



**Ballona Creek Watershed Management Group**  
**Enhanced Watershed Management Program**  
**(EWMP) Final Work Plan**



*Photo courtesy of: Jonathan Coffin, Inglewood, CA.*

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<b>Acronyms and Abbreviations</b>	
APLs	anticipated participation levels
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
BCWMA	Ballona Creek Watershed Management Area
BCWMG	Ballona Creek Watershed Management Group
BMPs	Best Management Practices
CASQA	California Stormwater Quality Association
CDFW	California Department of Fish and Wildlife
CIMP	Coordinated Integrated Monitoring Program
CO	Current Organics
CTR	California Toxics Rule
CWA	Clean Water Act
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
<i>e. coli</i>	<i>Escherichia coli</i>
EMCs	event mean concentrations
ESCP	Erosion and Sediment Control Plans
EWMP	Enhanced Watershed Management Program
GIS	geographic information system
GPCD	gross per capita water demand
gpd	gallons per day
HO	Historical Organics
I&I	infiltration and inflow
IBD	International BMP Database
IC/ID	Illicit Connection and Illicit Discharges
I/F	interim and/or final
IPM	Integrated Pest Management
IPs	Implementation Plans
IRWMP	Integrated Regional Watershed Management Plan
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LADWP	Los Angeles Department of Water and Power
LARWQCB	Regional Water Quality Control Board, Los Angeles
LID	Low Impact Development
LSPC	Loading Simulation Program C++

## Acronyms and Abbreviations

MCMs	minimum control measures
MS4	Municipal Separate Storm Sewer System
NA	not applicable
NOI	Notice of Intent
NOTF	North Outfall Treatment Facility
NPDES	National Pollutant Discharge Elimination System
NS	not sampled
NURP	National Urban Runoff Program
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
RAA	Reasonable Assurance Analysis
RWLs	Receiving Water Limitations
SCCWRP	Southern California Coastal Water Research Project
SCSC	Southern California Stormwater Committee
SMB	Santa Monica Bay
SUSMP	Standard Urban Stormwater Mitigation Plan
SUSTAIN	System for Urban Stormwater Treatment and Analysis INtegration
TBD	To be determined
TMDL	Total Maximum Daily Load
TMDLIP	Total Maximum Daily Load Implementation Plan
USEPA	US Environmental Protection Agency
WERF	Water Environment Research Federation
WLA	Wasteload Allocation
WMA	Watershed Management Area
WMG	Watershed Management Groups
WMMS	Watershed Management Modeling System
WQ	Water Quality
WQBELs	Water-Quality Based Effluent Limits

# Executive Summary

The Municipal Separate Storm Sewer System (MS4) Permit (Order No. R4-2012-0175; National Pollutant Discharge Elimination System [NPDES] Permit No. CAS004001) for Los Angeles County provides an innovative approach to Permit compliance through the development of Enhanced Watershed Management Programs (EWMPs). Through a collaborative approach, an EWMP for the Ballona Creek Watershed Management Area (WMA) is being developed by the Cities of Los Angeles (lead coordinating agency), Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood, the County of Los Angeles, and the Los Angeles County Flood Control District (LACFCD). In general, the EWMP for Ballona Creek will touch on multiple elements of municipal stormwater programs and communities, and emphasize multi-benefit stormwater projects that also provide environmental, aesthetic, recreational, water supply and/or other community enhancements.

This document is a Work Plan for the Ballona Creek EWMP, as required by the Permit. This Work Plan describes the work efforts and analyses that have been and will be conducted to develop an EWMP for the Ballona Creek WMA that addresses the Permit requirements. The planning area for the EWMP is approximately 123 square miles and Ballona Creek and Estuary are collectively 9.5 miles long. The Ballona Creek watershed has been subject to numerous water quality planning and compliance efforts and the EWMP will leverage those efforts and identify additional projects to address water quality issues in the watershed.

Major components of the Ballona Creek EWMP are described in this Work Plan along with details on some of the processes that will be used to develop the EWMP. Much of the process supports the ultimate selection of water quality control measures (often referred to as best management practices [BMPs]) that will be included in the EWMP to address water quality issues in the Ballona Creek WMA. The major components of the EWMP include the following:

- **Stakeholder Outreach:** a critical component of EWMP development is stakeholder outreach, and a series of workshops are being held by the Ballona Creek Watershed Management Group (WMG) to solicit input and ideas from other municipal agencies, environmental and community organizations, and state and federal agencies.
- **Water Quality Priorities:** the first step in the EWMP process follows the steps of the Permit to determine the Water Quality Priorities for the Ballona Creek WMA. Over 55,000 data records were compiled and analyzed to determine three categories of Water Quality Priorities based on whether total maximum daily loads (TMDLs) have been developed for waterbody-pollutants and whether exceedances have occurred in the last ten years.
- **EWMP Control Measures:** this Work Plan establishes a terminology for describing BMPs that can be used to improve water quality, presents “Fact Sheets” for different types of BMPs that could potentially be included in the EWMP, and a process for selecting regional BMPs that can capture the 85th percentile, 24-hour storm, which is an important compliance metric in the Permit.
- **Reasonable Assurance Analysis (RAA):** the approach for demonstrating that selected BMPs will address the Water Quality Priorities is described in this work plan. The RAA will use the Watershed Management Modeling System (WMMS) to select among the many potential options for BMPs and quantitatively demonstrate whether control measures will be effective.

This Work Plan charts the course forward for developing an EWMP for the Ballona Creek WMA that addresses Permit requirements while also providing multiple other benefits to communities. The EWMP offers an opportunity to develop a comprehensive stormwater management plan that optimizes the stormwater and financial resources under the stewardship of the Ballona Creek WMG members. The Ballona Creek WMG looks forward to engaging the Los Angeles Regional Water Quality Control Board (LARWQCB) and other interested parties on this Work Plan. The Ballona Creek WMG will follow up with interested parties, as needed, to discuss received comments and ideas.

# Section 1

## Introduction

The Ballona Creek Enhanced Watershed Management Program (EWMP) Work Plan describes the path that Municipal Separate Storm Sewer System (MS4) Permittees in the watershed will utilize to complete the Watershed Management Program process of the 2012 MS4 Permit (Order No. R4-2012-0175; National Pollutant Discharge Elimination System [NPDES] Permit No. CAS004001). The Work Plan describes the work efforts and analysis that will be conducted to develop an EWMP that addresses the Permit requirements as well as the stakeholder coordination process.

The MS4 Permittees completed a Notice of Intent (NOI) for the development of an EWMP and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed (Appendix 1.A). The NOI was approved by the Los Angeles Regional Water Quality Control Board (LARWQCB) on February 26, 2014. All MS4 Permittees in the Ballona Creek watershed have agreed to a collaborative approach in meeting the requirements of the new MS4 Permit.

### 1.1 Applicability of the Work Plan

The Ballona Creek EWMP Work Plan and the resulting EWMP apply to areas covered by the MS4 Permit within the Ballona Creek Watershed Management Area, shown in Figure 1-1. EWMP applies to the following MS4 Permittees, which comprise the Ballona Creek Watershed Management Group (BCWMG): Cities of Los Angeles (lead coordinating agency), Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood, Los Angeles County, and the Los Angeles County Flood Control District (LACFCD) (Figure 1-1).

The Work Plan identifies and outlines a path to developing control measures to address Water Body-Pollutant Combinations (WBPCs) that have been observed to exceed water quality objectives within the receiving waterbodies. Prioritization of water quality issues is an important element of the EWMP; thus the basis for the EWMP will be most influenced by high priority WBPCs and urban sources. The EWMP Work Plan will support the development program elements that are applicable to MS4 Permit requirements for receiving water limitations (RWLs) (Section V.A) and Total Maximum Daily Load (TMDL) provisions (Section VI.E) by setting a path for compliance. Also, the EWMP is applicable to Minimum Control Measures (MCMs) (Section VI.D), which may be modified to more effectively address the highest priority water quality conditions.

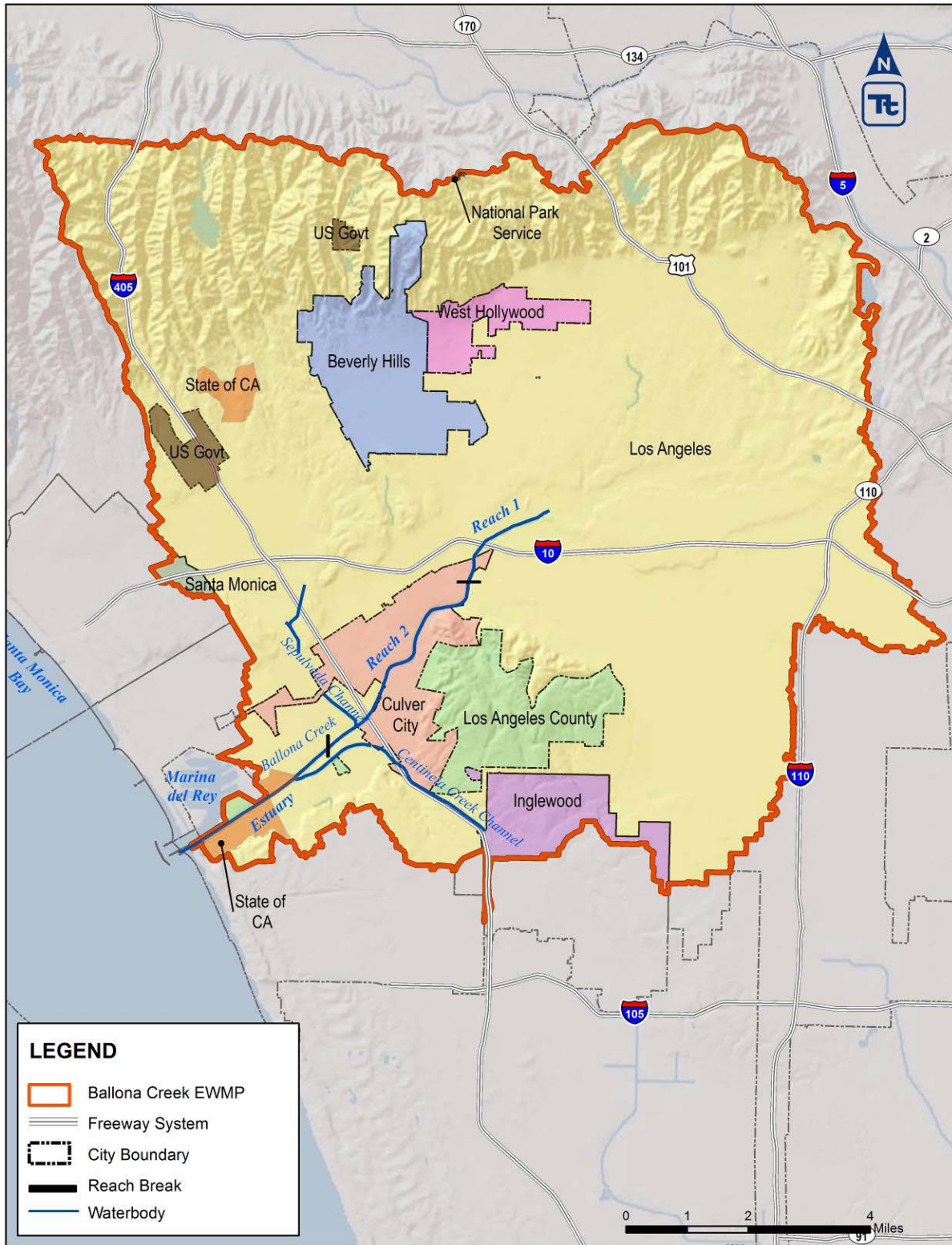


Figure 1-1 Ballona Creek Watershed Management Area

## 1.2 Geographical Scope and Characteristics

The Ballona Creek watershed is approximately 123 square miles and comprises the Cities of Beverly Hills and West Hollywood, and portions of the Cities of Los Angeles, Inglewood, Culver City, and Santa Monica as well as unincorporated areas of the County of Los Angeles. Additionally, the Los Angeles County Flood Control District (LACFCD) owns and operates drainage infrastructure within incorporated and unincorporated areas in the watershed (see Appendix 1.B for additional information about LACFCD). Figure 1-1 provides a map of the watershed boundaries and the delineations of the land areas of the MS4 permittees and other entities within the watershed.

Ballona Creek and Estuary are collectively approximately 9.5 miles long and divided in three hydrological units:

- Ballona Creek Reach 1 is approximately two miles long from Cochran Avenue to National Boulevard. This portion of the creek is channelized with vertical concrete walls.
- Ballona Creek Reach 2 is approximately four miles long between National Boulevard and Centinela Avenue where Ballona Estuary starts. Reach 2 is also channelized for the most part with trapezoidal walls.
- Ballona Estuary starts at Centinela Creek and continues to the Pacific Ocean. This portion is approximately 3.5 miles of soft bottom channel and experiences tidal inundation.

Major tributaries to Ballona Creek include Sepulveda Canyon Channel (Reach 2) and Centinela Creek (Ballona Estuary). Other water bodies in the watershed include the Del Rey Lagoon and the Ballona Wetlands, which are both connected to the Ballona Estuary through tide gates. Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylight where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed. The City of Los Angeles is the responsible agency for the Del Rey Lagoon whose tributary area is approximately 25 acres. The Ballona Wetlands encompass approximately 626 acres (541 acres of natural wetlands area and 85 acres of roads, parking lots, levees and other structures). Approximately 460 acres of the Ballona Wetlands are located within the Ballona Creek watershed and the remaining portion is located in the Marina Del Rey watershed. The Ballona Wetlands are owned and/or managed by the California Department of Fish and Wildlife (CDFW) and the State Land Commission. The relevant water bodies named in the Basin Plan are summarized in Table 1-1.

**Table 1-1 Waterbodies Associated with the Ballona Creek Watershed Management Area EWMP**

Mainstem	Associated Waterbodies
Ballona Creek Reach 1	
Ballona Creek Reach 2	Sepulveda Channel
Ballona Creek Estuary	Centinela Creek Channel
<b>Lagoons and Wetlands</b>	
Del Rey Lagoon	Ballona Creek Wetlands
<b>Downstream Waters</b>	
Santa Monica Bay	

The BCWMP agencies have agreed to collectively develop the EWMP. Therefore, the EWMP covers all of the areas owned by the MS4 permittees within the watershed. The total area of the Ballona Creek watershed is 123 square miles and a breakdown of areas by MS4 Permittee and other agencies is provided in Table 1-2. Collectively, the MS4 permittees in the Ballona Creek watershed have jurisdiction over 123 square miles or 96 percent of the total watershed area. The EWMP agencies have no jurisdiction over the land that is owned by the State of California (*i.e.*, CDFW, the State Lands Commission, and the California Department of Transportation [Caltrans]) or the US Government. All drainage infrastructures operated and maintained by the LACFCD within the Ballona Creek watershed management area (WMA) will be covered under this EWMP.

**Table 1-2 Ballona Creek Watershed Land Area Distribution and EWMP Participation**

Agency	EWMP Agency	Land Area (Acres)	% of EWMP Area
City of Los Angeles	Yes	65,272.89	83.21
County of Los Angeles	Yes	3,164.76	4.03
Los Angeles County Flood Control District	Yes	NA	
City of Beverly Hills	Yes	3,618.95	4.61
City of Culver City	Yes	3,125.00	3.98
City of Inglewood	Yes	1,907.72	2.43
City of West Hollywood	Yes	1,135.00	1.45
City of Santa Monica	Yes	217.31	0.28
<b>Area of EWMP Agencies</b>		<b>78,441.63</b>	<b>100</b>
Caltrans	No	1,651.33	
State of California	No	909.34	
US Government	No	674.49	
<b>Total Ballona Creek Watershed Area</b>		<b>81,676.79</b>	

## 1.3 Regulatory Framework

### 1.3.1 MS4 Permit

On November 8, 2012, the LARWQCB adopted Waste Discharge Requirements for MS4 discharges within the Coastal Watersheds of Los Angeles County, except those discharges originating from the City of Long Beach (Order No. R4-2012-0175; NPDES Permit No. CAS004001). The MS4 Permit, which became effective on December 28, 2012, applies to the LACFCD, Los Angeles County and 84 incorporated cities within Los Angeles County, including the cities in the Ballona Creek watershed. The 2012 MS4 Permit replaces the 2001 MS4 Permit.

The MS4 Permit contains effluent limitations, (RWLs), MCMs, TMDL provisions, and outlines the process for developing watershed management programs, including the EWMP. The MS4 Permit incorporates the TMDL Wasteload Allocations (WLAs) applicable to dry and wet weather as water quality based effluent limits (WQBELs) and/or RWLs. Section V.A of the Permit requires compliance with the WQBELs as outlined by the respective TMDLs.

### 1.3.2 Role of EWMP for Permit Implementation

The BCWMP has elected to collaborate on preparing an EWMP Plan that achieves the water quality objectives of the receiving waters. The BCWMP members intend to use the EWMP process to formulate a strategy that will remove or reduce pollutants from dry and wet weather urban runoff in a cost-effective manner, while providing multi-purpose projects that provide not only water quality improvement but other benefits to the region and the local communities.

Implementation Plans have been developed that include strategies for demonstrating compliance with the Ballona Creek and Ballona Estuary TMDLs. The Implementation Plans and strategies for compliance are based on a multi-pollutant approach that maximizes the retention and use of urban runoff as a resource for groundwater recharge and irrigation.

The EWMP offers an opportunity to develop a comprehensive stormwater management plan that optimizes the stormwater and financial resources under the stewardship of the BCWMP members. By leveraging past regional planning efforts and investments, including TMDL Implementation Plans, while exploring additional project opportunities to satisfy the predicted load reductions to meet the BCWMA's numeric goals, the EWMP will include projects that provide not only water quality improvement but also environmental, aesthetic, recreational, water supply and/or other community enhancements.

The EWMP will comprehensively evaluate opportunities, within the participating Permittees' collective jurisdictional area in a WMA, for 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. 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 (RAA) to demonstrate that applicable WQBELs and RWLs shall be achieved through implementation of other watershed control measures. Specific requirements of an EWMP are defined in the Permit (Section VI.C.1.g.) as follows:

- i. Be consistent with the provisions in Part VI.C.1.a.-f and VI.C.5-C.8;*
- ii. Incorporate applicable State agency input on priority setting and other key implementation issues;*
- iii. Provide for meeting water quality standards and other CWA obligations by utilizing provisions in the CWA and its implementing regulations, policies and guidance;*
- iv. Include multi-benefit regional projects to ensure that MS4 discharges achieve compliance with all final WQBELs set forth in Part VI.E. and do not cause or contribute to exceedances of receiving water limitations in Part V.A. by retaining through infiltration or capture and reuse the stormwater volume from the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects.;*
- v. In drainage areas where retention of the stormwater volume from the 85th percentile, 24-hour event is not technically feasible, include other watershed control measures to ensure that MS4 discharges achieve compliance with all interim and final WQBELs set forth in Part VI.E. with compliance deadlines occurring after approval of a EWMP and to ensure that MS4 discharges do not cause or contribute to exceedances of receiving water imitations in Part V.A.;*

- vi. *Maximize the effectiveness of funds through analysis of alternatives and the selection and sequencing of actions needed to address human health and water quality related challenges and non-compliance;*
- vii. *Incorporate effective innovative technologies, approaches and practices, including green infrastructure;*
- viii. *Ensure that existing requirements to comply with technology-based effluent limitations and core requirements (e.g., including elimination of non-stormwater discharges of pollutants through the MS4, and controls to reduce the discharge of pollutants in stormwater to the maximum extent practicable) are not delayed;*
- ix. *Ensure that a financial strategy is in place.*

### 1.3.3 Applicable TMDLs and Implementation Schedules

A TMDL represents an amount of pollution that can be released by anthropogenic and natural sources in a watershed into a specific water body without causing a decline in water quality and a concomitant impairment of beneficial uses. The Federal Clean Water Act (CWA) requires the development of water quality standards that identify beneficial uses and criteria to protect beneficial uses for each water body found within its region. Beneficial uses include swimming, fishing, drinking water, navigability, and wildlife habitats and reproduction. Table 1-3 presents the designated beneficial uses in the Ballona Creek watershed as presented in the Water Quality Control Plan, Los Angeles Region (Basin Plan). The LARWQCB carries out its CWA responsibilities through the state's Porter-Cologne Water Quality Control Act and establishes water quality objectives designed to protect beneficial uses contained in the Basin Plan.

