ENHANCED WATERSHED MANAGEMENT PROGRAM (EWMP)

for the Beach Cities Watershed Management Area (Santa Monica Bay and Dominguez Channel Watersheds)

Submitted to:
Los Angeles Regional Water Quality Control Board

Submitted by:
Beach Cities EWMP Group

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List of Acronyms

AED	Allowable Exceedance Days
ASBS	Area of Special Biological Significance
ASCE	American Society of Civil Engineers
BMP	Best Management Practice
Caltrans	California Department of Transportation
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CFCC	California Financing Coordinating Committee
cfs	Cubic feet per second
CIMP	Coordinated Integrated Monitoring Program
CML	Compliance Monitoring Location
CNT	Center for Neighborhood Technology
COMM	Commercial and Sport Fishing
Conc.	Concentration
CSMP	Coordinated Shoreline Monitoring Plan
CTR	California Toxic Rules
cu-ft	Cubic feet
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
DC	Dominguez Channel
DCu	Dissolved Copper
DDT	Dichloro-diphenyl-trichloroethane
DP	Dissolved Phosphorus as P
DZn	Dissolved Zinc
EIFD	Enhanced Infrastructure Financing Districts
EMC	Event Mean Concentration
EWMP	Enhanced Watershed Management Program
FAA	Federal Aviation Administration
FC	Fecal coliform
FIB	Fecal Indicator Bacteria
ft	Foot
GIS	Geographic Information System
GM	Geometric Mean
GO	General Obligation
gpm	Gallons per minute
HFS	High Flow Suspension
HSPF	Hydrological Simulation Program - Fortran
IBD	International BMP Database
IC/ID	Illicit Connection/Illicit Discharge
IDDE	Illicit Discharge Detection and Elimination
IGP	Industrial General Permit
in	inch
IND	Industrial Service Supply
in/hr	Inches per hour

IPM	Integrated Pest Management
J5&6	Jurisdictional Groups 5 and 6
JPA	Joint Powers Authority
LACFCD	Los Angeles County Flood Control District
LADWP	Los Angeles Department of Water and Power
LARWQCB	Los Angeles Regional Water Quality Control Board
lb	Pound
LID	Low Impact Development
LSPC	Loading Simulation Program C++
MAR	Marine Habitat
MB	Manhattan Beach
MCM	Minimum Control Measure
MEP	Maximum Extent Practical
MIGR	Migration of Aquatic Organisms
min	Minute
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MUN	Municipal and Domestic Supply
NAV	Navigation
NH3	Ammonia as N
NO3	Nitrate as N
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OM&R	Operations, Maintenance, and Replacement
PCB	Polychlorinated Biphenyl
PIPP	Public Information and Participation Program
RAA	Reasonable Assurance Analysis
RARE	Rare, Threatened, or Endangered Species
RB	Redondo Beach
REC-1	Water Contact Recreation
REC-2	Non-Contact Water Recreation
RWL	Receiving Water Limitation
SBPAT	Structural BMP Prioritization and Analysis Tool
SCCWRP	Southern California Coastal Watershed Research Project
SCPWA	Southern California Public Water Authority
SFPUC	San Francisco Public Utilities Commission
SHELL	Shellfish Harvesting
SMB	Santa Monica Bay
SMBBB	Santa Monica Bay Beaches Bacteria
SPWN	Spawning, Reproduction, and/or Early Development
SUSMP	Standard Urban Stormwater Management Program
SWMM	Storm Water Management Model, originally developed by USEPA
SWQDv	Storm Water Quality Design Volume
SWQPA	State Water Quality Protection Area

SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCu	Total Copper
TKN	Total Kjeldahl Nitrogen as N
TP	Total Phosphorus
TPb	Total Lead
TIE	Toxicity Identification Evaluation
TLR	Total Load Reduction
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TZn	Total Zinc
USEPA	United States Environmental Protection Agency
WARM	Warm Freshwater Habitat
WBPC	Water Body-Pollutant Combination
WDR	Waste Discharge Requirement
WER	Water Effects Ratio
WERF	Water Environment Research Foundation
WET	Wetland Habitat
WHAT	Web-Based Hydrograph Analysis Tool
WILD	Wildlife Habitat
WLA	Waste Load Allocation
WMA	Watershed Management Area
WMG	Watershed Management Group
WMMS	Watershed Management Modeling System
WMP	Watershed Management Program
WQBEL	Water Quality-Based Effluent Limitation
yr	Year

EXECUTIVE SUMMARY

PURPOSE AND OBJECTIVES

Following adoption of the 2012 Los Angeles Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit[1] (Permit), the Cities of Hermosa Beach, Manhattan Beach, Redondo Beach and Torrance, together with the Los Angeles County Flood Control District (LACFCD), collectively referred to as the Beach Cities Watershed Management Group (Beach Cities WMG) agreed to collaborate on the development of an Enhanced Watershed Management Program (EWMP) for the Santa Monica Bay (SMB) and Dominguez Channel Watershed areas within their jurisdictions (referred to herein as the Beach Cities EWMP Area). The Machado Lake Watershed is being addressed separately by the City of Torrance, and is not addressed in this EWMP.

