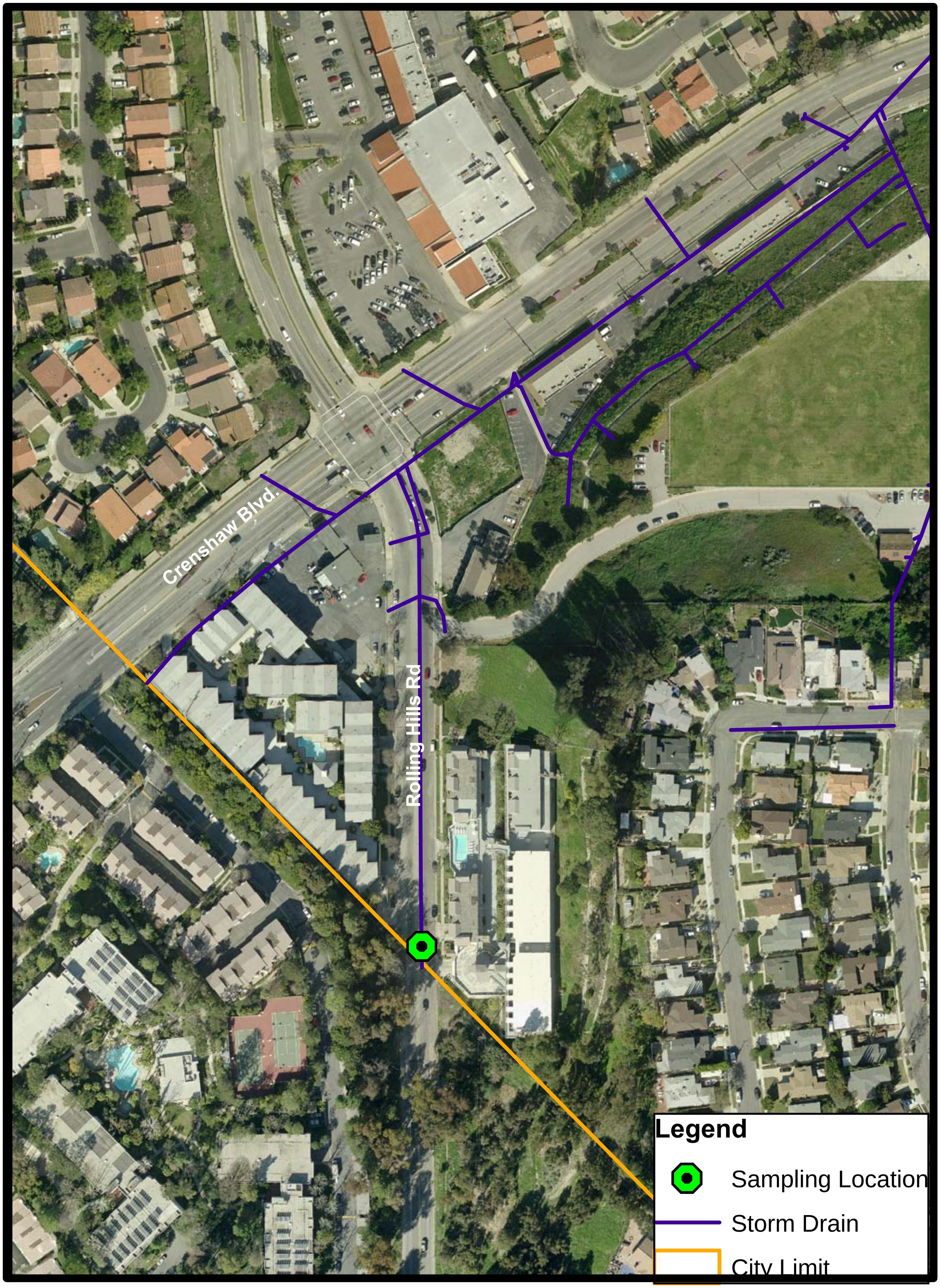
Stormwater Sampling Location - Tor-S4



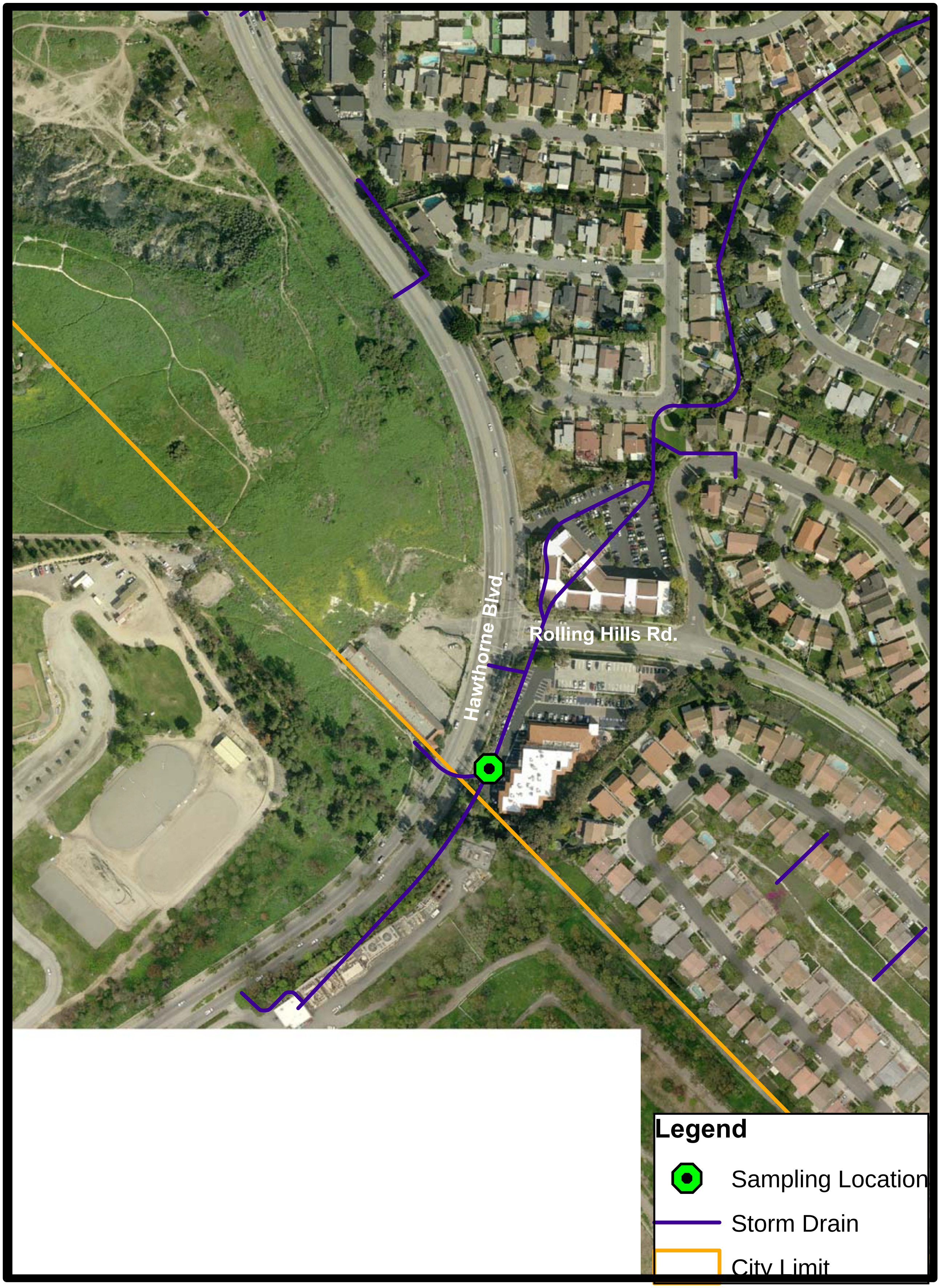
Stormwater Sampling Location - Tor-S5



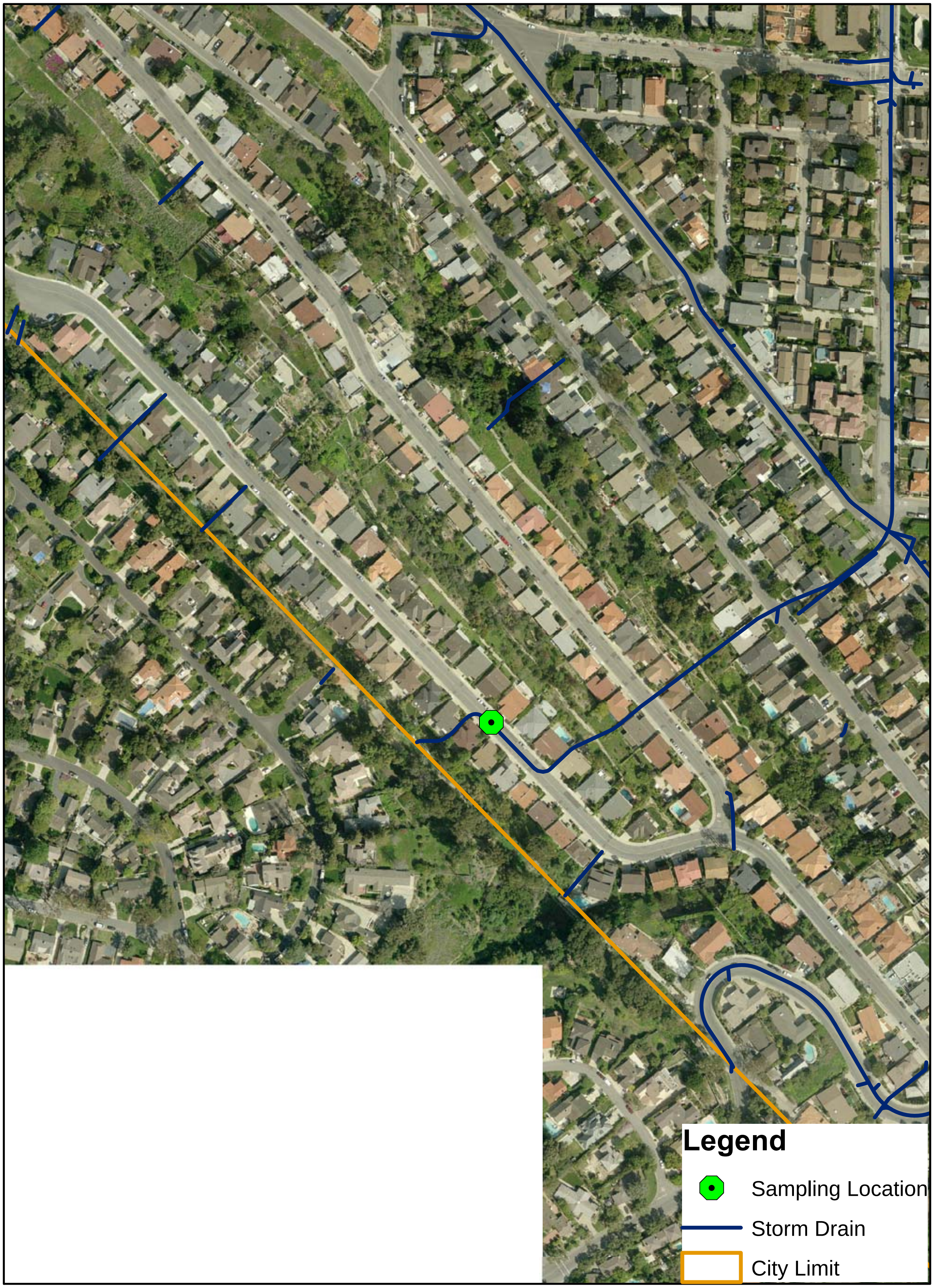
Stormwater Sampling Location - Tor-S6



Stormwater Sampling Location - Tor-S7



Stormwater Sampling Location - Tor-S8



Stormwater Sampling Location - Tor-S9

APPENDIX B

Field Data Sheet

Sampling Field Data

City of Torrance, California

Page______ of______

Area Letter & Name or Run #: ______________________

Run: Scheduled / Makeup / Reopen / Extra

Collected by:________________________________ **Initiated by:**________________________________