Section 303(d) of the CWA requires states to prepare a list of water bodies that do not meet water quality standards and establish for each of these water bodies a TMDL which will ensure attainment of water quality standards.

The TMDL is assigned to non-point (*e.g.*, areal deposition or releases) and point sources (*e.g.*, MS4 Permittees) as load allocations and wasteload allocations, respectively. TMDLs are determined based on the need to protect a narrative or numerical target, which is needed to protect the beneficial use of the receiving waterbody. A narrative target is used in the existing trash TMDL, which states that no trash can enter the Santa Monica Bay. Conversely, a numerical target is set for concentrations of specific water quality constituents including toxics, bacteria, and metals TMDLs. Table 1-4 presents TMDLs developed specifically for the Ballona Creek watershed and TMDLs that apply to the Ballona Creek watershed as a subwatershed of the Santa Monica Bay Watershed Management Area. Table 1-4 includes recent amendments to bacteria, toxics, and metals TMDLs in the Watershed. Table 1-5 presents interim and final compliance deadlines for the relevant TMDLs. Table 1-6 notes where the Permit assigns WQBELs, RWLs, or in the case of U.S. Environmental Protection Agency (USEPA) TMDLs and WLAs, to Permittees within the BCWMG. Table 1-4 through Table 1-6 do not include the Santa Monica Bay Beaches Bacteria TMDLs because the WLAs for these TMDLs for the receiving waters in the Ballona Creek watershed are established in the Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL.

**Table 1-3 Ballona Creek Watershed Designated Beneficial Uses as Presented in the Los Angeles Region Basin Plan**

Water Body	REC1	LREC-1	REC2	HFS	MUN	NAV	COMM	WARM	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET <sup>b</sup>
Ballona Creek Estuary (ends at Centinela Creek) <sup>c,w</sup>	E		E			E	E		E	E	E	E <sup>e</sup>	E <sup>f</sup>	E <sup>f</sup>	E	
Ballona Lagoon <sup>c</sup>	E		E			E	E		E	E	E	E <sup>e</sup>	E <sup>f</sup>	E <sup>f</sup>	E	E
Ballona Wetlands <sup>c</sup>	E		E						E		E	E <sup>e</sup>	E <sup>f</sup>	E <sup>f</sup>		E
Del Rey Lagoon <sup>c</sup>	E		E			E	E		E	E	E	E <sup>e</sup>	E <sup>f</sup>	E <sup>f</sup>		E
Ballona Creek Reach 2 (Estuary to National Blvd.)	P <sup>s,au</sup>	E	E	Y <sup>av</sup>	P*			P			P					
Ballona Creek Reach 1 (Above National Blvd.)	P <sup>s,au</sup>		E	Y <sup>av</sup>	P*			P			E					

E: Existing beneficial use  
 P: Potential beneficial use  
 b: Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory action would require a detailed analysis of the area.  
 c: Coastal waterbodies which are also listed in Coastal Features Table (2-3) or in Wetlands Table (2-4) of the Basin Plan. Ballona Lagoon, while listed in the Basin Plan as part of the Ballona Creek watershed, is actually in the Marina del Rey watershed. In order to be consistent with the Basin Plan, Ballona Lagoon is shown in this table, but recognize that it will be addressed in the Marina del Rey EWMP.  
 e: One or more rare species utilizes all ocean, bays, estuaries, and coastal wetlands for foraging and/or nesting.  
 f: Aquatic organisms utilize all bays, estuaries, lagoons, and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs.  
 s: Access prohibited by Los Angeles County Department of Public Works.  
 w: These areas are engineered channels. All references to Tidal Prisms in LARWQCB documents are functionally equivalent to estuaries.  
 \* Asterisked MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date (See pages 2-3, 4 for more details).  
 au: The REC-1 use designation does not apply to recreational activities associated with the swimmable goal as expressed in the Federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use in the Basin Plan, or the associated bacteriological objectives set to protect those activities. However, water quality objectives set to protect other REC-1 uses associated with the fishable goal as expressed in the Federal Clean Water Act section 1010(a)(2) shall remain in effect for waters where the (au) footnote appears.  
 av: The High Flow Suspension only applies to water contact recreational activities associated with the swimmable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use, noncontact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use and (2) other REC-2 uses (e.g., uses involving the aesthetic aspects of water) shall remain in effect at all times for waters where the (av) footnote appears.

**Table 1-4 TMDLs Applicable to the Ballona Creek Watershed**

TMDL	LARWQCB Resolution Number(s)	Effective Date and/or EPA Approval Date
Ballona Creek Trash (BC Trash)	2004-023	08/11/2005
Ballona Creek Estuary Toxic Pollutants (BC Toxics TMDL)	2005-008	01/11/2006
	2013-010	Not Yet Effective
Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria (BC Bacteria TMDL)	2006-011	04/27/2007
	2012-008	Not Yet Effective
Ballona Creek Metals (BC Metals TMDL)	2007-015	10/29/2008
	2013-010	Not Yet Effective
Santa Monica Bay Nearshore and Offshore Debris (Santa Monica Bay [SMB] Trash TMDL)	2010-010	03/20/2012
Santa Monica Bay DDTs and PCBs (SMB Toxics)	NA (USEPA TMDL)	03/26/2012
Ballona Creek Wetlands TMDL for Sediment and Invasive Exotic Vegetation (Wetlands TMDL)		03/26/2012

The numeric WQBELs and RWLs and the WLAs for the USEPA TMDLs listed in Table 1-5 and Table 1-6 can be found in Attachment M of the Permit. The Permit presents alternative WQBELs and RWLs for the BC Bacteria TMDL, which will become effective upon the effective date of the TMDL amendment (*i.e.*, after USEPA approval of the amendment). The BC Toxics TMDL and BC Metals TMDL were amended on December 5, 2013 by the LARWQCB. Revised WQBELs must be incorporated in the Permit by the LARWQCB at some point after the effective date of the TMDL amendment. However, for the purposes of developing the EWMP, the EWMP Work Plan will consider WQBELs based on both the current and amended TMDLs.

The LARWQCB adopted TMDLs presented above required responsible parties to submit a Total Maximum Daily Load Implementation Plan (TMDLIP) to describe how they would achieve compliance with the WLAs. The cities of Los Angeles Culver, Beverly Hills, Inglewood, West Hollywood, Santa Monica, and Caltrans submitted TMDLIPs to address each of the impairments contained within these TMDLs. Additionally, the County of Los Angeles and LACFCD submitted an integrated TMDLIP to address the impairments. Once approved, the EWMP for Ballona Creek will supersede individual TMDLIPs.

## 1.4 EWMP Development

The goal of the BCWMP is to develop a watershed-wide EWMP that will, once implemented, remove or reduce pollutants from dry and wet weather urban runoff in a cost-effective manner. The RAA demonstrations show that the projects identified in the EWMP will meet the requirements of the MS4 Permit.

### 1.4.1 EWMP Development Process

Figure 1-2 presents a flowchart of the EWMP development process that make up the Work Plan. The first step is to develop water quality priorities. To achieve the watershed water quality goals, the EWMP must be based on a comprehensive assessment of water quality priorities to develop a strategy that systematically addresses pollutant reduction in accordance with established TMDL compliance

schedules while also addressing additional WBPCs identified during the Work Plan development as described in Section 2.

Improvements to water quality will be achieved through implementation of control measures, which consist of structural and non-structural (institutional) Best Management Practices (BMPs). Step 2 involves identifying the existing BMPs to establish an understanding of the current status of stormwater programs implemented by the various BCWMP agencies. Planned BMPs as well as additional, potential BMPs or BMP improvements are also identified in this step and serve as the “tool kit” for achieving the water quality goals. Input from stakeholders will be solicited, as outlined in Section 5.1.

Combinations of existing, planned and selected potential BMPs are then evaluated by an RAA using a watershed model to provide an assessment of the ability of selected BMP scenarios to meet the water quality goals in the watershed (Step 3). A preferred BMP implementation scenario becomes the basis for the EWMP Plan (Step 4).

**Table 1-5 Interim and Final TMDL Compliance Milestones Applicable to the Ballona Creek Watershed**

TMDL	Water-bodies	Constituents	Compliance Goal	Weather Condition	Compliance Dates and Compliance Milestones (Bolded numbers indicated milestone deadlines within the current Permit term) <sup>1</sup>												
					2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2025		
BC Trash	All Water-bodies	Trash	% Reduction	All	9/30	9/30	9/30	9/30									
					80%	90%	96.7%	100%									
Santa Monica Bay Trash	Santa Monica Bay	Trash	% Reduction	All					3/20	3/20	3/20	3/20	3/20	3/20	3/20	3/20	3/20
									20%	40%	60%	80%	100%				
BC Toxics	Estuary	Sediment: Copper, Lead, Zinc, Silver, DDT, Chlordane, PCBs	% of MS4 Area Meets WQBELS	All		1/11		1/11									1/11
						25%		50%		75%					100%		
Amended BC Toxics	Estuary	Sediment: Copper, Lead, Zinc, Silver, DDT, Chlordane	% of MS4 Area Meets WQBELS or Reduction in Loading	All		1/11			1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11
						25%			50%	75%					100%		
BC Metals	Reach 1, 2, Sepulveda Canyon	Copper, Lead, Zinc, Selenium	% of MS4 Area Meets WQBELS	Dry		1/11			1/11								
						50%	75%		100%								
Amended BC Metals	Reach 1, 2, Sepulveda Canyon	Copper, Lead, Zinc	% of MS4 Area Meets WQBELS or Reduction in Loading	Wet		25%			50%								
						1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11	1/11
BC Bacteria	Estuary	Total Coliform, Fecal Coliform, Enterococcus	% of MS4 Area Meets WQBELS	Dry		4/27											7/15
						100%											



**Table 1-6 Applicability of WQBELs, RWLs, and/or WLAs Associated with TMDLs as Identified in the Permit<sup>1</sup>**

TMDL	Constituent	BC Estuary	BC Wetlands	BC Reach 1	BC Reach 2	Centinela Creek	Sepulveda Canyon Channel	Benedict Canyon <sup>2</sup>	Santa Monica Bay
BC Trash TMDL and SMB Trash TMDL	Trash	E	--	E	E	E	E	--	E
	Cadmium (sediment)	E	--	--	--	--	--	--	--
	Copper (sediment)	E	--	--	--	--	--	--	--
	Lead (sediment)	E	--	--	--	--	--	--	--
	Zinc (sediment)	E	--	--	--	--	--	--	--
BC Estuary Toxics TMDL	Silver (sediment)	E	--	--	--	--	--	--	--
	Polycyclic aromatic hydrocarbons (PAHs) (sediment) <sup>3</sup>	E	--	--	--	--	--	--	--
	Chlordane (sediment)	E	--	--	--	--	--	--	--
	DDT (sediment)	E	--	--	--	--	--	--	--
	PCBs (sediment)	E	--	--	--	--	--	--	--
Santa Monica Bay DDTs and PCBs TMDL	DDT (sediment)	--	--	--	--	--	--	--	WLA
	PCBs (sediment)	--	--	--	--	--	--	--	WLA
	Total Coliform	E/R	--	--	--	--	--	--	--
	Fecal Coliform	E/R	--	--	--	--	--	--	--
	Enterococcus	E/R	--	--	--	--	--	--	--
BC Metals TMDL	<i>E. coli</i>	--	--	E/R	E/R	E/R	E/R	E/R	--
	Copper	--	--	E	E	--	E	--	--
	Lead	--	--	E	E	--	E	--	--
	Zinc	--	--	E	E	--	E	--	--
	Selenium <sup>4</sup>	--	--	E	E	--	E	--	--
BC Wetlands Sediment and Invasive Exotic Vegetation TMDL	Sediment	--	WLA	--	--	--	--	--	--

<sup>1</sup>Unless explicitly stated as sediment, constituents are associated with the water column.

<sup>2</sup>Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylights where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed.

<sup>3</sup>The BC Toxics and Metals TMDLs were amended on December 5, 2013 and WLAs associated with these constituents were removed. Associated WQBELs would be expected to be removed when the Permit is updated to incorporate these two TMDLs once they become effective.

<sup>4</sup>Effluent limit established based on a TMDL.

R. RWL established based on a TMDL.

WLA. Wasteload Allocation assigned in a USEPA TMDL, but not included as effluent or RWLs.

As EWMP projects are implemented over time (Step 5), monitoring data are collected (Step 6) and used in a feedback loop to reassess and refine the compliance scenario established in the EWMP (Step 7). As part of an adaptive management process, modifications to the EWMP Plan will be reflected in updates over two-year cycles.

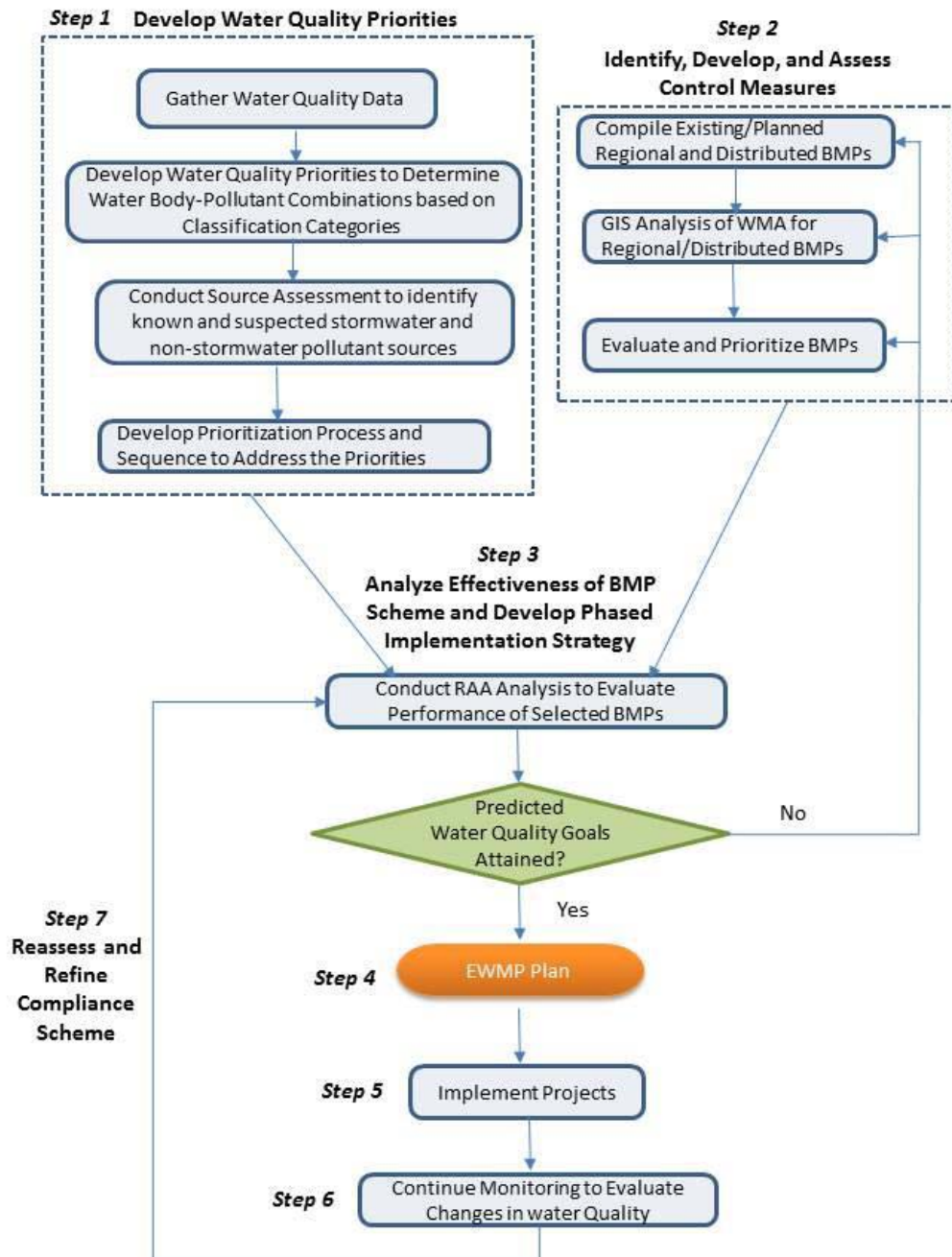


Figure 1-2 EWMP Development Process

### 1.4.2 Watershed Management Group and Stakeholder Process

The BCWMP, comprised of the jurisdictions identified in Section 1.1, has jointly and cooperatively agreed to execute the Work Plan contained herein with the goal of producing an EWMP Plan in accordance with the Permit requirements with stakeholder support and input. To achieve this objective, monthly meetings of the BCWMP have been held since the project's inception and will continue throughout the EWMP development process. In addition, a series of workshops are envisioned that will bring together other interested parties within the watershed to provide input and insight into the approach and findings of the Work Plan, particularly with respect to identifying potential multi-benefit regional projects. The Stakeholder Process is further described in Section 5.

## 1.5 EWMP Work Plan Overview

The Final EWMP Work Plan is presented in the following five sections:

**Section 1 – Introduction:** Provides the geographical scope, regulatory basis, development process and goals of the EWMP.

**Section 2 – Water Quality Priorities:** Presents the water quality characterization for the watershed, identifies WBPCs, and summarizes the source assessments conducted to date.

**Section 3 – Watershed Control Measures:** Provides descriptions of the suite of existing and potential structural and institutional pollution control measures that constitute the “tool box” for addressing the water quality priorities identified in Section 2. Most significantly, the process for identifying regional projects that constitute the defining characteristic of the EWMP is described.

**Section 4 – Reasonable Assurance Analysis Approach:** Provides a description of the modeling approach and RAA approach to demonstrate the projects identified in the EWMP will achieve the permit requirements.

**Section 5 – EWMP Development:** Provides a description of the EWMP framework, stakeholder engagement process and EWMP development schedule. It also includes a section on how the LARWCB and interested party comments on this work plan and the EWMP will be addressed.

**Section 6 - References**

## Section 2

# Water Quality Priorities

The identification of water quality priorities is an important first step in the EWMP process. The water quality priorities provide the basis for prioritizing implementation and monitoring activities within the EWMP and CIMP and selection and scheduling of BMPs in the RAA. The identification of water quality priorities is required in Section VI.C.5.a of the Permit as part of the development of an EWMP. The Permit defines three categories of WBPCs to support the development of priorities (Table 2-1). The Permit establishes a four-step process that leads to prioritization and sequencing of the water quality issues within each watershed, including:

- **Step 1:** Water quality characterization (VI.C.5.a.i, pg. 58) based on available monitoring data, TMDLs, 303(d) lists, stormwater annual reports, *etc.*,
- **Step 2:** Water body-pollutant classification (VI.C.5.a.ii, pg. 59), to identify water body-pollutant combinations that fall into three Permit defined categories,
- **Step 3:** Source assessment (VI.C.5.a.iii, pg. 59) for the water body-pollutant combinations in the three categories, and
- **Step 4:** Prioritization of the water body-pollutant combinations (VI.C.5.a.iv, pg. 60).

**Table 2-1 Water Body-Pollutant Classification Categories (Permit Section IV.C.5.a.ii)**

Category	Water Body-Pollutant Combinations (WBPCs)
1 Highest Priority	WBPCs for which TMDL Water Quality-Based Effluent Limits (WQBELs) and/or RWLs are established in Part VI.E and Attachment M of the MS4 Permit.
2 High Priority	WBPCs for which data indicate water quality impairment in the receiving water according to the State's Listing Policy, regardless of whether the pollutant is currently on the 303(d) List and for which the MS4 discharges may be causing or contributing.
3 Medium Priority	WBPCs for which there are insufficient data to indicate impairment in the receiving water according to the State's Listing Policy, but which exceed applicable RWLs contained in the MS4 Permit and for which MS4 discharges may be causing or contributing to the exceedance.