This EWMP is intended to facilitate effective, watershed-specific Permit implementation strategies in accordance with Permit Part VI.C. Watershed Management Program. This EWMP:

- Summarizes watershed-specific water quality priorities identified by the Beach Cities WMG;
- Outlines the program plan, including specific strategies, control measures and best management practices (BMPs)[2], necessary to achieve water quality targets (Water Quality-Based Effluent Limitations [WQBELs] and Receiving Water Limitations [RWLs]); and
- Describes the quantitative analyses completed to support target achievement and Permit compliance.

In compliance with Section VI.C.4.b of the Permit, the Beach Cities WMG submitted to the Los Angeles Regional Water Quality Control Board (LARWQCB) a Notice of Intent (NOI) (**Appendix A**) to develop an EWMP on June 28, 2013, with a revised NOI submitted December 17, 2013 in response to comments received from LARWQCB staff. On March 27, 2014, the Beach Cities WMG received a letter from the Executive Officer of the LARWQCB approving the revised NOI submittal. In compliance with Section VI.C.4.c.iv of the Permit, the Beach Cities WMG then submitted a draft EWMP Work Plan to the LARWQCB on June 26, 2014. LARWQCB comments were not received on the EWMP Work Plan; therefore work proceeded on EWMP development consistent with the approach outlined in the EWMP Work Plan. The Beach Cities WMG was required by Section VI.C.4.c.iv of the Permit to submit a draft EWMP no later than June 30, 2015. This document has been developed to serve as the Beach Cities Draft EWMP and is consistent with the Work Plan previously submitted to the LARWQCB.

Watershed Management Programs (WMPs) are a voluntary opportunity afforded by Section VI.C.1 of the Permit for Permittees to collaboratively or individually develop comprehensive watershed-

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

[2] For simplification, the term “BMP” will be used to collectively refer to strategies, control measures, and/or best management practices. The Permit also refers to these measures as Watershed Control Measures.

specific control plans and are intended to facilitate Permit compliance and water quality target achievement. Enhanced WMPs (EWMPS) are WMPs which comprehensively evaluate opportunities for collaboration on multi-benefit regional projects that retain all non-stormwater runoff and runoff from the 85th percentile, 24 hour storm event while also achieving benefits associated with issues such as flood control and water supply. Where it is not feasible for regional projects to retain the 85th percentile 24 hour storm, the EWMP must demonstrate through a Reasonable Assurance Analysis, that applicable water quality targets should be achieved. Permittees within the Beach Cities Watershed Management Area (WMA) have elected to prepare an EWMP. The EWMP allows Permittees to collaboratively or individually develop comprehensive watershed-specific control plans which a) prioritize water quality issues, b) identify and implement focused strategies, control measures and BMPs, c) execute an integrated monitoring and assessment program, and d) allow for modification over time. In general, WMPs and EWMPs are intended to facilitate Permit compliance and water quality target achievement and goals that: 1) discharges from covered MS4s achieve applicable WQBELs and RWLs and do not include prohibited non-stormwater discharges; and 2) control measures are implemented to reduce the discharge of pollutants to the maximum extent practicable (MEP). Per Permit Section VI.C.1.e, WMPs and EWMPs are to be developed based on the LARWQCB's WMAs or subwatersheds thereof.

Consistent with Permit requirements, this EWMP is written to:

1. Be consistent with Permit provisions for EWMPs in Part VI.C.1.a.-f and Part VI.C.5-C.8;
2. Incorporate applicable State agency input on priority setting and other key implementation issues;
3. Provide for meeting water quality standards and other Clean Water Act obligations;
4. Include multi-benefit regional projects which retain stormwater from the 85th percentile 24 hour storm where feasible;
5. Include watershed control measures which achieve compliance with all interim and final WQBELs in drainage areas where retention of the 85th percentile 24 hour storm is infeasible with reasonable assurance;
6. Maximize the effectiveness of funding;
7. Incorporate effective innovative technologies;
8. Ensure existing requirements to comply with technology based effluent limitations and core requirements are not delayed; and
9. Ensure a financial strategy is in place.