Date Collected:________________________________ **Date/time Initiated:**________________________________

Missed Station	Area Letter	Station #	Military Time	Boat /Land/ Clams/Mussels	Temp °C	Random / Adverse/ Extra	Condition or Adversity	Open or Closed	Wind	Salinity ‰	A-1 MPN/100 ml MF CFU/100ml EC MPN/100 ml	Comments

Remarks:

CHAIN OF CUSTODY:

Relinquished by:	Date, Time & Temp°C	# Samples	Relinquished to:	Received by:	Date, Time & Temp°C	# Samples
Circle Water Quality Lab: Boothbay or Lamoine			WQ Lab Staff Acceptance:			

Entered by: ________ **Date:**________

APPENDIX C

Chain of Custody

GENERAL CHAIN-OF-CUSTODY FORM

EVIDENCE/PROPERTY CUSTODY	Tracking Number Investigation ID Number	
NAME OF RECIPIENT FACILITY	LOCATION	
NAME, TITLE AND CONTACT NUMBER OF PERSON FROM WHOM RECEIVED	ADDRESS	
LOCATION FROM WHERE OBTAINED	REASON OBTAINED	DATE/TIME OBTAINED

ITEM NO	QUANTITY	DESCRIPTION OF ARTICLES (Include model, serial number, condition and unusual marks or scratches)

		CHAIN OF CUSTODY		
ITEM NO.	DATE	RELEASES BY	RECEIVED BY	PURPOSE OF CHANGE OF CUSTODY
		SIGNATURE	SIGNATURE	
		PRINTED NAME & CONTACT INFORMATION	PRINTED NAME & CONTACT INFORMATION	
		SIGNATURE	SIGNATURE	
		PRINTED NAME & CONTACT INFORMATION	PRINTED NAME & CONTACT INFORMATION	
		SIGNATURE	SIGNATURE	

Chain-of-Custody (continued)

ITEM NO.	DATE	RELEASES BY	RECEIVED BY	PURPOSE OF CHANGE OF CUSTODY
		SIGNATURE	SIGNATURE	
		PRINTED NAME & CONTACT INFORMATION	PRINTED NAME & CONTACT INFORMATION	
		SIGNATURE	SIGNATURE	
		PRINTED NAME & CONTACT INFORMATION	PRINTED NAME & CONTACT INFORMATION	
		SIGNATURE	SIGNATURE	
		PRINTED NAME & CONTACT INFORMATION	PRINTED NAME & CONTACT INFORMATION	
		SIGNATURE	SIGNATURE	
		PRINTED NAME & CONTACT INFORMATION	PRINTED NAME & CONTACT INFORMATION	
		SIGNATURE	SIGNATURE	

FINAL DISPOSAL ACTION		
RELEASE TO OWNER OR OTHER (NAME/ORGANIZATION)		
DESTROY		
OTHER (Specify)		
FINAL DISPOSAL AUTHORITY		
ON THIS DOCUMENT PERTAINING TO THE INQUIRY/INVESTIGATION INVOLVING;		
ITEM(S) (IS)(ARE) NO LONGER REQUIRED AS EVIDENCE AND MAY BE DOSPOSED AS INDICATED ABOVE. *If articles must be retained do not sign, but explain in separate correspondence.*		
(Typed or Printed Name & Organization)	(Signature)	(Date)
WITNESS TO DESTRUCTION EVIDENCE		
THE ARTICLES LISTED AT ITEM NUMBERS (WAS)(WERE) DESTROYED BY THE EVIDENCE CUSTODIAN IN MY PRESENCE, ON THE DATE INDICATED ABOVE		
(Typed or Printed Name & Organization)	(Signature)	(pole)

APPENDIX E

City of Torrance Stormwater Quality Master Plan

Due to the size of the City of Torrance Stormwater Quality Master Plan, this report has not been included herein. The entirety of this Plan can be provided upon request to the Beach Cities EWMP Group.