## 2.1 Water Quality Characterization (Step 1)

As noted in Section 1, the first step in developing an EWMP is to develop water quality priorities. These priorities were based on a comprehensive characterization of water quality impairments to develop a strategy that systematically addresses pollutant reduction in accordance with previous commitments, such as those established by TMDL compliance schedules, and implementation plans. To conduct the water quality characterization<sup>1</sup>, data were obtained from numerous sources. A data request was submitted to the BCWVG to gather information necessary to meet the water quality characterization and source assessment requirements outlined in the Permit (pages 58 and 59). The data requested to support the water quality characterization included:

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<sup>1</sup> Appendices 2.A and 2.B provide more detailed descriptions of the results of the characterization.

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

Monitoring data collected within the BCWMA were received from the following sources:

- Los Angeles Department of Public Works (LACDPW) provided long-term monitoring data from the Ballona Creek Mass Emission station S01 and temporary receiving water sites in Centinela Creek (TS-07), Sepulveda Channel (TS-08), Benedict Canyon (TS-09) and the following drains Adams Drain (TS-10), Fairfax Drain (TS-11), and Cochran Drain (TS-12),
- TMDL Coordinated Monitoring Program data funded by the BCWMA and provided by the City of Los Angeles for the Ballona Creek Metals, Toxics, and Bacteria TMDLs, and
- City of Los Angeles Status and Trends program.

Over 55,000 data records were compiled and reviewed as part of the data analysis. Figure 2-1 presents the site locations for the monitoring data received and used for the water quality characterization process.

### **2.1.1 Characterization of Receiving Water Quality**

Per Part VI.C.5.a.i (pg 58) of the Permit, each EWMP shall include an evaluation of existing water quality conditions, including characterization of receiving water quality. Appendix 2.A presents additional details on the data analysis approach and results. Data were compiled to identify constituents exceeding applicable water quality objectives. Applicable water quality objectives were obtained from the California Toxics Rule (CTR), the Basin Plan, and relevant TMDLs. Applicable water quality objectives from the CTR and Basin Plan were selected based on the beneficial uses identified in the Basin Plan (summarized in Table 1-3).

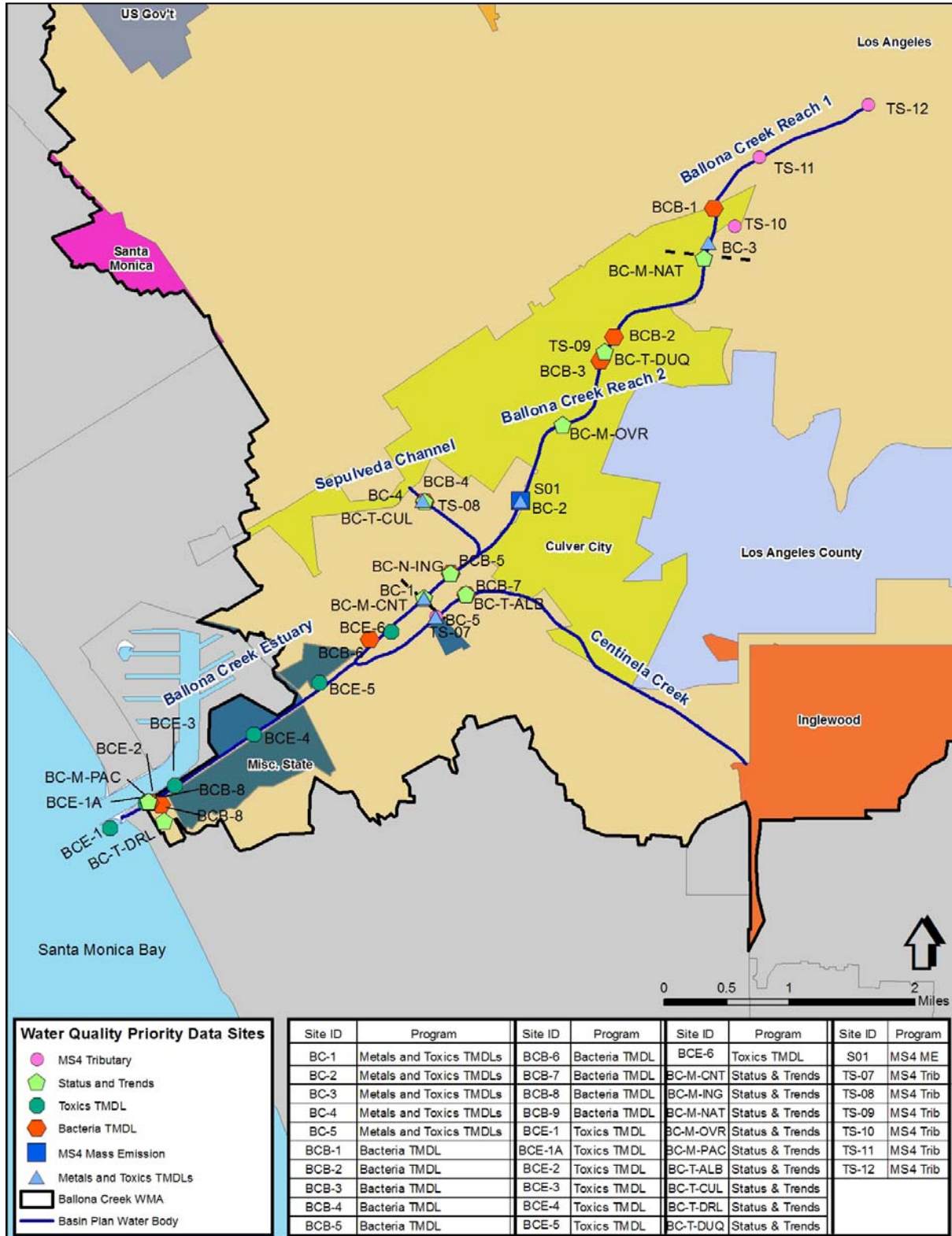


Figure 2-1 Monitoring Site Locations for Data Utilized in the Water Quality Priorities Process

Generally, the water quality objectives utilized included those established for the protection of aquatic life, contact recreation and human health related to the consumption of organisms. Bed and suspended sediment quality data were compared to TMDL targets. Given the significant number of water quality constituents and corresponding water quality objectives the following steps were taken to identify WBPCs:

- The first step in the analysis was to eliminate lower priority constituents that were sampled for but were never detected in any water body within the EWMP area and therefore would not fall into one of the three Permit categories (see Table 2-1). A list of these constituents is presented in Appendix 2.A - Attachment 1.
- Next, constituents that were detected, but the sample results never exceeded a corresponding water quality objective and therefore would not fall into one of the three Permit categories were identified. A list of these constituents is presented in Appendix 2.A – Attachment 2.
- All other constituents (*i.e.*, all constituents detected and with sample results that had at least one result greater than an applicable water quality objective) were subject to further analysis. A list of these constituents is presented in Appendix 2.A – Attachment 3.

### 2.1.2 Characterization of Discharge Quality

Per Part VI.C.5.a.i (pg 58) of the Permit, each EWMP shall include a characterization of stormwater and non-stormwater discharges from the MS4. A characterization was conducted on stormwater and non-stormwater discharges from the MS4 associated with constituents identified in a TMDL, a 303(d) listing, or through the receiving water data analysis described above. The following sources of discharge characterization data were reviewed and are summarized in Appendix 2.B:

- TMDL Staff Reports for TMDLs identified in Table 1-4.
- Data collected during a June 2012 bacteria snapshot event conducted along Ballona Creek and Sepulveda Channel to document the locations and bacteriological water quality of dry weather discharges.
- Data collected as part of the 2007 Southern California Coastal Water Research Project (SCCWRP) Technical Report 510 titled “Sources, patterns and mechanisms of stormwater pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA.”
- Land use data collected as part of previous MS4 Permit monitoring and presented in the 2000 report titled “Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report.”

## 2.2 Water Body Pollutant Classification (Step 2)

Based on available information and data analysis, WBPCs were classified into one of the three Permit categories described in Table 2-1. To further support development of the EWMP, the three Permit categories were further subdivided into subcategories (described in Table 2-2) and each WBPC was assigned to an appropriate subcategory. Additionally, pollutants were identified as belonging to a specific “class.” As stated in the Permit (pg. 49, footnote 21), pollutants are considered to belong in the same class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the EWMP for the TMDL. The “classes” are preliminary in nature and may be refined as part of EWMP development.

The following classes were identified:

- Metals,
- Trash,
- Bacteria,
- Sediment,
- Historical Organics (HO) – inclusive of historically-used pesticides,
- Current Organics (CO) – inclusive of current use pesticides and other organics such as PAHs, and
- To be determined – used for conditions (pH and dissolved oxygen) that are not pollutants, *per se*, or constituents where the linkage to another type of constituent will be further investigated during EWMP development.

Table 2-3 presents the BCWMP WBPCs by subcategory. Summary tables presenting the data analysis to support the placement of WBPCs into the various subcategories are presented in Attachment 3 of Appendix 2.A.

## 2.3 Source Assessment (Step 3)

Following the water body-pollutant classification, the next step in the prioritization process is to conduct a source assessment. The Permit requires that a source assessment be conducted to identify potential sources within the watershed for the WBPCs in Categories 1-3, utilizing existing information.

The intent of the source assessment is to identify potential sources within the watershed for the WBPCs in Categories 1-3 and to support prioritization and sequencing of management actions. Prioritization of the pollutants and sequencing of BMP installation and management actions will be part of the EWMP development process, described in Section 5. Watershed modeling conducted as part of the RAA during the EWMP development process may shed additional light on potential pollutant sources that will further inform the resultant EWMP Plan. Pollutant exceedances may come from point or non-point sources, described below. Often, however, non-point source discharges may flow to the MS4 and thus become associated with the MS4 and subject to the MS4 Permit requirements.

### 2.3.1 Permit Requirements

The specific requirements in the Permit for the source assessment are as follows (per section VI.C.5.a.iii, page 59):

*“(1) Permittees shall identify known and suspected stormwater and non-stormwater pollutant sources in discharges to the MS4 and from the MS4 to receiving waters and any other stressors related to MS4 discharges causing or contributing to the water quality priorities. The identification of known and suspected sources of the highest water quality priorities shall consider the following:*

*(a) Review of available data, including but not limited to:*

*(i) Findings from the Permittees’ Illicit Connections and Illicit Discharge Elimination Programs;*

*(ii) Findings from the Permittees’ Industrial/Commercial Facilities Programs;*

*(iii) Findings from the Permittees' Development Construction Programs;*

*(iv) Findings from the Permittees' Public Agency Activities Programs;*

*(v) TMDL source investigations;*

*(vi) Watershed model results;*

*(vii) Findings from the Permittees' monitoring programs, including but not limited to TMDL compliance monitoring and receiving water monitoring; and*

*(viii) Any other pertinent data, information, or studies related to pollutant sources and conditions that contribute to the highest water quality priorities.*

*(b) Locations of the Permittees' MS4s, including, at a minimum, all MS4 major outfalls and major structural controls for stormwater and non-stormwater that discharge to receiving waters.*

*(c) Other known and suspected sources of pollutants in non-stormwater or stormwater discharges from the MS4 to receiving waters within the watershed."*

The findings from items *VI.C.5.a.iii (1)(a)(i)-(vii)* and item *VI.C.5.a.iii (1)(c)* that are pertinent to the Category 1, 2 and 3 pollutants identified in Section 2.2 of this Final Work Plan are summarized below.

Item *VI.C.5.a.iii (1)(b)* is provided in the discussion of the MS4 database requirements of Part VII.A of Attachment D (Monitoring and Reporting Program) of the Permit and addressed in the CIMP.

### 2.3.2 Point Sources

Point sources are discrete conveyances that can carry pollutants to surface waters. Discharges from point sources are regulated by both CWA NPDES permits and California's Porter-Cologne Water Quality Control Act Waste Discharge Requirements (WDRs). Combined NPDES/WDR permits are issued by the LARWQCB for discharges to surface waters.

Urban runoff to Ballona Creek and Estuary is regulated as a point source discharge under two stormwater permits that cover MS4 discharges. The first is the MS4 Permit applicable to the Permittees developing the EWMP. The second is a separate statewide stormwater permit issued to the California Department of Transportation (Caltrans) (Order No. 2012-0011-DWQ, NPDES No. CAS000003). The other NPDES permits in the watershed include the general construction stormwater permits, general industrial stormwater permits, minor NPDES permits, and general NPDES permits, as listed in Table 2-4. A broad assessment of the relative potential for pollutant contribution and runoff condition (wet weather or dry weather) of the discharges typically associated with each of the permit types is also provided in Table 2-4.

Appendix 2.C contains detailed descriptions of WBPCs and their common sources, which will provide the basis for source assessment activities in the Ballona Creek watershed.

**Table 2-2 Details for Water Body-Pollutant Classification Subcategories**

Category	Water Body-Pollutant Combinations (WBPCs)	Description
1	<p>Category 1A: WBPCs with past due or current Permit term TMDL deadlines with exceedances in the past 5 years.</p> <p>Category 1B: WBPCs with TMDL deadlines beyond the Permit term with exceedances in the past 5 years.</p> <p>Category 1C: WBPCs addressed in USEPA TMDL without an LARWQCB adopted Implementation Plan.</p> <p>Category 1D: WBPCs with past due or current Permit term TMDL deadlines but have there have been no exceedances in the past 5 years.</p> <p>Category 2A: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements with exceedances in the past 5 years.</p>	<p>WBPCs with TMDLs with past due or current Permit term interim and/or final limits. These pollutants are the highest priority for the current Permit term.</p> <p>The Permit does not require the prioritization of TMDL interim and/or final deadlines outside of the Permit term or USEPA TMDLs, which do not have implementation schedules. To ensure EWMPs consider long term planning requirements and utilize the available compliance mechanisms, these WBPCs should be considered during BMP planning and scheduling, and during CIMP development.</p> <p>WBPCs where specific actions may end up not being identified because recent exceedances have not been observed and specific actions may not be necessary. The CIMP should address these WBPCs to support future re-prioritization.</p> <p>WBPCs with confirmed impairment or exceedances of RWLs. WBPCs in a similar class<sup>1</sup> as those with TMDLs are identified. WBPCs currently on the 303(d) List are differentiated from those that are not to support utilization of EWMP compliance mechanisms.</p>
2	<p>Category 2B: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements that are not a “pollutant”<sup>2</sup> (e.g., toxicity).</p> <p>Category 2C: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements but there have been no exceedances in the past 5 years.</p>	<p>WBPCs where specific actions may not be identifiable because the cause of the impairment or exceedances is not resolved. Either routine monitoring or special studies identified in the CIMP should support identification of a “pollutant” linked to the impairment and re-prioritization in the future.</p> <p>WBPCs where specific actions for implementation may end up not being identified because recent exceedances have not been observed (and thus specific BMPs may not be necessary.) Pollutants that are in a similar class<sup>1</sup> as those with TMDLs are identified. Either routine monitoring or special studies identified in the CIMP should ensure these WBPCs are addressed to support re-prioritization in the future.</p>
3	<p>Category 3A: All other WBPCs that have exceeded in the past 5 years.</p> <p>Category 3B: All other WBPCs that are not a “pollutant”<sup>2</sup> (e.g., toxicity).</p> <p>Category 3C: All other WBPCs that have exceeded in the past ten years, but not in past five years.</p> <p>Category 3D: WBPCs identified by the BCWWMG.</p>	<p>Pollutants that are in a similar class<sup>1</sup> as those with TMDLs are identified.</p> <p>WBPCs where specific actions may not be identifiable because the cause of the impairment or exceedances is not resolved. Either routine monitoring or special studies identified in the CIMP should support identification of a “pollutant” linked to the impairment and re-prioritization in the future.</p> <p>Pollutants that are in a similar class<sup>1</sup> as those with TMDLs are identified.</p>

1. Pollutants are considered in a similar class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the EWMP for the TMDL. (Permit pg. 49, footnote 21).

2. While pollutants may be contributing to the impairment, it currently is not possible to identify the specific pollutant/stressor.

**Table 2-3 Summary of Ballona Creek Water Body-Pollutant Categories**

Class <sup>1</sup>	Constituents	Ballona Creek			Centinela Creek	Sepulveda Channel	Benedict Channel <sup>2</sup>	Santa Monica Bay
		Estuary	Wetlands	Reach 1				
<b>Category 1A:</b> WBPCs with past due or current Permit term TMDL deadlines with exceedances in the past 5 years. (I = Interim and F = Final Limits)								
Trash	Trash	I/F	I/F	I/F	I/F	I/F	--	I
Bacteria	Total Coliform, Fecal Coliform, Enterococcus	F (Dry)	--	--	--	--	--	F (Dry)
	<i>E. coli</i>	--	--	F (Dry)	F (Dry)	F (Dry)	F (Dry)	F (Dry)
Metals	Copper, Lead, Zinc, Selenium <sup>3</sup>	--	--	I (Wet & Dry)/F (Dry)		--	--	--
Metals	Sediment: Cadmium, Copper, Lead, Zinc, Silver	I	--	--	--	--	--	--
HO	Sediment: PAHs <sup>3</sup> , Chlordane, DDT, PCBs	I	--	--	--	--	--	--
<b>Category 1B:</b> WBPCs with TMDL deadlines beyond the Permit term with exceedances in the past 5 years. (F = Final Limits)								
Trash	Trash	--	--	--	--	--	--	F
Metals	Copper, Lead, Zinc, Selenium <sup>3</sup>	--	--	F (Wet)		--	--	--
Metals	Sediment: Cadmium, Copper, Lead, Zinc, Silver	F	--	--	--	--	--	--
HO	Sediment: PAHs <sup>3</sup> , Chlordane, DDT, PCBs	F	--	--	--	--	--	--
Bacteria	Total Coliform, Fecal Coliform, Enterococcus	F (Wet)	--	--	--	--	--	F (Wet)
	<i>E. coli</i>	--	--	F (Wet)	F (Wet)	F (Wet)	F (Wet)	--
<b>Category 1C:</b> WBPCs addressed in USEPA TMDL without an LARWQCB Adopted Implementation Plan. (WLA = Wasteload Allocation in EPA TMDL)								
HO	DDT (sediment)	--	--	--	--	--	--	WLA
	PCBs (sediment)	--	--	--	--	--	--	WLA
Sediment	Sediment	--	WLA	--	--	--	--	--
<b>Category 1D:</b> WBPCs with past due or current Permit term TMDL deadlines but have not exceeded in past 5 years.								
	None	--	--	--	--	--	--	--
<b>Category 2A:</b> 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements with exceedances in the past 5 years.								
Bacteria	Fecal Coliform (Shellfish Harvesting Advisory)	303(d)	--	--	--	--	--	--
Metals	Cyanide	--	--	--	Delist	--	--	--

Table 2-3 Summary of Ballona Creek Water Body-Pollutant Categories

Class <sup>1</sup>	Constituents	Ballona Creek			Centinela Creek	Sepulveda Channel	Benedict Channel <sup>2</sup>	Santa Monica Bay
		Estuary	Wetlands	Reach 1				
Metals	Copper (dissolved and total)	Dry	--	--	--	--	--	--
Metals	Mercury (total)	--	--	--	Dry	--	--	--
HO	4,4'- Dichlorodiphenyldichloroethylene (4,4'-DDE)	--	--	--	Wet	--	--	--
CO	Benzo(a)anthracene	--	--	--	Wet	--	--	--
CO	Dibenzo(a,h)anthracene	Dry	--	--	--	--	--	--
CO	Indeno(1,2,3-cd)pyrene	Dry	--	--	--	--	--	--
<b>Category 2B:</b> 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements that are not a "pollutant" <sup>4</sup> (i.e., toxicity).								
TBD	pH	--	--	--	Dry	Dry	--	--
<b>Category 2C:</b> 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements but have not exceeded in past 5 years.								
Nutrients	Ammonia	--	--	--	--	Dry (Delist)	--	--
Metals	Copper (dissolved and total)	Wet (NS)	--	--	--	--	--	--
Metals	Lead (dissolved and total)	Dry	--	--	--	--	--	--
Metals	Mercury Total	Wet (NS)/Dry (NS)	--	Wet (NS)/Dry (NS)	Wet	--	--	--
Metals	Nickel (dissolved and total)	Dry (NS)	--	--	--	--	--	--
Metals	Silver (dissolved and total)	--	--	Wet	--	--	--	--
Metals	Zinc (dissolved and total)	Wet (NS)	--	--	--	--	--	--
<b>Category 3A:</b> All other WBPCs with exceedances in the past 5 years.								
Nutrients	Ammonia-N	--	--	--	Dry	--	--	--
TBD	Cyanide (total)	--	--	--	Wet	--	--	--
Metals	Silver (total)	--	--	--	Wet	--	--	--
HO	4,4'-DDE	--	--	--	Wet	--	--	--
HO	4,4'-DDT	--	--	--	Wet	--	--	--
CO	3,4-Benzofluoranthene	--	--	--	Wet	--	--	--

**Table 2-3 Summary of Ballona Creek Water Body-Pollutant Categories**

Class <sup>1</sup>	Constituents	Ballona Creek			Centinela Creek	Sepulveda Channel	Benedict Channel <sup>2</sup>	Santa Monica Bay
		Estuary	Wetlands	Reach 1				
HO	alpha-chlordane	--	--	--	--	--	--	--
HO	gamma-chlordane	--	--	--	--	--	--	--
CO	Benzo(a)anthracene	--	--	--	Wet	--	--	--
CO	Benzo(a)pyrene	--	--	--	Wet	--	--	--
CO	Benzo(k)fluoranthene	--	--	--	Wet	--	--	--
CO	Bis(2-Ethylhexyl) phthalate	--	--	--	Wet	--	--	--
CO	Chrysene	--	--	--	Wet	--	--	--
CO	Indeno(1,2,3-cd)pyrene	--	--	--	Wet	--	--	--
<b>Category 3B:</b> All other WBPCs that are not a "pollutant" <sup>4</sup> (i.e., toxicity). (D = dry weather exceedances, W = wet weather exceedances)								
TBD	Dissolved Oxygen	--	--	--	Wet	--	--	--
TBD	pH	--	--	--	Wet	--	--	--
<b>Category 3C:</b> All other WBPCs that have exceeded in the past ten years, but not in past five years.								
CO	Bis(2-Ethylhexyl) phthalate	--	--	--	Dry	Wet (NS)	Wet (NS)	--
CO	Diazinon	--	--	--	Wet	Wet (NS)	Wet (NS)	--
Metals	Cadmium (total)	--	--	Wet	Wet	Wet	--	--
Metals	Cyanide (total)	--	--	--	Dry	Wet (NS)	Wet (NS)	--
Metals	Mercury (total)	--	--	--	--	--	--	--
Metals	Silver (dissolved and total)	Wet (NS)	--	--	Wet	--	--	--
Metals	Zinc (total)	Dry (NS)	--	--	--	--	--	--

<sup>1</sup>Pollutants are considered in a similar class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the EWMP for the TMDL. (Permit pg. 49, footnote 21).