This EWMP is applicable to the Beach Cities WMG EWMP Area, which consists of all of the incorporated MS4 areas of the cities of Redondo Beach, Manhattan Beach, Hermosa Beach and Torrance (excluding the Machado Lake Watershed) and includes the infrastructure of the LACFCD within those jurisdictions (**Figure ES-1**). This area includes portions of two distinct HUC-12 watersheds[3], Santa Monica Bay Watershed and Dominguez Channel Watershed, as summarized in **Table ES-1**. The Wylie Sump, Bishop Montgomery Basin, and Ocean Basin are all retention basins with no outlet. Therefore, their drainage areas have been excluded from the EWMP Reasonable Assurance Analysis (RAA). The Del Amo Retention Basin also has no outlet, and is sized to capture runoff from at least the 85th percentile, 24 hour storm event. Because the Del Amo Retention Basin is within the Machado Lake Watershed, this drainage area is excluded from the EWMP.

- The western portion of the Beach Cities EWMP Area consists of approximately 7,840 acres of land that drains to Santa Monica Bay (SMB). This accounts for 52% of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance, and the entirety of the City of Hermosa Beach. This portion of the study area is hereinafter referred to as the "SMB Watershed".
- The northeastern portion of the Beach Cities EWMP Area is tributary to Dominguez Channel (including Torrance Carson Channel) and is comprised of approximately 7,380 acres of land. This watershed accounts for 48% of the total Beach Cities EWMP Area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance. Storm drains from the Cities of Manhattan Beach and Redondo Beach drain through the City of Lawndale before discharging to Dominguez Channel. The City of Torrance's MS4 discharges directly to Dominguez Channel and Torrance Carson Channel (Torrance Lateral). Collectively, this portion of the study area is hereinafter referred to as the "Dominguez Channel Watershed".

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

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

The EWMP approach, including model selection, data inputs, critical condition selection, calibration performance criteria, and output types is consistent with the LARWQCB Reasonable Assurance Analysis Guidance Document (LARWQCB, 2014) and also leverages previous efforts where relevant models have already been developed. The individual water quality targets, BMPs, Reasonable Assurance Analyses, schedules, and costs for each of the watersheds are summarized in watershed-specific sections that follow.

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

SANTA MONICA BAY WATERSHED

Receiving waters for stormwater runoff from the Beach Cities EWMP Area were screened for water quality priorities by reviewing Total Maximum Daily Loads (TMDLs), the State's 303(d) list, and additional water quality data. Each identified water quality priority for a given receiving water body was categorized as a water body-pollutant combination. Water body-pollutant combinations were classified into one of three categories, in accordance with Section VI.C.5(a).ii of the Permit. **Table ES-2** presents the prioritized water body-pollutant combinations within the SMB Watershed portion of the Beach Cities EWMP Area. Water body-pollutant combinations categorized below are subject to change based on future data collected as part of the Coordinated Integrated Monitoring Program (CIMP) or other monitoring program.