APPENDIX F

Los Angeles County Flood Control District Background Information

LACFCD Background Information

In 1915, the Los Angeles County Flood Control Act established the LACFCD and empowered it to manage flood risk and conserve stormwater for groundwater recharge. In coordination with the United States Army Corps of Engineers the LACFCD developed and constructed a comprehensive system that provides for the regulation and control of flood waters through the use of reservoirs and flood channels. The system also controls debris, collects surface storm water from streets, and replenishes groundwater with storm water and imported and recycled waters. The LACFCD covers the 2,753 square-mile portion of Los Angeles County south of the east-west projection of Avenue S, excluding Catalina Island. It is a special district governed by the County of Los Angeles Board of Supervisors, and its functions are carried out by the Los Angeles County Department of Public Works. The LACFCD service area is shown in **Figure-1.**

Unlike cities and counties, the LACFCD does not own or operate any municipal sanitary sewer systems, public streets, roads, or highways. The LACFCD operates and maintains storm drains and other appurtenant drainage infrastructure within its service area. The LACFCD has no planning, zoning, development permitting, or other land use authority within its service area. The permittees that have such land use authority are responsible under the Permit for inspecting and controlling pollutants from industrial and commercial facilities, development projects, and development construction sites. (Permit, Part II.E, p. 17.)

The MS4 Permit language clarifies the unique role of the LACFCD in storm water management programs: "[g]iven the LACFCD's limited land use authority, it is appropriate for the LACFCD to have a separate and uniquely-tailored storm water management program. Accordingly, the storm water management program minimum control measures imposed on the LACFCD in Part VI.D of this Order differ in some ways from the minimum control measures imposed on other Permittees. Namely, aside from its own properties and facilities, the LACFCD is not subject to the Industrial/Commercial Facilities Program, the Planning and Land Development Program, and the Development Construction Program. However, as a discharger of storm and non-storm water, the LACFCD remains subject to the Public Information and Participation Program and the Illicit Connections and Illicit Discharges Elimination Program. Further, as the owner and operator of certain properties, facilities and infrastructure, the LACFCD remains subject to requirements of a Public Agency Activities Program." (Permit, Part II.F**,** p. 18.)

Consistent with the role and responsibilities of the LACFCD under the Permit, the [E]WMPs and CIMPs reflect the opportunities that are available for the LACFCD to collaborate with permittees having land use authority over the subject watershed area. In some instances, the opportunities are minimal, however the LACFCD remains responsible for compliance with certain aspects of the MS4 permit as discussed above.

In some instances, in recognition of the increased efficiency of implementing certain programs regionally, the LACFCD has committed to responsibilities above and beyond its obligations under the 2012 Permit. For example, although under the 2012 Permit the Public Information and Participation Program is a responsibility of each Permittee, the LACFCD is committed to implementing certain regional elements of the PIPP on behalf of all Permittees at no cost to the Permittees. These regional elements include:

- Maintaining a countywide hotline (888-CLEAN-LA) and website (www.888cleanla.com) for public reporting and general stormwater management information at an estimated annual cost of $250,000. Each Permittee can utilize this hotline and website for public reporting within its jurisdiction.
- Broadcasting public service announcements and conducting regional advertising campaigns at an estimated annual cost of $750000.
- Facilitating the dissemination of public education and activity specific stormwater pollution prevention materials at an estimated annual cost of $100,000.
- Maintaining a stormwater website at an estimated annual cost of $10,000.

The LACFCD will implement these elements on behalf of all Permittees starting July 2015 and through the Permit term. With the LACFCD handling these elements regionally, Permittees can better focus on implementing local or watershed-specific programs, including student education and community events, to fully satisfy the PIPP requirements of the 2012 Permit.

Similarly, although water quality monitoring is a responsibility of each Permittee under the 2012 Permit, the LACFCD is committed to implement certain regional elements of the monitoring program. Specifically, the LACFCD will continue to conduct monitoring at the seven existing mass emissions stations required under the previous Permit. The LACFCD will also participate in the Southern California Stormwater Monitoring Coalition's Regional Bioassessment Program on behalf of all Permittees. By taking on these additional responsibilities, the LACFCD wishes to increase the efficiency and effectiveness of these programs.

Figure-1 Los Angeles County Flood Control District Service Area