<sup>2</sup>Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylights where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed.

<sup>3</sup>The BC Toxics and Metals TMDLs were amended on December 5, 2013 and WLAs associated with these constituents were removed. Associated WQBELs would be expected to be removed when the Permit is updated to incorporate these two TMDLs once they become effective.

<sup>4</sup>While pollutants may be contributing to the impairment, it currently is not possible to identify the specific pollutant/stressor.

Note that unless explicitly stated as sediment, constituents are associated with the water column.

I/F = Denotes where the Permit includes interim (I) and/or final (F) effluent and/or RWLs.

NS = Not sampled

303 = WBPC on the 2010 303(d) List where the listing was confirmed during data analysis.

Delist = WBPC on the 2010 303(d) List that could now be delisted.

HO = Historical Organics – inclusive of historical pesticides.

CO = Current Organics – inclusive of current use pesticides and other organics such as PAHs.

TBD = To be determined – used for conditions (pH and dissolved oxygen) that are not pollutants, per se, or constituents where the linkage to another type of constituent will be further investigated during EWMP development.

**Table 2-4 NPDES Permits in the Ballona Creek Watershed**

Type of NPDES Permit	Number of Permits	Potential for Pollutant Contribution
Los Angeles County Municipal Stormwater	1	High (wet/dry weather)
Caltrans Stormwater	1	High (wet weather)
General Construction Stormwater	17	High (wet weather)
Industrial Stormwater	68	High (wet weather)
Construction Stormwater	47	Medium (wet weather)
Individual NPDES Permits (Minor)	7	Medium (wet/dry weather)
<b>Total</b>	<b>141</b>	

(LACDPW, 2012a)

### 2.3.3 Non-Point Sources

Pollutants from non-point sources are conveyed to surface waters in a diffuse manner, *i.e.*, not directly from point source conveyances. However, when contaminants from such non-point sources reach the MS4 system, they become regulated through the MS4 point source NPDES permits. In the highly urbanized Ballona Creek watershed, there is not necessarily a clear regulatory distinction between point and non-point sources.

Non-point sources in the Ballona Creek watershed include:

- Runoff from the National and State forests outside of the MS4s into the headwaters of tributaries, and
- Sources that occur within the channels of Ballona Creek and tributaries (“in-channel sources”) such as:
  - Urban runoff,
  - Groundwater discharges,
  - Pet Waste,
  - Sanitary sewer leaks/spills,
  - Illicit/illegal discharges,
  - Wildlife and birds, and
  - Suspension and/or regrowth of sediment-associated pollutants.

Targeted special studies and planned stormwater program elements, such as an IC/ID program, to identify these sources of pollution within the MS4 drainage area will also be developed and incorporated in the EWMP.

## 2.4 Approach to Prioritization (Step 4)

The Permit outlines a prioritization process that defines how pollutants in the various categories will be considered in scheduling during the EWMP development process. The factors to consider in the scheduling include the following based on the compliance pathways outlined in the Permit:

- TMDLs with past due interim and/or final limits and those with interim and/or final limits within the Permit term (schedule according to TMDL schedule),
- TMDLs with interim and/or final limits outside the Permit term (schedule according to TMDL schedule), and
- Other receiving water exceedances:
  - Pollutants in the same class as TMDL (evaluate ability to consider on same time frame as TMDL),
  - Pollutants on 303(d) list or in same class as 303(d) listings (develop schedule to address as soon as possible with milestones),
  - Pollutants with exceedances that are not in same class as 303(d) listing (conduct monitoring under CIMP to confirm exceedances and if confirmed develop schedule with milestones), and
  - Pollutants without exceedances in last five years (not prioritized for BMPs, but included in monitoring).

Evaluating whether or not a pollutant is in the same class<sup>2</sup> as either a TMDL or a 303(d)-listed pollutant is a critical decision for prioritization and scheduling.

As part of EWMP development and the RAA, prioritizing and sequencing of BMPs will consider the aforementioned factors, including linking pollutants within the same class.

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<sup>2</sup> Pollutants are considered in a similar class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the EWMP for the TMDL. (Permit pg. 49, footnote 21).

## Section 3

# Watershed Control Measures

The EWMP provides the opportunity for Permittees to customize their stormwater programs to achieve compliance with applicable RWLs and WQBELs through implementation of stormwater best management practices (BMPs) or control measures.

BMPs vary in function and type, with each BMP providing unique design characteristics and benefits from implementation. The overarching goal of BMPs in the EWMP is to reduce the impact of stormwater and non-stormwater on receiving water quality and address the Water Quality Priorities. The development of the EWMP will involve the evaluation and selection of multiple BMP types. This section describes proposed processes for evaluating and identifying BMPs for inclusion in the EWMP. The main categories of BMPs outlined herein include structural, either regional or distributed scale, and institutional, as follows:

- Regional Structural BMPs - Constructed structural practices intended to treat runoff from a contributing area of multiple parcels (*e.g.*, facilities typically serving a contributing area on the order of 10s or 100s of acres or larger).
- Distributed Structural BMPs - Constructed structural practices intended to treat runoff close to the source and typically implemented at a single- or few-parcel level (*e.g.*, facilities typically serving a contributing area less than one acre).
- Institutional BMPs - Policies, actions, and activities intended to prevent pollutants from entering stormwater runoff thus eliminating the source of the pollutants. These BMPs are not constructed, but may involve costs such as signage or spill kits.

The development of the EWMP will involve the evaluation and selection of multiple BMP types, as described in the following sections. Section 3.1 describes structural BMPs and the process for identifying and selecting Regional BMPs. Section 3.2 describes institutional BMPs and potential approaches to customization.

## 3.1 Structural BMPs

Structural BMPs will likely be an important component of the EWMP, and information on existing and planned BMPs will support efforts to select among the many potential BMPs. This subsection describes nomenclature and categories used to compile BMP information and support the BMP planning process.

### 3.1.1 Sub-Categories of Structural BMPs

Regional and distributed BMPs are separated into *subcategories* as shown in Table 3-1. These categories are used herein to compile and describe information on existing, planned, and potential BMPs. The nomenclature will be important for engaging participating agencies as the EWMP is developed. Each of these subcategories is described in more detail with the *BMP Fact Sheets* included in Appendix 3.A.

To assist with the process of compiling and describing existing, planned, and potential BMPs, the *BMP functions* that drive BMP performance are presented in each BMP Fact Sheet.

The three major BMP functions for *structural BMPs* are infiltration, water quality treatment, and storage, as follows:

- Infiltration - Runoff is directed to percolate into the underlying soils. Volume reduction and groundwater recharge occur in infiltration practices.
- Water Quality (WQ) Treatment - Pollutants are removed through various unit processes, including filtration, settling, sedimentation, sorption, straining, and biological or chemical transformations.
- Storage - Runoff is captured, stored (detained), and slowly released into downstream waters. Storage can reduce the peak flow rate from a site, but does not directly reduce runoff volume.

**Table 3-1 Summary of Structural BMP Categories and Major Functions**

Category	Subcategory	Example BMP Types
Regional <sup>1</sup>	Infiltration	Surface infiltration basin, subsurface infiltration gallery
	Detention	Surface detention basin, subsurface detention gallery
	Constructed Wetland	Constructed wetland, flow-through/linear wetland
	Treatment Facility	Facilities designed to treat runoff from and return it to the receiving water
	Low Flow Diversion	Facilities designed divert dry weather flows to the sanitary sewer
Distributed	Site-Scale Detention	Dry detention basin, wet detention pond, detention chambers, etc.
	Green Infrastructure	Bioretention and biofiltration (vegetated practices with a soil filter media, and the latter with an underdrain)
		Permeable pavement
		Green streets (often an aggregate of bioretention/biofiltration and/or permeable pavement)
		Infiltration BMPs (non-vegetated infiltration trenches, dry wells, rock wells, etc.)
		Bioswales (vegetative filter strips and vegetated swales)
		Rainfall harvest (green roofs, cisterns, rain barrels)
	Flow-Through Treatment BMP	Media/cartridge filters, high-flow biotreatment filters, etc.
Source Control Structural BMPs	Catch basin inserts, screens, hydrodynamic separators, trash enclosures, etc.	

1. The term “regional BMP” does not necessarily indicate the project can capture the 85th percentile storm, as used in the Permit. The term “Regional EWMP projects” is recommended for those regional BMPs that are able (or expected to be able) to capture the 85th percentile storm.

### 3.1.2 Structural BMP Selection

Structural BMPs will play an integral role in meeting MS4 Permit objectives. Development of the EWMP will involve a process by the BCWVG to develop networks of structural BMPs (Regional EWMP projects, regional BMPs, and distributed BMPs) that, when combined with institutional BMPs (including the effect of Low Impact Development [LID] ordinances), have reasonable assurance of addressing Water Quality Priorities (see Section 4 for a description of the RAA). The BCWVG will assess the effectiveness of existing structural BMPs and evaluate other regional or distributed BMP projects contained in existing watershed plans and identified as new/additional opportunities in the EWMP development process.

The process for selecting structural BMPs to be included in the EWMP will follow these general steps:

- Step 1. Compilation of regional and distributed BMPs from existing planning documents,
- Step 2. Identification of additional regional BMPs (beyond those identified in planning documents), utilizing resources such as a geographic information system (GIS) and stakeholder input,
- Step 3. Evaluation and ranking of all structural BMPs identified in Steps 1 and 2 into appropriate prioritization categories, including:
  - Regional EWMP Projects that capture and treat the 85th percentile storm event volume.
  - Regional BMPs to be included in the EWMP that provide significant pollutant load reductions.
  - Other Potential Regional BMPs which are of interest for possible future implementation, but are not ready to be included in the EWMP.
  - Other Potential Regional BMPs which need more study and re-evaluation before they can be included as projects of interest.
- Step 4. Identification and evaluation of additional distributed structural BMPs to provide needed water quality improvement in SMSs where no regional BMPs are prioritized for inclusion in the EWMP, and
- Step 5. Site-specific feasibility assessments for structural BMP projects prioritized for inclusion in the EWMP.

The prioritization of projects will use the output from the RAA as the primary basis for determining performance toward achieving the goals of the EWMP. The RAA provides a detailed estimation of water quality improvements as a result of implementing a series of watershed control measures; however, it does not provide site-specific information about project locations. Therefore, the final step prior to selection of structural BMPs for inclusion in the EWMP will involve site-specific feasibility assessments. Figure 3-1 provides a flow chart to illustrate the process being followed by the BCWMP to develop a set of structural BMPs that, when combined with institutional BMPs, will meet the objectives of the MS4 Permit. Figure 3-2 summarizes the key milestones in the development of the structural BMP for inclusion in the EWMP.

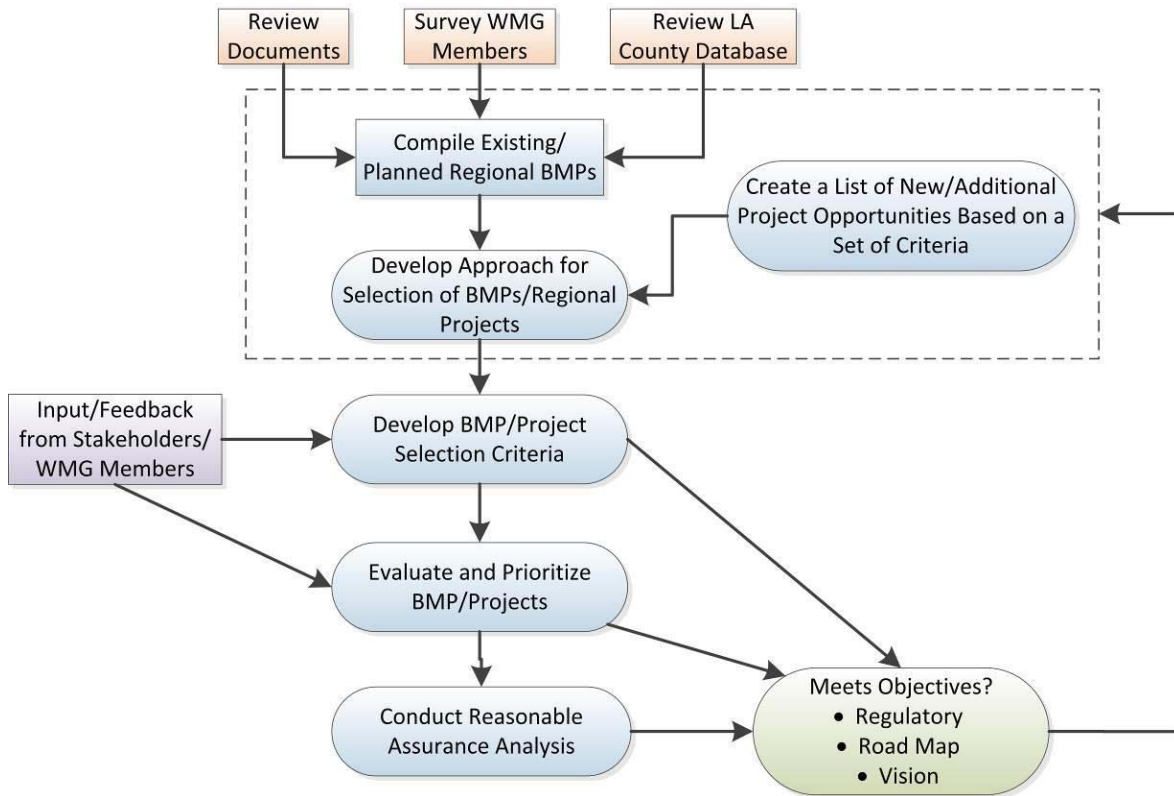


Figure 3-1 Flow Chart for Selecting Structural BMPs for the Ballona Creek EWMP

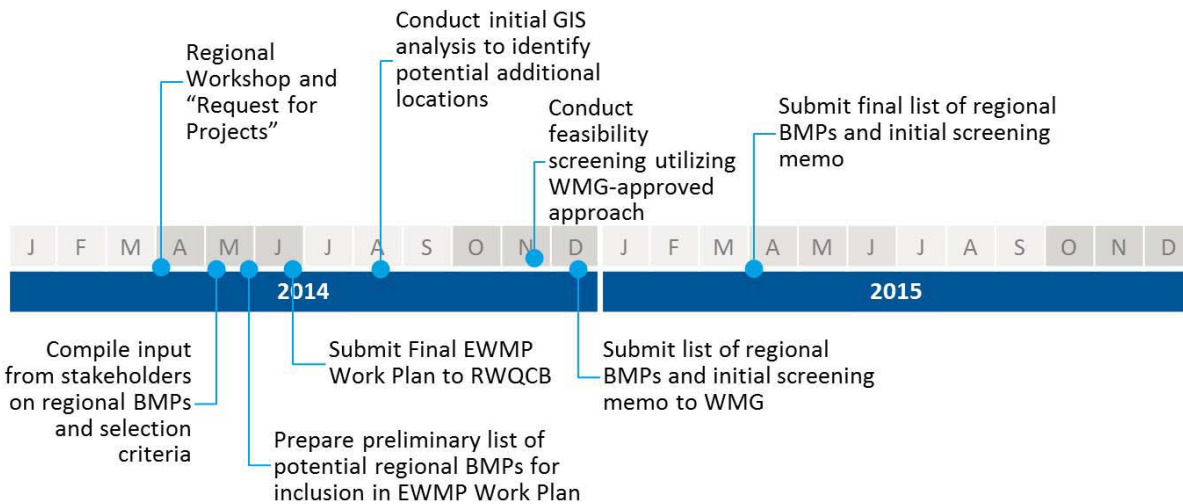


Figure 3-2 Summaries of Key Milestones in the Identification and Selection of Regional BMPs

### 3.1.2.1 Existing Regional BMPs

Within the Ballona Creek WMA, there are existing structural BMPs currently operating that are providing reductions to specific pollutants of concern and are presumed to be improving downstream water quality. Most of these BMPs were selected and installed by developers as part of a Standard Urban Stormwater Mitigation Plan (SUSMP) to provide required runoff capture and treatment for new development or significant redevelopment projects. Prior to the 2012 NPDES Permit update (Order No. R4-2012-0175), the selection of BMPs to be included in project SUSMPs involved a qualitative assessment of the effectiveness of different BMPs for the pollutants of concern. More recent projects have been subject to more stringent BMP selection criteria, whereby BMP selection must follow a hierarchy of infiltration, then harvest and use, then biological treatment and release, and then other flow through treatment alternatives.

In addition to development-driven BMPs, the stormwater programs have constructed several publically-owned regional structural BMPs to reduce pollutants of concern to a receiving water body and to comply with TMDLs for WBPCs.

A key step in the development of the RAA for the EWMP will be to consider the effectiveness of existing regional structural BMPs for the full range of pollutants and flow conditions that must be addressed in the downstream receiving waterbody. Accordingly, modifications to these existing facilities will be considered in the EWMP if these facilities currently are shown to be ineffective for all downstream WBPCs or flow conditions. The EWMP will identify and consider such modifications to all publically owned and a subset (those serving at least ten acres) of privately owned regional structural BMPs.

### 3.1.2.2 Planned Regional BMPs

Potential Regional BMPs have been identified in a number of watershed management or TMDL implementation plans developed by public agencies or organizations in the watershed. While not yet implemented, these potential regional BMPs represent projects that could be incorporated into the EWMP. An example BMP identified to be implemented in the Ballona Creek WMA as a path toward compliance with individual TMDLs for specific WBPCs is the enhancement of the North Outfall Treatment Facility (NOTF), which will provide disinfection of dry weather flows in Ballona Creek Reach 2. Modifications to the planned facilities will be considered in the EWMP to ensure that each potential project can be effective for all downstream WBPCs and flow conditions. These watershed plans identified many potentially feasible sites where retrofits to include regional structural BMPs could be incorporated into the existing landscape (Appendix 3.B).