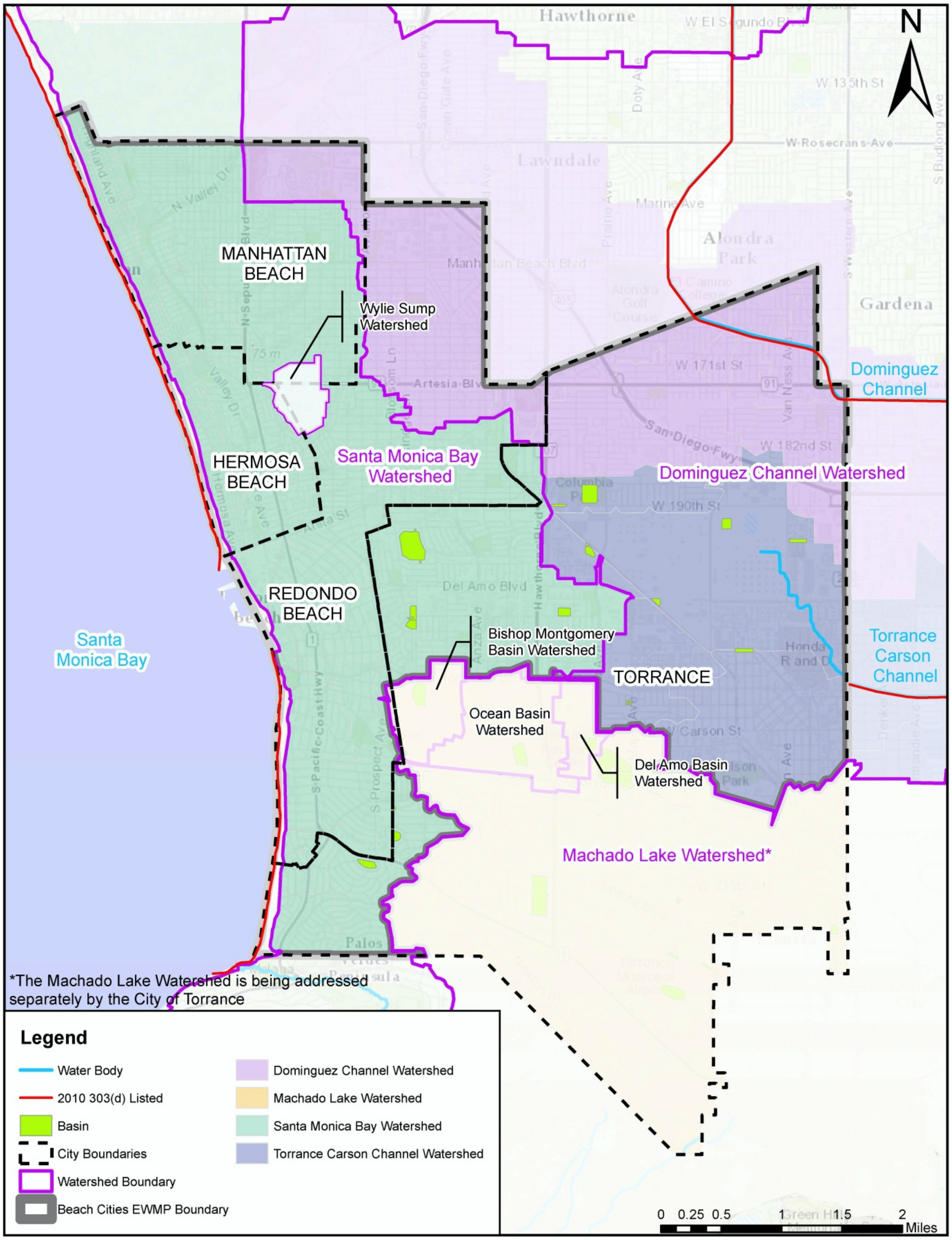

Figure ES-1. Beach Cities EWMP Area

Table ES-2. Water Body-Pollutant Combination Prioritization for the Santa Monica Bay Watershed

Category	Water Body	Pollutant	Reason for Categorization
1: Highest Priority	Santa Monica Bay Beaches	Dry Weather Bacteria	SMB Beaches Dry Weather Bacteria TMDL
		Wet Weather Bacteria	SMB Beaches Wet Weather Bacteria TMDL
	Santa Monica Bay	Trash/Debris	SMB Debris TMDL
		DDTs	SMB PCBs and DDT TMDL
		PCBs	SMB PCBs and DDT TMDL
2: High Priority	N/A	None	No other 303(d) listings exist for the Beach Cities portion of SMB
3: Medium Priority	N/A	None	Outfall and receiving water monitoring data are not available for the Beach Cities portion of SMB

The Reasonable Assurance Analysis was performed on bacteria in each of the defined analysis regions (**Figure ES-2**), as it was the controlling pollutant within the SMB Watershed. Bacteria targets are summarized in **Table ES-3**.

Trash was not modeled as part of the Reasonable Assurance Analysis; instead, the Reasonable Assurance Analysis describes how the Beach Cities WMG Agencies will comply with the TMDL through their Trash Monitoring and Reporting Programs which are aimed at meeting the zero trash discharge definition in the TMDL (see Section 2.2.2 herein).

The MS4 compliance targets for dichloro-diphenyl-trichloroethanes (DDTs) and polychlorinated biphenyls (PCBs) established in the Santa Monica Bay DDT & PCB TMDL were based on the assumption that the existing stormwater pollutant loads for DDT and PCBs were equal to or lower than what was needed to protect the Santa Monica Bay from these legacy pollutants (i.e., based on data used in the TMDL, no MS4 pollutant load reduction is expected to be required to demonstrate compliance with the TMDL). Therefore, it is assumed that no reductions in DDT and PCB loading from the Beach Cities WMG MS4s are required to meet the TMDL and reasonable assurance of compliance is assumed to be demonstrated without modeling. Monitoring of these pollutants will occur under the Beach Cities CIMP. Once three years of water quality data are collected, further source assessment will be considered and the categorization and prioritization of PCBs and DDT as MS4-related pollutants of concern will be reevaluated. If the CIMP monitoring data show that Beach Cities discharges are not in compliance with the TMDL, an RAA will be conducted for these pollutants and the EWMP will be revised accordingly.

Table ES-3. Water Quality Targets for Modeled Pollutants in the Santa Monica Bay Watershed

Water Body	Pollutant	RWL/WQBEL from the Permit	Note on Modeling Assumptions
Santa Monica Bay Beaches	Fecal Coliform (modeled as surrogate for all three fecal indicator bacteria in the Santa Monica Bay Beaches Bacteria [SMBBB] TMDL)	Allowable Exceedance Days per season per year (varies by beach Compliance Monitoring Location)	Used 90th percentile rain year (based on wet days) as the critical condition. Accounted for site-specific exceedance rates and the number of discharge days modeled for each Compliance Monitoring Location.

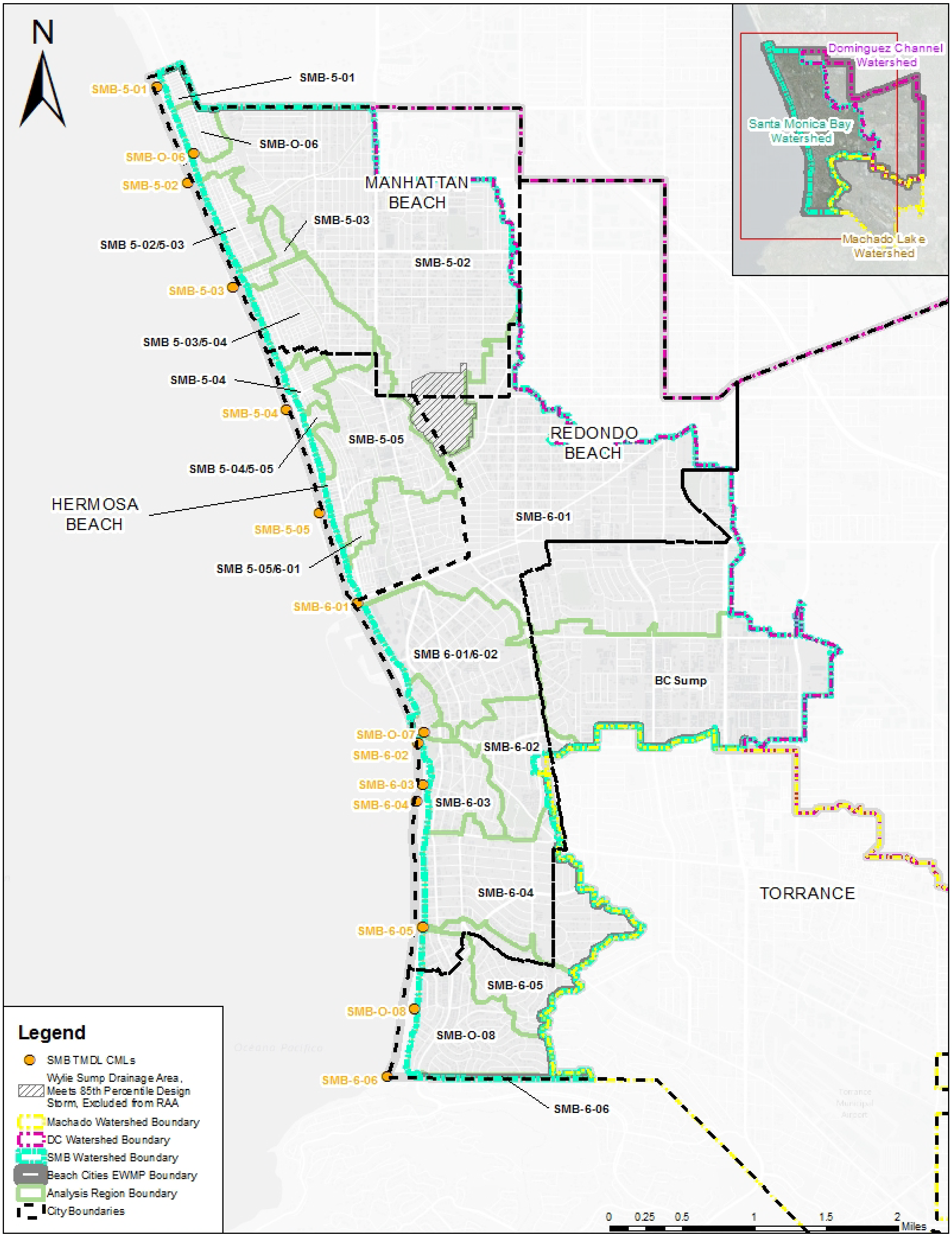

Figure ES-2. Analysis Regions and Compliance Monitoring Locations within the SMB Watershed portion of the Beach Cities EWMP Area