### 3.1.2.3 New/Additional Regional BMPs to be Developed in this EWMP

BCWMG members provided input on the development of an approach to identify new/additional regional BMPs for inclusion in the EWMP, considering several existing and completed regional efforts to identify and evaluate regional BMPs including the call for projects used in the LA IRWMP process, the 2013 LA IRWMP OPTI database, and other regional project development processes such as the Southern California Stormwater Committee (SCSC) Stormwater Capture Master Plan, Los Angeles Department of Water and Power (LADWP) Stormwater Capture Master Plan, and the Green Solutions Project (a GIS-based analysis developed by Community Conservation Solutions). Based on this input this approach will include three key components:

- 1) **Stakeholder Engagement** - The following process for identifying additional regional BMPs through stakeholder engagement has been developed in consultation with the BCWMG:

- a. A formal “Request for Projects” to BCWMG members and other watershed stakeholders in April 2014 to identify additional potential regional BMPs for inclusion in the final EWMP.
  - b. A regional workshop in mid-2014 which invites a broad cross section of stakeholders from throughout the region to provide input and ideas for additional regional BMPs.
  - c. A dedicated BCWMG meeting in late March 2014 which continues to invite input and ideas for additional regional BMPs.
  - d. One-one-one meetings with key stakeholders to discuss additional potential regional BMPs.
- 2) **GIS-Based Approach for Identifying Additional Regional BMPs** - The development of a GIS-based approach is a useful tool for identifying additional Regional BMP opportunities. BCWMG members have requested that the GIS process be operable by city staff, and not require consultant support on an ongoing basis.
- a. Figure 3-3 below represents a suggested GIS-based approach for identifying additional regional BMPs. The approach builds on the preliminary set of regional BMPs identified in the “Request for Projects”, and a preliminary output from the Watershed Management Modeling System (WMMS) that estimates per-sub watershed volumes that correspond to the 85th percentile storm. This initial output from the WMMS model will provide useful information about the areas of opportunity to capture runoff from critical areas.

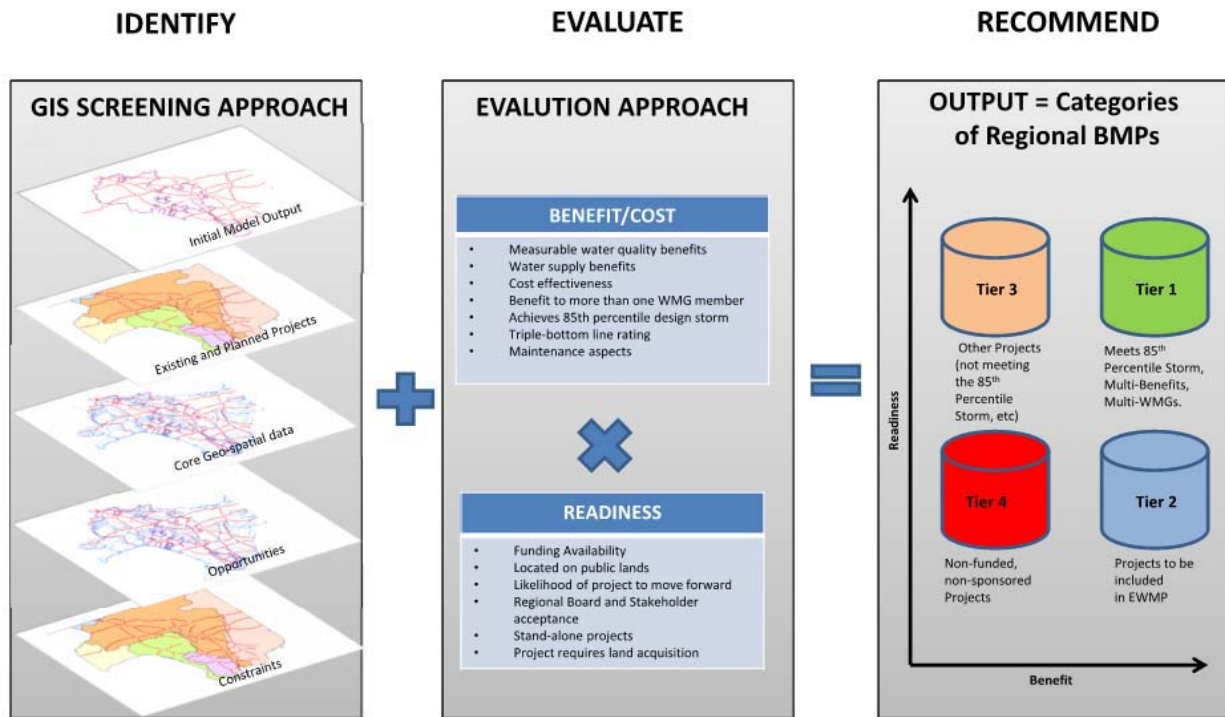


Figure 3-3 Suggested GIS-Based Approach for Identifying Additional Regional BMPs

- b. Potential regional BMP projects identified through the GIS-based approach will be screened based on a number of criteria, including:
- i. Topography
  - ii. Hydrologic features
  - iii. Land use
  - iv. Transit infrastructure
  - v. Parcel data/ownership
  - vi. Existing storm drain infrastructure
  - vii. Storm drain invert depth

Key considerations of both opportunities and constraints that will be used in the final selection of regional BMPs are presented in Table 3-2.

**Table 3-2 Opportunities and Constraints for Structural BMP Implementation**

List of Opportunities	List of Constraints
<ul style="list-style-type: none"> <li>▪ Water supply benefits</li> <li>▪ Water quality benefits</li> <li>▪ Multiple benefits (includes projects that would (a) provide more than one type of benefit, <i>e.g.</i>, in addition to stormwater runoff and pollutant load reduction, aesthetic enhancements, habitat restoration, etc.; or (b) complement another project to result in combined/synergistic benefits.)</li> <li>▪ Recreation/open space benefits</li> <li>▪ Located on public lands</li> <li>▪ 85th percentile storm criteria</li> <li>▪ Funding is committed</li> <li>▪ Benefit – cost ratio (ROI)</li> <li>▪ Benefits to more than one BCWMG member</li> <li>▪ Project sponsor is BCWMG member</li> <li>▪ Project readiness</li> <li>▪ Stand-alone projects, <i>i.e.</i>, those projects that do not require significant infrastructure development to implement</li> <li>▪ Likelihood of project to move forward</li> <li>▪ Project sponsor is committed</li> <li>▪ Flood control benefits or address historical flooding issues</li> <li>▪ LARWQCB acceptance</li> <li>▪ Stakeholder acceptance</li> <li>▪ Proximity to pollutant sources or impaired waters</li> <li>▪ Adjacent to existing storm drain</li> </ul>	<ul style="list-style-type: none"> <li>▪ Soil contamination</li> <li>▪ Historical landmarks</li> <li>▪ Brownfields</li> <li>▪ High groundwater</li> <li>▪ Project requires land acquisition</li> <li>▪ Cost Effectiveness</li> <li>▪ Proximity to pollutant sources or impaired waters</li> <li>▪ Located on private land</li> <li>▪ Liquefaction zones</li> </ul>

- 3) Evaluation and ranking of all regional BMPs into appropriate prioritization categories. This step will use the results of the RAA, described in Section 4 of this EWMP Work Plan, to finalize the most effective projects for inclusion in the EWMP to meet water quality objectives in receiving waterbodies. Appendix 3.C provides summary statistics of pollutant removal effectiveness of various BMPs that may be selected for implementation at a potential location. These statistics provide a basis for the simulation of load reduction in the RAA. One key part of the BMP evaluation step will be to conduct a site-specific assessment of each prioritized regional BMP opportunity to ensure its feasibility for implementation as specified in the RAA. If the project cannot be constructed as modeled, then the RAA will be updated with a modified project. If the project is found to have a fatal flaw, then the RAA will be updated with additional lower ranking project(s), including potential new distributed BMP opportunities such as green street retrofits, to that equal or better water quality improvement may be obtained.

## 3.2 Institutional BMPs including MCMs

Institutional BMPs are non-constructed control measures that limit the amount of stormwater runoff or pollutants that are transported within the MS4 area. Most institutional BMPs are implemented to meet MCM requirements in the MS4 Permit.

The LA MS4 Permit was recently updated in 2012 and changes were made to the MCMs that must be implemented. The BCWMG has assessed these changes in Permit requirements. One key change was to allow for customized actions within each category of control measures as set forth in an approved EWMP. Thus, Permittees can evaluate the MCMs, identify potential customization that will address water quality priorities, and provide justification for customization of any MCM that is determined to not be applicable to the Permittee (with the exception of MCMs in the Planning and Land Development Program, which may not be customized). Customization may include replacement of an MCM for a more effective measure, reduced implementation of an MCM, augmented implementation of the MCM, focusing the MCM on the water quality priority, or elimination of a MCM.

### 3.2.1 Summary of Existing MCMs/Institutional BMPs

The MS4 Permit categorizes institution BMPs and MCMs into the following five program categories:

- Development Construction Program,
- Industrial/Commercial Facilities Program,
- IC/ID Detection and Elimination Program,
- Public Agency Activities Program, and
- Public Information and Participation Program.

Specific institutional BMPs currently implemented by the BCWMG member jurisdictions as part of these stormwater program categories are reported in the Los Angeles County MS4 Permit Unified Annual Report<sup>3</sup>.

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<sup>3</sup> Los Angeles County provides access to Permittee Annual Reports at the following website:  
<http://ladpw.org/wmd/NPDESRSA/AnnualReport/>

### 3.2.2 Potential EWMP Approach to Modifying MCMs/Institutional BMPs

As part of the implementation of the Work Plan, the BCWVG agencies may develop customized plans for MCM implementation. If one or more MCMs are customized, the approach and results of customization will be presented in the EWMP along with an overview of the remaining MCMs. The following subsections describe generalized steps for conducting the MCM customization process. Some of these steps have been completed and provide the basis for later steps in the process that may or may not be undertaken. Permittees may choose to forgo MCM customization during the initial EWMP development process and customize MCMs during subsequent revisions to the EWMP conducted as part of the regularly scheduled adaptive management process.

#### 3.2.2.1 Step 1 Summarize the Current MCM Implementation

The existing MCM implementation was summarized to allow for a comparison of the implementation of current control measures to the MCMs specified in the Permit. The 2010-2011 and 2011-2012 Annual Reports were used as the basis for the summary.

#### 3.2.2.2 Step 2 Compare Current MCM Implementation to 2012 Permit

The summary of current MCM implementation provided a basis for a comparison of control measure implementation from the 2001 Permit requirements against the 2012 Permit, thus allowing for a general assessment of the potential gaps in the current program with the required MCMs. In general, the 2001 Permit and 2012 Permit requirements are worded differently and contain different specific requirements that cannot easily be compared.

#### 3.2.2.3 Step 3 Develop a List of MCMs that are Candidates for Customization

Step 3 is intended to develop a list of the MCMs that may be evaluated for customization for those BCWVG agencies that choose to do so. The EWMP will include an assessment of the water quality priorities that MCMs address based on the classes of the various WBPCs identified in Section 2. Resources such as the California Stormwater Quality Association (CASQA) BMP Handbooks provided information that relate control measures to the targeted constituents and information on sources of the pollutant (such as TMDLs) were utilized to complete the assessment. In some cases, an MCM only indirectly addresses a water quality priority. For example, a Public Outreach control measure may directly address a water quality priority if that pollutant is the focus of an outreach message, or the message may broadly address pollution prevention without targeting a specific pollutant. Conversely, some MCMs may be customized to provide “true source control”, such as is achieved by product replacement programs (*e.g.*, support for legislation to reduce allowable copper content in brake pads).

Once the candidates for customization are identified, the EWMP will evaluate the potential effectiveness of MCMs. This evaluation will use qualitative rankings of high, medium, or low effectiveness. The basis for these qualitative rankings will be from readily available resources including CASQA BMP Handbooks, effectiveness assessment guidance, stormwater program implementation experience, and published scientific studies.

### 3.2.2.4 Step 4 Evaluate Existing Information and Data and Develop Justifications for MCM Customization

MCMs that are candidates for customization may be either modified to be more effective/efficient or to provide greater water quality benefits. Examples of evaluations that could be conducted to identify more effective/efficient approaches to MCM implementation include:

- Public Outreach material can be evaluated on whether it addresses a water quality priority. If public outreach is found to be ineffective (Step 3), then the material is general (broadly addresses pollution prevention without targeting a specific pollutant), it could be modified to focus on a water quality priority (*e.g.*, pesticides).
- Industrial inspection checklists can be evaluated to ensure consistency with water quality priorities.
- Industrial and commercial inspection frequencies can be evaluated to better target identified sources of water quality priorities.
- Permittees can evaluate whether changes in equipment, for example, from mechanical broom to vacuum assisted street sweepers may provide a meaningful improvement in the reduction of water quality priority pollutants.

If there are no reasonable opportunities to modify MCMs to improve effectiveness/efficiency or to focus on a water quality priority, the MCM could be considered for reduced implementation or elimination. Note that the Permit (Part VI.C.5.b) directs Permittees to “provide justification for elimination of any MCM that is determined not to be applicable to the Permittee.” Thus any reduction/elimination must be supported by sufficient information. A hypothetical example is described on the box above.<sup>4</sup>

The following outlines the procedures that may be followed by the Permittees to determine if there is justification to reduce/eliminate an MCM. At a minimum, there are two potential rationales for reduced implementation or elimination:

- MCMs that are not expected to address a water quality priority: For those MCMs that do not address, at least in part, a water quality priority, potential opportunities to focus the MCM on one or more water quality priorities may be considered and identified. If there are no reasonable opportunities to modify MCMs to focus on a water quality priority, the MCM may be considered for reduced implementation or elimination. It is expected that MCMs that address, at least in part,

#### Example Assessment and Justification

A stormwater program’s Illicit Discharges Program Element contains multiple control measures to detect and eliminate illicit discharges (IDs) and illicit connections (ICs), including dry weather field screening. Program staff recognized that dry weather field screening was a resource-intensive effort, but was not effective in identifying any consistent or definitive sources of IDs. Over multiple years of outfall screening, only a small percentage of screened outfalls exceeded action levels for only one parameter, and a definitive source was not identified. Program staff provided justification for discontinuing field screening and refocusing efforts on other more cost-effective mechanisms for detection and elimination of IDs (*e.g.*, public reporting and field crew inspections during regular maintenance activities). Bottom Line: This control measure was a good candidate for elimination since it was resource intensive with poor performance, and there were redundant program elements that were effective.

<sup>4</sup>Note that this example is completely hypothetical and no cities have identified IDIC as an MCM they plan to modify.

a water quality priority will continue to be implemented. However, customization may still be desirable to make the MCM more effective.

- MCMs that address a water quality priority, but are not an effective or efficient use of program resources: An assessment of the effectiveness of the MCM will be conducted to determine if the MCM makes effective and efficient use of program resources. Similar to the customization discussion for water quality priorities, reasonable opportunities should be explored to modify MCMs to make them more effective. Assessing the effectiveness of a MCM may require combining information from a variety of measurement tools, depending on what data are collected (*e.g.*, survey results in response to number of items turned in or changes in sales of certain products). If the effectiveness evaluation shows that a MCM is not effective or the costs are high compared to other MCMs that address the same water quality priorities, the Permittee may determine if the implementation strategy can be modified to be more effective, or if there are alternative measure(s) that may work better. Three potential tools for assessing effectiveness, in addition to the information that has been summarized in the annual reports, are described below. The appropriate evaluation method will depend on the type of MCM and the data collected.

The CASQA *Municipal Stormwater Program Effectiveness Assessment Guidance* (May 2007) (Guidance Document) provides a framework for evaluating the effectiveness of a stormwater program and/or the stormwater program elements. It includes multiple outcome levels that reflect a gradient from activity-based to water-quality based outcomes. The Guidance Document identifies the following outcome levels to help categorize and describe the results of the program implementation:

- Outcome Level 6 – Receiving Water Quality,
- Outcome Level 5 – Runoff Quality,
- Outcome Level 4 – Sources and Loads,
- Outcome Level 3 – Behavior,
- Outcome Level 2 – Awareness, and
- Outcome Level 1 – Implementation.

At this time, water-quality based outcomes (Outcome Levels 4-6) will likely be tenuous for most control measures or unable to be determined, so it is recommended that the evaluations of effectiveness focus on activity-based outcomes (Outcome Levels 1-3). CASQA is expected to release an updated version of its effectiveness assessment guidance manual in early to mid-2014. The updated guidance is expected to advance the concept and tools of effectiveness assessments for stormwater Program Managers. Once available, the tools from the new guidance can be utilized to support the evaluation of the MCM effectiveness.

Another approach to evaluating the effectiveness of source control programs, (WERF and ASCE 2012), is to estimate the potential load reduction associated with an MCM. This is accomplished by determining a participation rate for the target audience (*e.g.*, business outreach is performed at 90 percent of facilities) and a loading factor (*e.g.*, 50 percent of the pollutant load is reduced if there is 100 percent participation). The participation and loading factors are multiplied to estimate effectiveness with respect to reduction in loading of a pollutant that is released to the environment (*e.g.*, 45 percent effectiveness for the above examples). This strategy typically requires several assumptions to be made

and will be easiest to employ with MCMs that target specific pollutants. Similarly, a non-static approach that utilizes buildup/washoff approaches could be utilized.

A cost analysis can be used to determine if a MCM is an efficient use of program resources. A cost analysis helps evaluate the resources necessary to implement the MCM as compared to its effectiveness. The overall cost should take into account the time requirements of staff and the direct costs of any materials needed.

### **3.2.3 Other Institutional BMPs Under Consideration for EWMP**

There may be other institutional BMPs that are not considered as MCMs in the MS4 Permit, but that could provide significant water quality improvements for one or more WBPCs. The BCWVG will consider alternative institutional BMPs for inclusion in the EWMP. These BMPs could replace existing MCMs in the MS4 Permit that are reduced or eliminated, or could serve to reduce the need placed on structural BMPs to meet water quality objectives. Several additional institutional BMPs proposed within several existing Ballona Creek WMA plans, include but are not limited to the following:

- Water-use efficiency BMPs for dry weather runoff reduction,
- Support for new legislation to reduce allowable copper content in brake pads, and
- Rebates or other incentive programs for property owners to install rain barrels or disconnect downspouts.

## Section 4

# Reasonable Assurance Analysis Approach

### 4.1 Introduction

A key element of each EWMP is the RAA, which is used to demonstrate “that the activities and control measures...will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term” (Section C.5.b.iv.(5), page 63). The purpose of this section of the Work Plan is to describe the process to be used to conduct the RAA for the Ballona Creek EWMP. While the Permit prescribes the RAA as a quantitative demonstration that control measures (BMPs) will be effective, the RAA also provides an opportunity to utilize a modeling process to identify and prioritize potential control measures. In other words, the RAA approach for the Ballona Creek watershed will result in not only demonstrating the cumulative effectiveness of BMPs to be implemented, it will also support BMP *selection*. Additionally, the RAA considers the applicable compliance dates and milestones for attainment of the WQBELs and RWLs, and therefore supports BMP scheduling.

The modeling component of the RAA effort will begin in summer 2014, and the methodology described herein will likely evolve over the course of EWMP development. Also, the proposed RAA methodology is generally consistent with the RAA Guidelines document from the LARWQCB.

### 4.2 Modeling System to be used for the RAA

The Watershed Management Modeling System (WMMS) will be used to support the RAA. WMMS is identified in the Permit as a potential tool to conduct the RAA. The LACFCD, through a joint effort with USEPA, developed WMMS specifically to support informed decisions associated with managing stormwater. The ultimate goal of WMMS is to identify cost-effective water quality improvement projects through an integrated, watershed-based approach. The WMMS encompasses Los Angeles County’s coastal watersheds of approximately 3,100 square miles, representing 2,655 subwatersheds (Figure 4-1). As described in the following subsections, WMMS is a modeling system that incorporates three tools: (1) a watershed model for prediction of long-term hydrology and pollutant loading (LSPC – Loading Simulation Program C++), (2) a BMP model (SUSTAIN – **S**ystem for **U**rban **S**tormwater **T**reatment **A**nalysis and **I**ntegration), and (3) a BMP optimization tool to support regional, cost-effective planning efforts (NIMS). A total of 115 subwatersheds in the Ballona Creek watershed are represented by WMMS (Figure 4-2). To support evaluation of regional BMPs, these subwatersheds *will be further grouped* by “pour point” to receiving waters.