Targets – Santa Monica Bay

Target load reductions (TLRs) represent a numerical expression of the Permit compliance metrics that can be modeled and can serve as a basis for confirming, with reasonable assurance, that implementation of the proposed BMPs will result in attainment of the applicable TMDL-based WQBELs and RWLs in the Permit for Category 1 pollutants, or the Water Quality Objectives for Category 2 and Category 3 pollutants. For bacteria, the target load reductions are expressed as Allowable Exceedance Days (AEDs) per year. TLRs for both interim and final compliance deadlines are presented for all analysis regions including both open beach and point zero compliance monitoring locations (CMLs) (**Table ES-4**).

Table ES-4. TLRs for Fecal Coliform in the Santa Monica Bay Watershed

Analysis Region	Baseline Condition for the Critical Year			Allowed Condition for the Critical Year			Target Load Reduction for the Critical Year[6]			
	Annual Runoff	Average Pollutant Conc.[5]	Annual Pollutant Load	Annual Runoff	Average Pollutant Conc.[5]	Annual Pollutant Load	Interim Target Load Reduction		Final Target Load Reduction	
	(ac-ft)	(MPN/100mL)	(10^{12} MPN)	(ac-ft)	(MPN/100mL)	(10^{12} MPN)	Absolute Load (10^{12} MPN)	% of Baseline Annual Load	Absolute Load (10^{12} MPN)	% of Baseline Annual Load
SMB-5-01[1]	39	15,400	7.4	39	15,400	7.4	Interim target load reduction assessed on a watershed-wide basis		0	0%
SMB-O-06	90	20,700	23.0	90	20,700	23.0			0	0%
SMB-5-02	1516	28,600	534.8	1516	15,400	287.2			247.6	46.3%
SMB-5-02/ SMB-5-03[2]	123	23,000	34.9	123	23,000	34.9			0	0%
SMB-5-03[1]	65	36,200	29.0	65	36,200	29.0			0	0%
SMB-5-03/ SMB-5-04[2]	251	28,800	89.3	251	28,800	89.3			0	0%
SMB-5-04[1]	51	27,200	17.1	51	27,200	17.1			0	0%
SMB-5-04/ SMB-5-05[2]	37	17,800	8.2	37	17,800	8.2			0	0%
SMB-5-05[1]	472	31,400	182.8	472	31,400	182.8			0	0%
SMB-5-05/ SMB-6-01[2]	36	15,100	6.7	36	15,100	6.7			0	0%
SMB-6-01[3]	2118	27,100	706.6	2118	15,100	394.3			312.1	44.2%
BCSump[3]	1191	25,800	379.4	1191	13,700	201.4			178	46.9%
SMB-6-01/ SMB-6-02[2]	621	21,200	162.5	621	21,200	162.5			0	0%
SMB-6-02[1,4]	358	22,600	99.6	358	22,600	99.6			0	0%
SMB-6-03	206	24,500	62.2	206	24,500	62.2			0	0%
SMB-6-04	621	27,400	209.9	621	27,400	209.9			0	0%
SMB-6-05[1]	230	32,000	90.9	230	32,000	90.9			0	0%
SMB-O-08	425	26,500	138.9	425	26,500	138.9			0	0%
SMB-6-06[1]	19	28,000	6.7	19	28,000	6.7			0	0%
SMB Watershed	**8468**	**26,700**	**2789.9**	**8468**	**19,600**	**2052.1**	**368.9**	**13%**	**737.7**	**26%**

[1] Anti-degradation site.

[2] For the unmonitored tributary areas located in-between the CML tributary areas, TLRs were assigned from the geographically smaller of the two adjacent CML analysis regions.

[3] "BCSump" was defined as a separate analysis region for modeling purposes. The baseline load for "BCSump" analysis region was combined with the baseline load of the "SMB-6-01" analysis region to equal the total baseline load contributing to the SMB-6-01 CML ("SMB-6-01+BCSump").

[4] The drainage area to Outfall SMB-O-07 is encompassed by analysis region SMB-6-02; therefore SMB-O-07 was analyzed as part of analysis region SMB-6-02.

[5] The average pollutant concentration is estimated as the total pollutant load divided by total runoff volume.