Figure 4-1 WMMS Model Domain, Representative Land Uses, and Slopes by Subwatershed

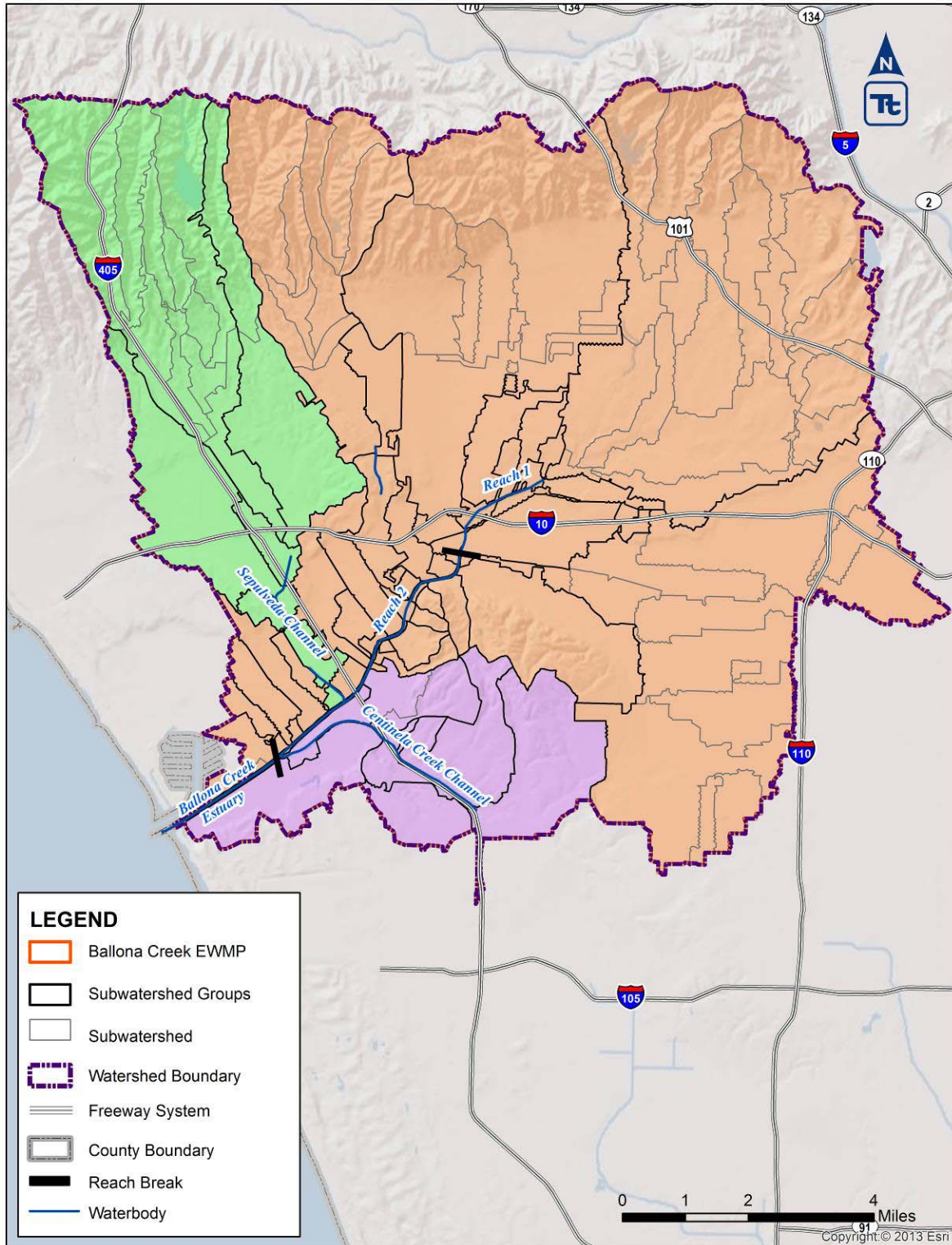


Figure 4-2 Ballona Creek Watershed and the 115 Subwatersheds in WMMS

WMMS is available for public download from LACFCD. The version of WMMS to be used for the Ballona Creek RAA has been customized through enhancements and modifications in several ways, including the following:

- Updates to meteorological records to represent the last ten years and to allow for simulation of the design storm,
- Calibration adjustments to incorporate the most recent ten years of water quality data collected at the nearby Ballona Creek mass emission station,
- Enhancements to LSPC to allow for simulation of non-structural BMPs,
- Enhancements to SUSTAIN to allow for representation of an expanded/modified BMP network,
- Application of a second-tier of BMP optimization using SUSTAIN, which replaces the NIMS component of WMMS,
- Optimization of BMP effectiveness for removal of bacterial pollutant (rather than metals only), and
- Updates to GIS layers, as available.

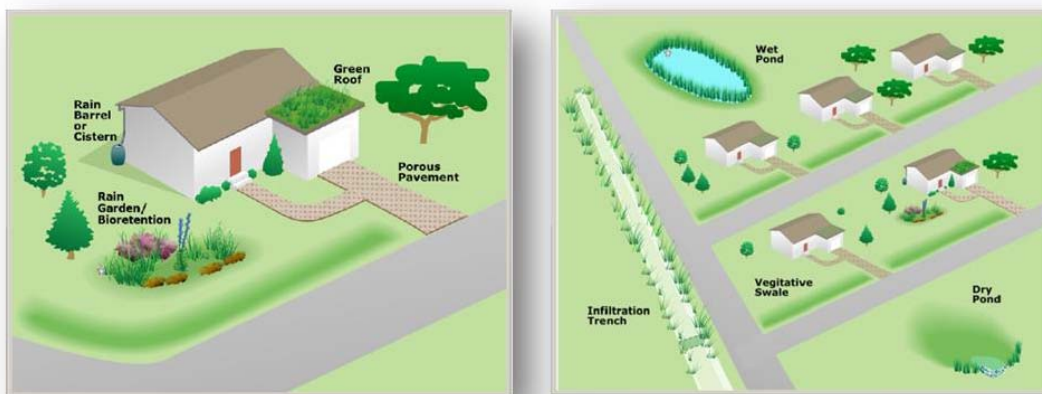
#### 4.2.1 Watershed Model - LSPC

The watershed model included within WMMS is the Loading Simulation Program C++ (LSPC) (Shen *et al.*, 2004; Tetra Tech and USEPA 2002; USEPA 2003). LSPC is a watershed modeling system for simulating watershed hydrology, erosion, and water quality processes, as well as in-stream transport processes. LSPC also integrates a GIS, comprehensive data storage and management capabilities, and a data analysis/post-processing system into a convenient PC-based Windows environment. The algorithms of LSPC are identical to a subset of those in the Hydrologic Simulation Program-FORTRAN (HSPF) model with selected additions, such as algorithms to dynamically address land use change over time. Another advantage of LSPC is that there is no inherent limit to the size and resolution of the model than can be developed, making it an attractive option for modeling the Los Angeles region watersheds. USEPA's Office of Research and Development (Athens, Georgia) first made LSPC available as a component of USEPA's National TMDL Toolbox (<http://www.epa.gov/athens/wwqtsc/index.html>). LSPC has been further enhanced with expanded capabilities since its original public release.

The WMMS development effort culminated in a comprehensive watershed model of the entire Los Angeles County area that includes the unique hydrology and hydraulics of the system and characterization of water quality loading, fate, and transport for all the key TMDL constituents (Tetra Tech 2010a, 2010b). The 115 subwatersheds in the Ballona Creek watershed as represented by WMMS are shown in Figure 4-2. Since the original development of the WMMS LSPC model, Los Angeles County personnel have independently updated the model with meteorological data through 2012, and refined the physical representation of the spreading grounds with higher resolution information.

### 4.2.2 Small-Scale BMP Model – SUSTAIN

The **S**ystem for **U**rban **S**tormwater **T**reatment and **A**nalysis **I**ntegration (SUSTAIN) was developed by the USEPA to support practitioners in developing cost-effective management plans for municipal stormwater programs and evaluating and selecting BMPs to achieve water resource goals (USEPA, 2009). It was specifically developed as a decision-support system for selection and placement of BMPs at strategic locations in urban watersheds. It includes a process-based continuous simulation BMP module for representing flow and pollutant transport routing through various types of structural BMPs. Users are given the option to select from various algorithms for certain processes (*e.g.*, flow-routing, infiltration, etc.) depending on available data, consistency with coupled modeling assumptions, and the level of detail required. Figure 4-3 shows images from the SUSTAIN model user interface and documentation depicting some of the available BMP simulation options in a watershed context.



**Figure 4-3 SUSTAIN Model Interface Illustrating Some Available BMPs in Watershed Settings**

SUSTAIN extends the capabilities and functionality of traditionally available models by providing integrated analysis of water quantity, quality, and *cost factors*. The SUSTAIN model in WMMS includes a cost database comprised of typical BMP component cost data from a number of published sources including BMPs constructed and maintained in LA County. SUSTAIN considers certain BMP properties as “decision variables,” meaning that they are permitted to change within a given range during model simulation to support BMP selection and placement optimization. As BMP size changes, so do cost and performance. SUSTAIN runs iteratively to generate a cost-effectiveness curve comprised of optimized BMP combinations within the modeled study area (*e.g.*, the model evaluates the optimal width and depth of certain BMPs to determine the most cost-effective configurations for planning purposes).

### 4.2.3 Large-Scale BMP Optimization Tool – NIMS

WMMS was specifically designed to dynamically evaluate effectiveness of BMPs implemented in subwatersheds for meeting downstream RWLs while maximizing cost-benefit. The structural BMP strategies included in WMMS primarily focus on (1) distributed green infrastructure BMPs and (2) large regional BMPs. With the number of alternative combinations of BMPs possible in a watershed, the ability to evaluate and compare the benefits and costs of each scenario (representing a combination of multiple BMPs) is highly desirable. As such, WMMS employs optimization based on an algorithm named Nonlinearity-Interval Mapping Scheme (NIMS) to navigate through the many potential scenarios of BMP strategies and identify the strategies that are the most cost-effective (Zou *et al.* 2010). While SUSTAIN performs optimization at the subwatershed-scale,

NIMS optimizes at the watershed-scale, supporting identification of the subwatersheds that should be targeted to most cost effectively achieve pollutant reduction goals. The RAA will employ a similar watershed-scale optimization approach as NIMS, except SUSTAIN will be leveraged because optimization at the jurisdictional level (rather than watershed-wide) is not readily achieved with NIMS. This optimization approach with SUSTAIN is referred to as “two-tiered”, meaning both subwatershed-scale and watershed-scale optimization is being conducted (see Figure 4-2 for the 115 subwatersheds in the Ballona Creek Watershed).

### 4.3 Overview of the RAA Process and Elements

The proposed RAA approach is a predictive quantitative process that includes the following components (see Figure 4-4 and the more detailed descriptions in the following subsections):

1. **Incorporates Water Quality Priorities and identifies Numerical Goals to address them** (Step 1): the Water Quality Priorities identified in Section 2 and corresponding Numeric Goals (*i.e.*, TMDL targets, WQBELs, and RWLs) represent RAA drivers. The estimated baseline/existing loading provides a reference point of comparison for measuring BMP performance and cost-effectiveness (*i.e.*, the difference ( $\Delta$ ) between the current loading and predicted loading after BMPs are implemented, and the cost (\$) of those BMPs).
2. **Identifies opportunities for BMP implementation in the watershed** (Step 2): the RAA inherently includes an exploratory element for evaluating BMP opportunities. The opportunities include BMPs under construction (committed BMPs), BMPs in planning documents (proposed BMPs), and additional BMPs identified through the iterative modeling process (potential BMPs).
3. **Evaluates effectiveness of potential BMPs on receiving water quality and jurisdictional loading** (Step 3): EWMPs are ultimately developed as “recipes for compliance” for each jurisdiction, but compliance is also assessed in the receiving waters. As such, assessment of the effectiveness of BMP scenarios requires consideration of averaging/simulation periods and determination of points where load reductions will be assessed.
4. **Identifies the combination of BMPs expected to attain Numeric Goals** (Step 4): the RAA will be an iterative process that evaluates different combinations of BMPs and quantifies their effectiveness. It is through the iterative modeling process that certain BMPs will be prioritized for inclusion in the EWMP.

**Supports scheduling to implement the BMPs over a timeline that addresses milestones cost-effectively** (Step 5): BMPs that offer the greatest immediate benefit for the lowest cost would be among those first identified and included in the early implementation phases. Furthermore, the pace at which BMPs are implemented will be dictated by applicable TMDL and EWMP milestones.

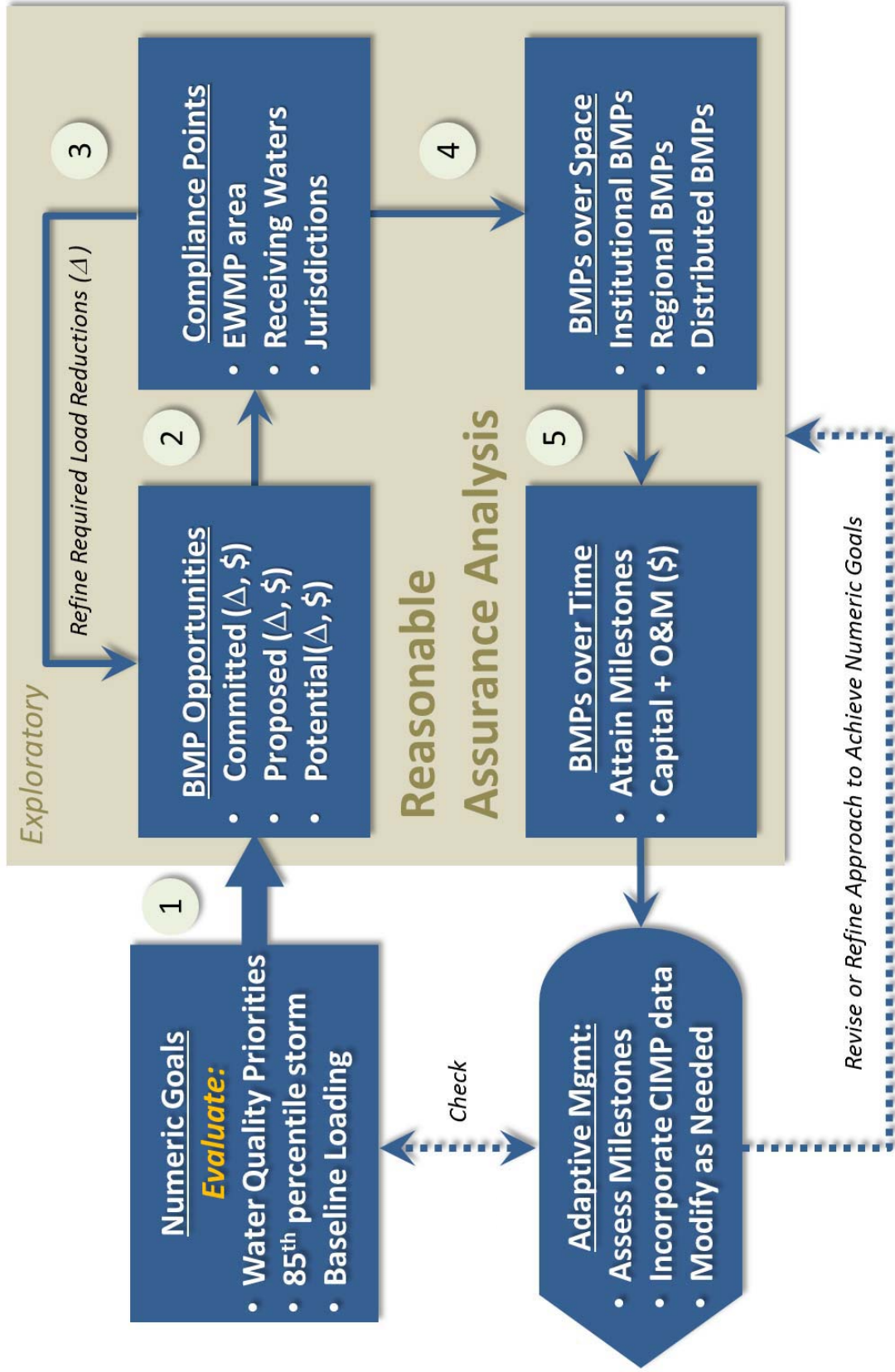


Figure 4-4 Conceptual Diagram of RAA Components

### 4.3.1 Establishing Numeric Goals to Address Water Quality Priorities (Step 1)

The Water Quality Priorities (WQ Priorities) are the primary driver of the EWMP and its BMPs. The Permit provides two types of Numeric Goals for addressing WQ Priorities (see Figure 4-5):

- Retain the standard runoff volume from the 85th percentile, 24-hour storm, and
- Achieve the necessary *pollutant load* reductions to attain RWLs or WQBELs.

At this time, the difference in these two compliance paths (in terms of number and types of BMPs) is unknown. As such, early in the RAA process, both types of Numeric Goals will be evaluated. If the Numeric Goal based on the 85th percentile storm is similar to the pollutant-based Numeric Goal, then the volume-based goal may be selected because [1] it offers increase compliance coverage (also applies to final TMDL limits) and [2] it represents a more comprehensive approach to addressing all Water Quality Priorities while also promoting increased sustainability of local water supplies.

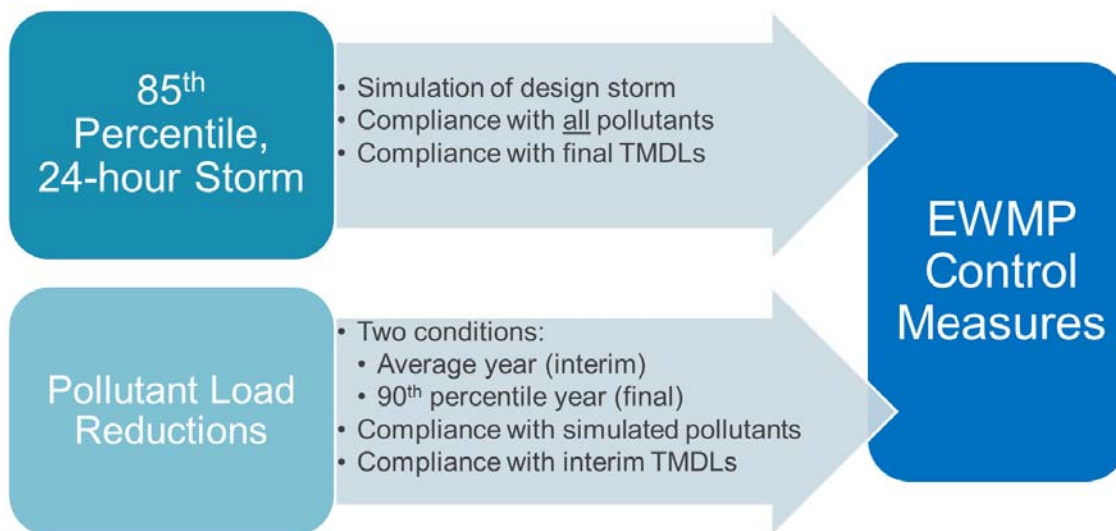


Figure 4-5 Two Types of Numeric Goals and EWMP Compliance Paths

#### 4.3.1.1 Numeric Goals based on 85th Percentile, 24-hour Storm Volume

The volume associated with the 85th percentile, 24-hour storm varies by subwatershed. Each of the 115 subwatersheds in the Ballona Creek watershed will have a unique volume, due to varying rainfall amounts and land characteristics (imperviousness, soils, slope, *etc.*). Shown in Figure 4-6 are the rainfall depths associated with the 85th percentile, 24-hour storm. These rainfall amounts will be used as boundary conditions in the LSPC watershed model, in order to predict the associated runoff volumes for each of the 115 subwatersheds in the Ballona Creek River watershed. These runoff volumes could potentially be attained with distributed BMPs (both retrofits and BMP implemented through LID ordinances) as well as Regional EWMP Projects.

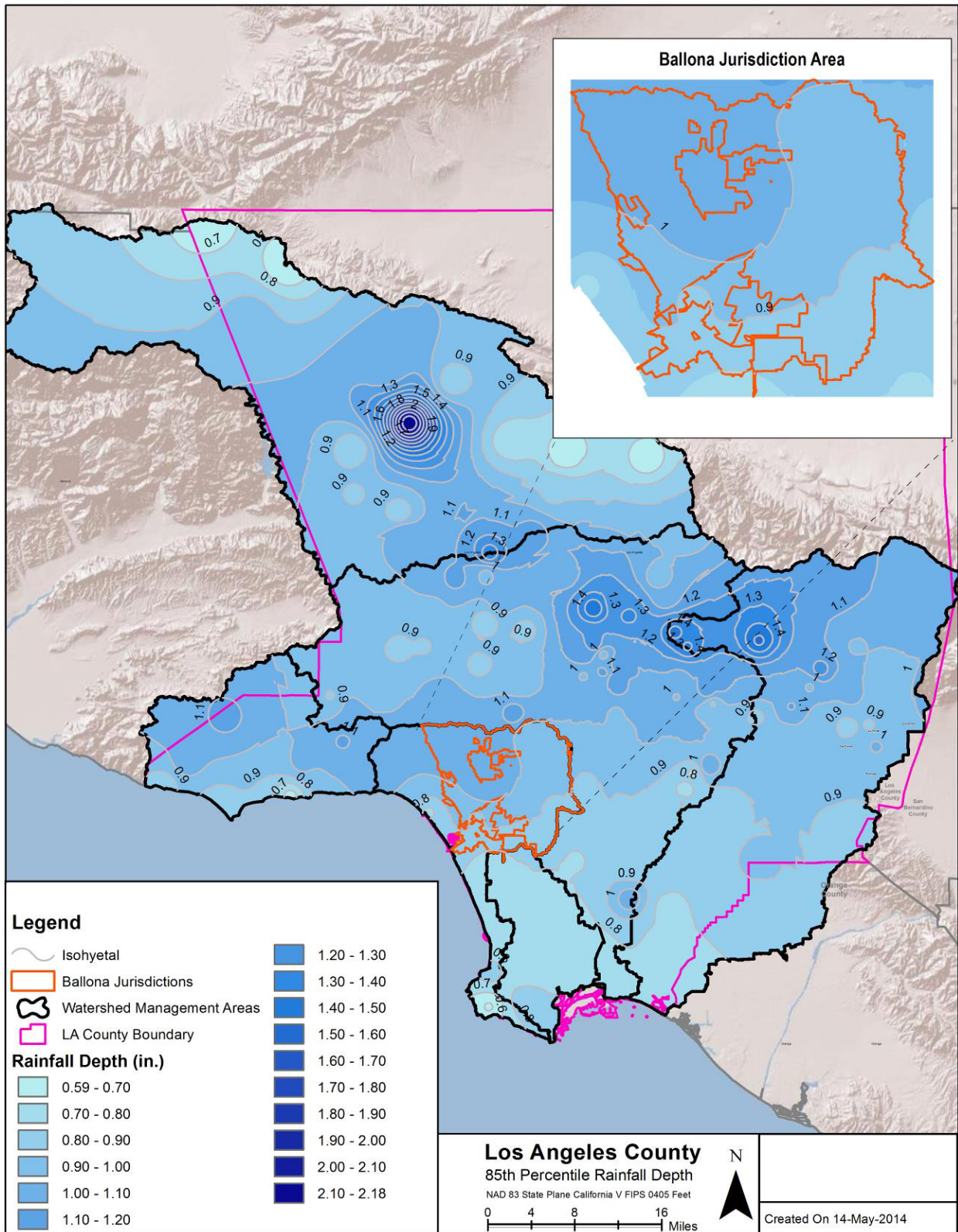


Figure 4-6 Rainfall Depths Associated with the 85th Percentile, 24-Hour Storm

#### 4.3.1.2 Numeric Goals based on Pollutant Load Reductions

The numeric goals based on pollutant load reductions are derived from WQBELs and RWLs. The required pollutant load reduction is the difference between current/baseline loading and the loading predicted to attain the WQBELs and RWLs. The baseline loading will be calculated for most WQ Priority pollutants by simulating the hydrology and water quality that occurred during average conditions and critical conditions, per the RAA Guidelines from the LARWQCB. At this time, it is anticipated the 90th percentile wet year will serve as a “default” critical condition for many pollutants, though several critical conditions may be evaluated. One possible exception is the Ballona Creek Toxics TMDL, which uses the average year as the critical condition.

The load-based Numeric Goals will assume each jurisdiction is held to the same percent load reduction for the critical pollutant associated with the compliance point of concern. With each jurisdiction held equitably to the same load reduction percentage, this ensures (1) the overall net load reduction for the entire watershed is consistent with the required TMDL reduction, and (2) that each contributing jurisdiction does an equal amount of effort to achieve this goal relative to the loads emanating from their jurisdiction. The result is that jurisdictions with higher existing loads also have more loads to reduce in order to achieve the same percent reduction as jurisdictions with lower existing loads.

The EWMP will prescribe responsibilities for each MS4 Permittee and thus a GIS analysis will be performed to support determination of the BMP planning areas for the EWMP. Caltrans facilities and parcels with facilities subject to general or individual industrial NPDES permits will be extracted prior to determination of baseline MS4 loading. Other parcels outside of the MS4 jurisdictions will also be excluded, including state and federally-owned land.

Many of the pollutants included in the WQ Priorities for the Ballona Creek EWMP are listed in Table 4-1, along with the approach for modeling them for the RAA. The LSPC watershed model in WMMS includes modules for modeling sediment, metals, bacteria, and nutrients (not all pollutants can be modeled cost-effectively). Pollutants in the WQ Priorities that do not fall directly in these classes will be indirectly modeled by associating them with a surrogate pollutant to which they are typically associated within the environment, as shown in Table 4-1. For example, certain toxic and legacy pollutants are typically associated with sediment, and therefore sediment reductions will be associated with toxics/legacy pollutant reductions.

The RAA will include many pollutants, yet it is likely that one or two pollutants are “limiting,” meaning that achieving the Numeric Goal applicable to those pollutants (through BMP implementation) will result in other pollutant also meeting their Numeric Goals. An analysis will be performed to determine which of the pollutants in Table 4-1 are limiting.

**Table 4-1 Approach for Modeling a Subset of Water Quality Priority Pollutants**

Pollutant Type	Pollutant	Modeled LSPC Pollutant Category			
		● Directly Modeled ○ Indirectly Modeled			
		Sediment	Metals	Nutrients	Bacteria
Metals	Copper		●		
	Lead		●		
	Zinc		●		
	Selenium		○		
	Cadmium		○		
	Silver		○		
Bacteria	Fecal Coliform				●
	Total Coliform				○
	<i>E. coli</i>				○
	Enterococcus				○
Historical Organics	Chlordane	○			
	DDT	○			
	PAH	○			
	PCBs	○			
Trash	Trash	n/a			
Nutrients <sup>1</sup>	Ammonia			○	
Sediment	Sediment	●			
-	Cyanide	○			

1. Ammonia portion estimated as a portion of Total Nitrogen (Directly Modeled)

n/a. Trash will not be modeled. The trash capture and quantification approach of the Trash TMDL will be used.

### 4.3.2 Identifying Opportunities for BMP Implementation (Step 2)

Opportunities for BMP implementation are driven by locations where BMPs are feasible/desirable. This step in the RAA process includes the following analyses:

- Distributed BMPs:** the RAA process includes a desktop GIS analysis to identify roads, public parcels and rights-of-way (see Figure 4-7). Then, screening criteria such as slope and soil contamination are used to exclude areas where BMP implementation is less feasible. The potential capacity available for distributed BMPs will be determined for each of the 115 subwatersheds (one capacity per subwatershed), based on the GIS screening. For example, the capacity available for green streets will be assessed based on the estimated length and width of roads in each subwatershed that met the screening criteria. Note that distributed BMPs on private parcels, as implemented through the LID ordinances, will be incorporated separately through redevelopment projections.
- Regional BMPs:** the process for identifying Regional EWMP Projects and regional BMPs is described in Section 3.1. The WMMS model will be used iteratively to assess the effect of potential Regional EWMP Projects, and evaluate which, if any, additional BMPs are needed.

Overall, the results of the BMP screening determine the capacity available on public parcels and rights-of-way for BMP deployment, and ultimately the amount of private land acquisition required (if any) to provide additional BMP capacity to meet the Numeric Goals.

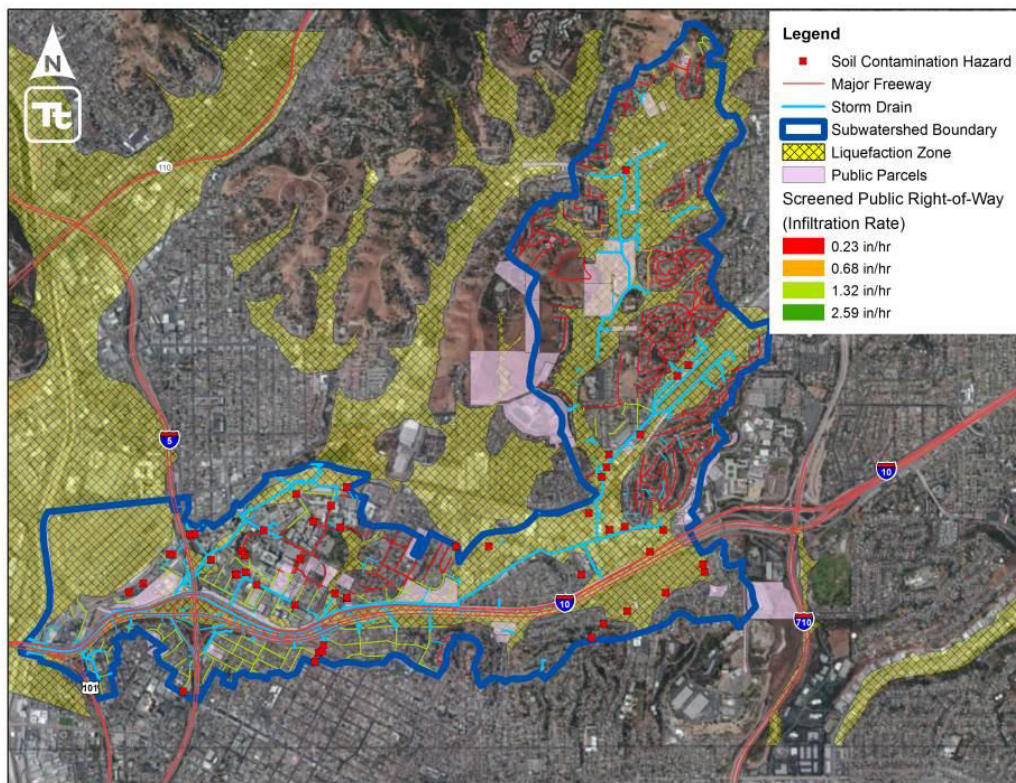


Figure 4-7 Example of GIS Data used to Screen for Regional and Distributed BMP Opportunities

### 4.3.3 Evaluating Effectiveness of Potential BMPs (Step 3)

BMP performance varies according to multiple factors including BMP type, location, size to drainage area ratio, contributing area imperviousness, etc. WMMS will be used to explore scenarios for BMPs to be included in the EWMP, including the following:

- **Institutional BMPs:** using the LSPC watershed model, the potential effectiveness of new or enhanced institutional BMPs including enhanced street sweeping, enhanced irrigation control (elimination of non-stormwater discharges through programmatic efforts), and brake pad replacement will be quantified. In addition, a small percent will be assumed to apply to all other “non-modeled” institutional BMP enhancements (*e.g.*, enhanced public outreach/education). Note that only enhancements will be modeled as it is assumed the effect on water quality of current level of institutional BMP implementation is captured in the water quality data utilized to establish baseline loading.
- **Distributed BMPs:** using the SUSTAIN BMP model, the potential effectiveness of distributed BMPs on volume reduction and pollutant loading from each of the 115 subwatersheds in the Ballona Creek watershed will be assessed.

- **Regional BMPs:** using the LSPC watershed model, the potential effectiveness of Regional EWMP Projects identified through the regional BMP selection process will be quantified (see Section 3.1). A generalized approach to incorporating Regional EWMP Projects into the RAA process is shown in Figure 4-8.

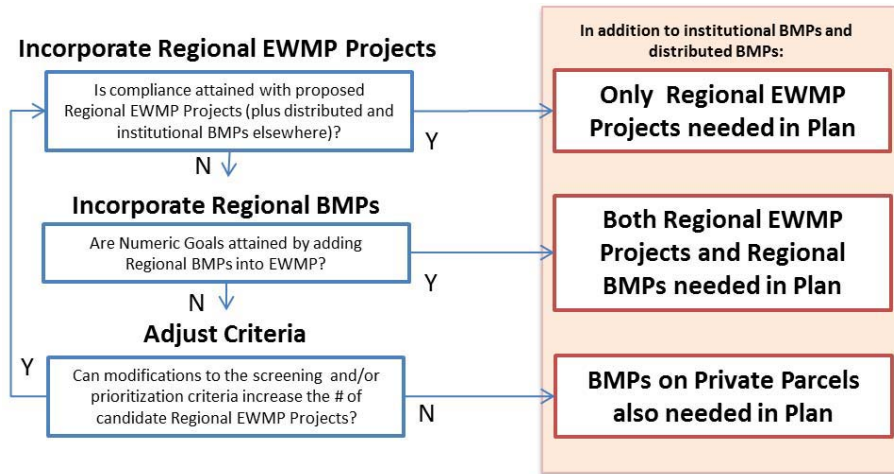


Figure 4-8 Generalized Process for Incorporating Regional EWMP Projects into the RAA

An illustration of using WMMS to identify required BMP capacities at the watershed-scale is shown in Figure 4-9. The figure shows the interaction between compliance points, distributed BMP capacities, and decisions on regional BMPs. The shading of the subwatersheds shows the capacity of distributed BMPs necessary to meet the Numeric Goals (darker blue indicates more BMP capacity to be implemented to meet Numeric Goals).

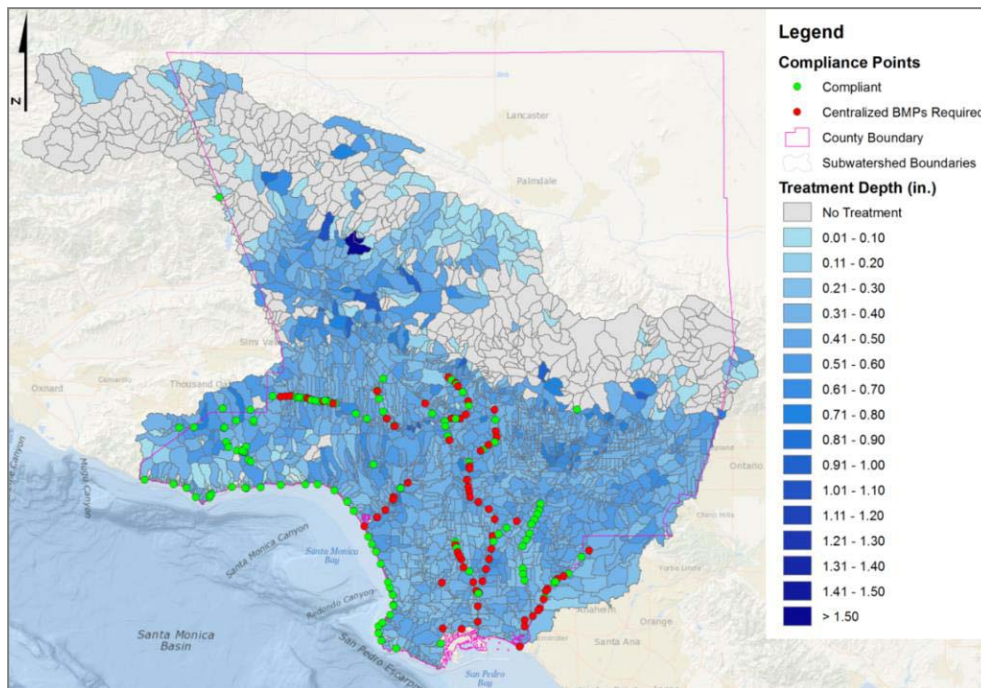


Figure 4-9 Hypothetical Example of WMMS Output Showing BMP Capacities by Subwatershed and Linkage to Receiving Water Conditions

The dots indicate whether RWLs are attained (green is attainment, red is non-attainment). In cases, where red dots are shown, the output indicates that additional BMPs are required upstream to attain RWLs.

The process for determining the necessary *cumulative* BMP capacity for both distributed and regional BMPs in each of the 115 subwatersheds in the Ballona Creek watershed depends on the type of Numeric Goal being addressed. As shown in Figure 4-10, the volume-based (85th percentile storm) approach, necessary BMP capacity is determined through a design storm analysis. For the load-based (pollutant reduction), the analysis is more intensive and will utilize in-stream receiving water assessment points to guide optimization of load-reduction BMPs. Attainment of load-based Numeric Goals will be evaluated based on [1] analysis of the subwatershed loadings and opportunities and [2] linkage to receiving water conditions through simulation of the representative year. The BMP treatment capacities determined to be needed will drive the number and type of BMPs selected for inclusion in the EWMP, as described in the next subsection. A key factor for selecting those BMPs is the preferences among the different BMP types.