[6] RAA demonstration is made based on the achievement of the TLR values in terms of absolute load removed by the proposed suite of BMPs in each analysis region. The allowed conditions in terms of runoff volume and concentration are shown for informational purposes only.

Nine CMLs were assigned zero TLRs to reflect their historic good water quality (consistent with anti-degradation-based wet weather allowable exceedance days). Although the SMBBB TMDL requires only the maintaining of beach water quality at anti-degradation compliance locations, the Beach Cities EWMP will seek to implement nonstructural and Low Impact Development (LID)-based BMPs within the SMB portion of their EWMP area; this will further protect and potentially improve water quality at these beaches and is consistent with the Jurisdictional Group 5 and 6 (J5&6) Implementation Plan (Geosyntec Consultants, 2011).

BMPs – Santa Monica Bay

EWMPs offer Permittees the opportunity to identify and implement focused strategies, control measures and BMPs to achieve applicable water quality targets (WQBELs and RWLs) and to reduce the discharge of pollutants to the maximum extent practicable. In order to demonstrate reasonable assurance, BMPs were identified and prioritized. Prioritization was based on cost (low cost BMPs were prioritized); BMP effectiveness for the pollutants of concern (BMPs that had greater treatment efficiency for the specific pollutants of concern were prioritized); and implementation feasibility as determined by the Beach Cities agencies. In general, nonstructural (e.g., programmatic) BMPs were prioritized over structural BMPs due to their lower relative cost.

The following is an overview of the types of BMPs contemplated in this EWMP within the Santa Monica Bay Watershed.

<u>Programmatic BMPs</u>: These source controls include a combination of BMPs such as new or enhanced pet waste controls (ordinance, signage, education/outreach, mutt mitts, etc.), Clean Bay Restaurant Program, human waste source tracking and remediation (e.g., leaking sewer investigations including implementation of each agency's Sanitary Sewer Management Plan consistent with Statewide Waste Discharge Requirements [WDRs], etc.), enhanced street sweeping (e.g., 100% vacuum sweepers, increased frequency, posting of 'No Parking' signs for street sweeping, etc.), increased catch basin and storm drain cleaning, and other new or enhanced nonstructural BMPs that target the pollutants addressed in this EWMP.

<u>Public Retrofit Incentives</u>: These BMPs include programs directed at incentivizing the public to decrease the amount of stormwater runoff from their property, specifically via downspout disconnection programs that redirect roof runoff to vegetated or otherwise pervious areas.

<u>Redevelopment</u>: Beginning in 2001, redevelopment projects were required by the Permit (via the Standard Urban Stormwater Management Program [SUSMP]) to incorporate stormwater treatment BMPs into their projects if their project size exceeded specified thresholds. The 2001 MS4 Permit SUSMP redevelopment requirements were applied between 2003 (the point at which the Bacteria TMDL was implemented) and 2015 for the SMB EWMP area. Additionally, the 2012 MS4 Permit established new criteria for redevelopment projects, requiring certain sized projects to capture, retain, or infiltrate the 85th percentile design storm or the 0.75-inch design storm, whichever is greater, via the implementation of LID BMPs. These were taken into account as well.

<u>Non-MS4 Permitted Parcels or Areas</u>: In general, this BMP assumes that regulated parcels/areas would be in compliance with the NPDES Statewide Storm Water Permit Waste Discharge

Requirements (WDRs) from State of California Department of Transportation (Order No. 2012-0011-DWQ, NPDES No. CAS000003) and the California NPDES General Permit for Storm Water Discharges Associated with Industrial Activities (Industrial General Permit [IGP], Order 2014-0057-DWQ).

Structural BMPs: Both existing and proposed regional and distributed structural BMPs are included in this EWMP to address water quality targets in the SMB Watershed. Because bacteria were identified as the controlling pollutant of concern, infiltration BMPs were prioritized as they are most effective for addressing bacteria. General design criteria for proposed structural BMPs are summarized in **Table ES-5**.