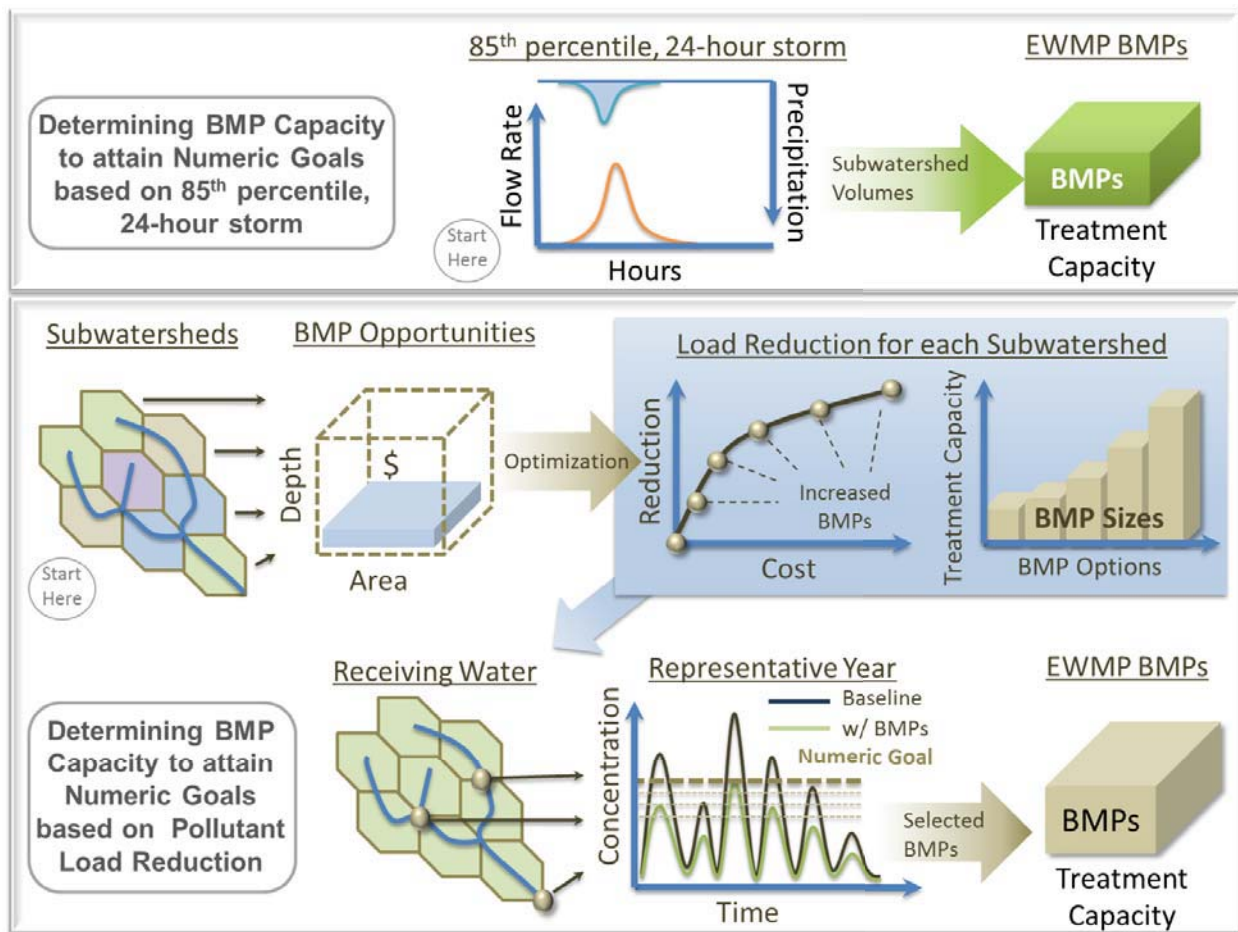
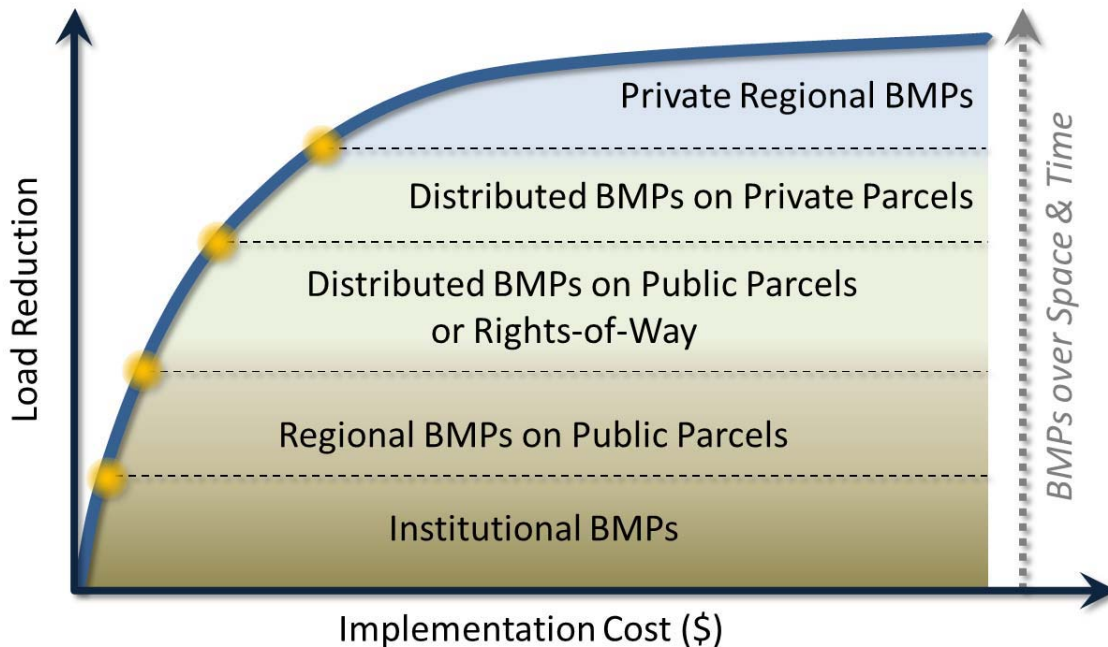


Figure 4-10 Illustration of the Process for Determining Required BMP Capacities for the RWMP using Volume-Based (Top Panel) and Load-Based (Bottom Panel) Numeric Goals

In general, the BMP preferences for the RAA, based on cost effectiveness, are shown in Figure 4-11. Notice the diminishing returns of load reduction associated with each additional BMP effort moving up the curve. These default preferences will be modified on a jurisdiction-by-jurisdiction basis, using a BMP Preferences Survey that has been distributed to the Ballona Creek WMA Group members. Some BCWMA Group members may choose to implement a BMP type, while others choose to not (regardless of the generalized approach below). As shown in Figure 4-11, the generalized approach to BMP preferences includes the following:



**Figure 4-11 Generalized Preferences for BMP Types to be Incorporated into the RAA and EWMP**

- **Minimum control measures and other institutional BMPs** (such as street sweeping) are often preferred because they can reduce flows and/or pollutants with little capital cost. Enhancement of institutional BMPs can provide an immediate load reduction at a relatively low cost. However, implementation of institutional BMPs often requires coordination with multiple departments with a municipality/agency.
- The preference of distributed versus regional BMPs is determined on a case-by-case basis.

**Regional BMPs** located on public parcels are often preferred because (1) there are little to no land acquisition costs (although there are institutional issues to overcome in a multijurisdictional setting), (2) publicly-owned land has fewer ingress/egress barriers for maintenance, and (3) regional facilities offer economies-of-scale in terms of treated drainage area. However, while they may have the lowest cost per pollutant load reduced, regional BMPs are also generally the most expensive *individual* projects. Finally, the regional BMPs that qualify as Regional EWMP Projects provide additional compliance coverage.

**Distributed BMPs** may be preferred because (1) they can often be implemented in the rights-of-way, (2) they often have multiple benefits including green infrastructure (*e.g.*, green streets) improving

aesthetics and enhancing property values and (3) the costs for *individual* projects are less than regional BMPs. Also many distributed BMPs will be implemented over time by private land owners, as required by LID ordinances. However, distributed BMPs may be limited in their ability to achieve the necessary volume/load reductions identified by the RAA. Also, it may take more time to treat the volume that regional BMPs can treat, because so many *individual* projects must be completed and the multitude of projects increases maintenance requirements.

There will likely be locations where the BMP capacity on public parcels is insufficient to attain the Numeric Goals, and BMP sites on private land will need to be incorporated into the EWMP. BMPs on private land will be avoided to the extent possible. However, where needed to support compliance, they will be slated later in the EWMP implementation schedule as described in Section 4.3.5.

#### 4.3.4 Identify the Combination of BMPs Expected to Attain Numeric Goals (Step 4)

The iterative RAA process will ultimately result in combinations of BMPs predicted by the customized WMMS to cost-effectively attain the Numeric Goals. As shown in Figure 4-12, the RAA output for a key Numeric Goal-milestone combinations will present BMPs in the following manner:

- Individual jurisdictions: each jurisdiction will have its own set of BMPs to attain the Numeric Goals (top of Figure 4-12). In addition, each jurisdiction will receive a detail BMP “recipe” for each subwatershed within its jurisdiction (bottom of Figure 4-12).
- Regional BMPs: the regional BMPs, including Regional EWMP Projects selected by the BCWMA Group according to the decision process (see Section 3.1), will be included. In the EWMP, these BMPs will be identified with details on location (cross streets) and concepts for the projects (capacity, footprint, etc.).
- Distributed BMPs: for each jurisdiction and each of the 115 subwatersheds, a total treatment capacity (“treatment depth” expressed in inches of runoff) to be achieved by distributed BMPs will be identified. Within that treatment capacity, recommendations for the types of distributed BMPs to implement will be provided. The BCWMA Group members will have flexibility to substitute one type of distributed BMP for another type during adaptive management, as long as the total treatment capacity is achieved for the subwatershed (bottom of Figure 4-12). The model identifies the capacities of distributed BMPs needed in each of the 115 subwatersheds, but does not identify specific locations (cross streets) for the distributed BMPs within a subwatershed. Also, there may be opportunities to leverage LID ordinances to achieve some distributed BMP capacity on private land (implemented by private developers).
- Institutional BMPs: for BCWMA Group members that choose to implement the modeled institutional BMPs (enhanced street sweeping, enhanced irrigation control, or brake pad replacement) those enhanced BMPs will be highlighted in the RAA output. In addition, a small percentage will be assumed to apply to all other “non-modeled” institutional BMP enhancements.

A unique set of BMPs will be identified for each interim and final TMDL and other EWMP milestones<sup>5</sup> that occur in the next two Permit cycles. In contrast, TMDL milestones that occur more than two Permit cycles in the future (but prior to the final TMDL compliance dates) will not be considered to the same level of detail. The BMP sequencing process is described in the next subsection.

<sup>5</sup> Because EPA TMDLs, Category 2 WQ Priorities, and Category 3 WQ Priorities do not have adopted TMDL implementation schedules, the EWMP shall propose milestones to address them.

Jurisdiction	Total Number of Regional BMPs	Total Capacity of Distributed BMPs				Non-structural BMPs/MCMs	
		Treatment Depth (inches)	Green streets (ft)	Bio-retention (ft <sup>3</sup> )	LID on private (ft <sup>3</sup> )	Enhanced Irrigation ordinances	Enhanced sweeping
City A	6	0.54	884,323	662,676	421,567	●	
City B	3	0.37	97,634	88,954	14,623	·	●
City C	2	0.34	56,534	47,453	7,890	●	
City D	2	0.12	45,323	39,494	6,375	●	
·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·
City Z	4	0.48	297,634	188,954	114,623		●

Jurisdictional Sub-area (sub-watershed)	Total Number of Regional BMPs	Total Capacity of Distributed BMPs				Non-structural BMPs/MCMs	
		Treatment Depth (inches)	Green streets (ft)	Bio-retention (ft <sup>3</sup> )	LID on private (ft <sup>3</sup> )	Enhanced Irrigation ordinances	Enhanced sweeping
1	1	0.54	4,323	675	567	●	
2	0	0	0	0	0	●	
3	1	0.24	534	453	890	●	
4	2	0	0	0	0	●	
·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·
115	0	0.68	8,634	4,954	3,623	●	

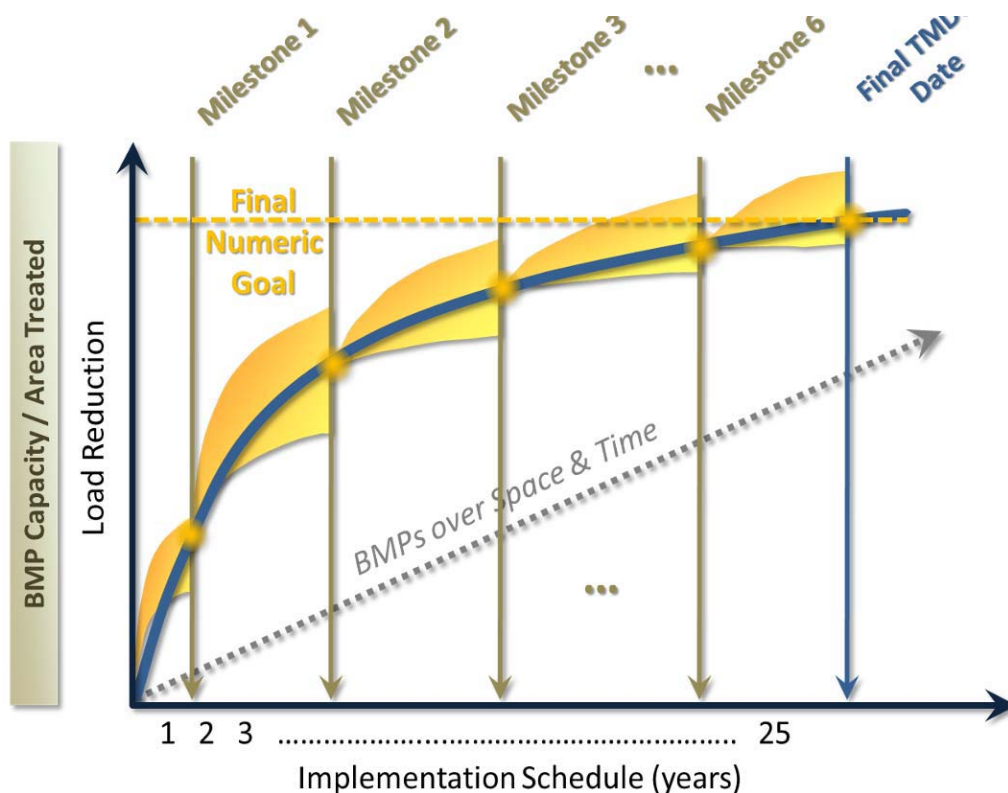
**Figure 4-12 Hypothetical Example of RAA Output for One Set of Numeric Goals for the Entire Watershed (Top Panel, One Row Per Jurisdiction) and for an Individual Jurisdiction (Bottom Panel, one Row per Subwatershed)**

The BMP numbers, types, capacities and locations are completely hypothetical, for illustration purposes only. Note the output (bottom) is separated into 115 subwatersheds. This type of output will be generated each interim and final TMDL milestones that occur in the next two Permit cycles.

### 4.3.5 Using the RAA to Support BMP Scheduling (Step 5)

The TMDL and EWMP milestones/compliance dates establish the pace at which BMPs must be implemented. Traditionally, the approach of TMDL implementation plans has been focused on *final* TMDL compliance, whereas the Permit compliance paths offered to EWMPs increase emphasis on *milestones*. For each interim and final TMDL milestones that occur in the next two Permit cycles, the combination of BMPs expected to result in attainment of the corresponding Numeric Goals will be identified by the RAA. In addition, the control measures to attain final TMDL Numeric Goals (even if beyond two Permit terms) will be identified to support long-term planning. An illustration of the BMP scheduling to account for milestones is shown in Figure 4-13.

The TMDL milestones for the Ballona Creek watershed are shown in Table 1-5, which illustrates the potentially complicated sequence based on multiple pollutants. For example, in the two years following submittal of the EWMP, there are milestones for both metals and toxics. As such, the limiting pollutant analysis will be important for establishing the pace of BMPs. Furthermore, dry weather milestones tend to occur earlier in the schedule than wet weather milestones. Because the structural BMPs implemented for wet weather will also be relied on for dry weather reductions, the pacing to attain dry weather milestones may be dependent on the pacing to attain wet weather milestones. It is important to note that Table 1-5 does not show the EWMP milestones (for Category 2 and 3 WQ Priorities), which will be established during EWMP development.



**Figure 4-13 Illustration of BMP Scheduling based on TMDL and EWMP Milestones**

A unique set of BMPs will be generated for each interim and final TMDL milestones that occur in the next two Permit cycles. The width of the yellow bands represents the relative cumulative BMP capacity to be constructed over the course of each milestone period. The BMPs being implemented during early versus late milestones will likely reflect the BMP preferences shown in Figure 4 11 (*i.e.*, BMPs on private land will be implemented late in the schedule).

## 4.4 Conclusions

The previous efforts used to develop WMMS will be leveraged to develop the RAA for the Ballona Creek EWMP. The EWMPs will drive innovative approaches for using models to select BMPs to address WQ Priorities based on an array of pollutants over implementation schedules that differ by pollutant. The models used to develop the RAA will also support adaptive management as additional monitoring data are collected and watershed conditions and regulatory requirements change. The RAA developed for the Ballona Creek EWMP will include detailed appendices to document the methods and assumptions used to select BMPs and demonstrate the BMPs will be effective.

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## Section 5

# EWMP Development

The EWMP Work Plan provides the foundation for the EWMP development process that will culminate in the submittal of the EWMP Plan to the LARWQCB by June 2015. The Work Plan reflects collaboration by the BCWVG members in the formulation of the EWMP Plan. The following subsections briefly describe the formal stakeholder process and EWMP development schedule and milestones.

Comments on the analysis conducted to develop the Work Plan as well as the approaches contained herein to complete the EWMP Implementation of the EWMP Work Plan will be considered in the EWMP. Specially, it is the intention of the BCWVG to follow up with LARWQCB staff and other interested parties.

### 5.1 Stakeholder Process

Members of the BCWVG participated in the Watershed Management Program Technical Advisory Committee and associated subcommittees. The goals of the BCWVG participation were to gain a better understanding of the perspectives of the interested parties as it related to County-wide considerations for EWMP development and to provide input on the considerations. Additionally, the BCWVG is participating in a EWMP stakeholder outreach process lead by the City of Los Angeles, which is intended to provide additional opportunities for all interested parties to provide meaningful input on their issues and concerns, and attempt to address them in the approach taken during EWMP development.

The BCWVG has identified stakeholders comprised of the following groups in an attempt to provide meaningful opportunities for collaboration and consensus building:

- Key city administrators, stormwater program managers, council districts, etc.,
- Environmental and community organizations, and
- Collaborating governmental agencies, *e.g.*, LARWQCB, US EPA Region 9, Caltrans, and the US Army Corps of Engineers.

A series of three EWMP workshops have been designed to engage the stakeholders by providing a common and consistent orientation to the EWMP process. The first workshop was held during the development of the EWMP Work Plan on April 10, 2014 and included not only the Ballona Creek watershed interested parties, but also four additional watersheds within the County: Upper Los Angeles River, Dominguez Channel, Santa Monica Bay Jurisdictions 2 and 3, and Marina del Rey.

The topics for each of the three workshops are as follows:

#### **1. Workshop No.1 – Input for the Draft EWMP Work Plans**

Date: April 10, 2014

The first workshop initiated the formal stakeholder process and the target audience was local and “regional” stakeholders. The agenda consisted of introducing the planned EWMP stakeholder process, explaining the relevance and context of the EWMP process, and soliciting input from stakeholders on regional and distributed projects to potentially include in the EWMP. The second half of this workshop included breakout sessions for watershed-specific discussions and project solicitation.

## **2. Workshop No.2 – Draft EWMP Work Plans/RAA Preliminary Results/Regional Projects**

Target date: October 2014

The second workshop will include a brief recap of the first workshop and highlights of feedback from stakeholders. As with the first workshop, the target audience for this workshop will be the local and regional stakeholders. The agenda will focus on a presentation of the EWMP Work Plan and explain how the input received at the first workshop was addressed in the draft plans. Preliminary results of the RAA will be presented and discussed. Potential regional projects and the GIS tools used for the initial screening will also be discussed. An advance notice, including a more detailed agenda, will be sent out to all stakeholders.

## **3. Workshop No.3 – Input into the Draft EWMP Plan**

Target date: Late 2014/Early 2015

The third workshop will be specific to the Ballona Creek watershed. The purpose of the third workshop will be to provide a summary of activities and work products to date, and to present the outline and key elements of the Draft EWMPs to solicit input. A primary objective of the third workshops will be to present the revised list of proposed regional projects and solicit input. The target audience will be local stakeholders; however, regional stakeholders will also be invited.

## **5.2 Project Schedule and Milestones**

The EWMP Plan will be developed in much the same manner as this initial Work Plan. Draft work memoranda will be developed to address key study elements as indicated in the schedule provided in the June 2013 NOI. These memoranda will describe the analysis conducted, results and recommendations for consideration by the Watershed Management Groups (WMG) members. The major tasks and associated milestone deadlines are summarized in Table 5-1.

**Table 5-1 Ballona EWMP Development Schedule**

Deliverable	Description	Milestone Deadline
Approach to Addressing Water Quality Priorities not Addressed by a State TMDL Memorandum	TMDLs adopted by the LARWQCB were incorporated into the Permit as WQBELs, RWLs, and a corresponding compliance schedule to meet final milestones TMDLs was adopted by USEPA. Other WBPCs not addressed by a LARWQCB TMDL do not have a commensurate set of interim and final milestones. The memorandum will describe the approach to establishing appropriate milestones for the EWMP.	July 2014 – March 2015
Regional Projects and Initial Screening Memorandum	This memorandum describes the process for assembling a comprehensive list of potential regional projects, and the screening process employed to ultimately identify regional projects to be included in the EWMP.	April 2014 – March 2015
Watershed Control Measures and RAA Results Memorandum	This memorandum describes the WMMS model development for the RAA and key modeling assumptions. It incorporates regional projects presented in the <i>Regional Projects and Initial Screening Memo</i> , summarizes the results of the RAA and provides a recommended program of implementation to achieve the water quality goals established in the <i>Water Quality Improvement Memorandum</i> .	September 2014 – March 2015
Project Schedules and Cost Estimates Memorandum	This memorandum summarizes the costs and schedules for proposed watershed control measures recommended in the <i>Watershed Control Measures and RAA Results Memorandum</i> that will serve as the basis for the recommended EWMP Plan.	December 2014 – March 2015
Draft EWMP Plan	Compiles relevant findings contained in the Work Plan as well as the content of the four memoranda prepared during the EWMP Plan development process.	February 2015 – May 2015
Final EWMP Plan (to the LARWQCB)	Describes the EWMP Plan that will serve as the basis for MS4 NPDES compliance by the BCWVG members.	May 2015 – June 28, 2015

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## Section 6

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