Table ES-5. Proposed Structural BMPs in the Santa Monica Bay Watershed

Analysis Region	Project Name[1]	Description	Design Storage Volume (cu-ft)	Tributary Area (acres)
SMB-5-02	Manhattan Beach Infiltration Trench[3]	Located along the coast of Manhattan Beach, the sub-surface trench has a potential surface area of 2.2 ac, an average depth of 2.1 ft with a diversion rate of 160 cfs and an infiltration rate under the trench of 13 in/hr.	198,000	1,475[2]
SMB-5-02	Distributed Green Streets	The distributed green streets, proposed to address runoff from 5% of single family residential, multi-family residential, and commercial land uses, are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	205,500	66
SMB-6-01	Hermosa Beach Infiltration Trench	Located along the coast of Hermosa Beach, the sub-surface trench has a potential surface area of 0.2 ac, an average depth of 1.7 ft, a diversion flowrate of 25 cfs, and an infiltration rate of 12.5 in/hr.	13,300	2,000[2]
SMB-6-01	Hermosa Beach Greenbelt Infiltration[3]	Located in Hermosa Beach, between Valley Dr. and Ardmore Ave., the sub-surface trench has a potential surface area of 1.5 ac, an average depth of 5 ft, a diversion flowrate of 48 cfs, and an assumed infiltration rate of 12 in/hr.	319,000	1,800[2]
SMB-6-01	Park #3	Located northwest of Blossom Lane and 190th street, the sub-surface infiltration basin has a potential surface area of 0.4 ac, an average depth of 5ft , a diversion flowrate of 13 cfs, and an infiltration rate of 1 in/hr.	87,100	1,430[2]
SMB-6-01	Distributed Green Streets	The distributed green streets, proposed to address runoff from 25% of single family residential, multi-family residential, and commercial land uses, are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	605,200	190

1 All projects listed in this table were modeled in the RAA and sized to collectively comply with the WQBELs and RWLs in combination with other existing and proposed structural and non-structural BMPs
2 This includes upstream BMPs and associated tributary drainage areas
3 Alternative project locations have also been identified

Distributed green streets BMPs are proposed and were modeled as part of the Reasonable Assurance Analysis within select analysis regions, at analysis region-specific implementation levels (e.g., runoff from 14% of single family residential, multi-family residential, and commercial land uses would be treated by green streets BMPs). It should be noted that if at any time in the future, specific distributed green streets or regional/centralized BMPs are found to be infeasible for implementation, alternative BMPs or operational changes will be planned within the same subwatershed and within the same timeline, to meet an equivalent subwatershed load reduction. In addition, if monitoring data indicate that more easily implementable, alternative BMPs can provide equivalent (or superior) load reductions, these alternative BMPs may be implemented at the discretion of the WMG Agencies. The Beach Cities WMG will provide timely notification and project details to the Regional Board in the case of any project substitutions.

Demonstration of Compliance – Santa Monica Bay

To demonstrate wet weather compliance, a Reasonable Assurance Analysis was conducted in which the following steps were taken:

1. For each analysis region, develop TLRs for 90th percentile year based on Permit requirements and LARWQCB guidance;
2. Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future:
    a. Assume a load reduction for <u>non-modeled non-structural (or programmatic) BMPs</u> (five percent of baseline pollutant load);
    b. Calculate load reductions for <u>public incentives for retrofits on private property</u> (e.g., downspout disconnects) and <u>redevelopment (e.g., low impact development requirements)</u>;
    c. Calculate load reductions attributable to anticipated <u>new permit compliance activities of non-MS4 Permittees</u> (e.g., Industrial General Permit holders and California Department of Transportation [Caltrans]); and
    d. Calculate load reductions for <u>proposed regional BMPs</u> that were identified in existing plans;
3. Compare total estimated load reduction for each analysis region with the TLRs; and
4. Meet the TLRs by backfilling the remaining load reduction with <u>new regional or distributed green streets BMPs</u>, and with green streets that address a certain percentage of specific developed land uses.

Results of the Reasonable Assurance Analysis for each analysis region in the SMB watershed are presented in **Table ES-6** below. The values provided correspond to the load reductions attributable to the BMP types following the applicable final and interim compliance deadlines. As shown, the final TLR is met in all SMB watershed analysis regions with varying applications of non-structural and regional BMPs. The interim 50% TLR is met through a combination of nonstructural and existing regional BMPs.

For dry weather bacteria compliance, a qualitative analysis was conducted to show compliance at each of the CMLs. Many CMLs have an effective diversion such that they are consistently operational, well maintained, and sized to effectively eliminate discharges to the surf zone during year-round dry weather days. For the remaining smaller outfalls a systematic screening conducted in 2002 demonstrated that there was no discharge to the wave wash during summer dry weather from these storm drains. Rescreening of outfalls will be conducted as part of the Non-Stormwater Screening and Monitoring in the Coordinated Integrated Monitoring Program and will include both summer dry weather and winter dry weather screening. For the CMLs in the SMB Watershed that have anti-degradation based allowed exceedance days for both winter-dry and summer-dry weather, reasonable assurance is assumed to be demonstrated through the basis that the TMDL established their allowed exceedance days based on historic conditions (i.e., no water quality improvements were necessary).

Table ES-6. Santa Monica Bay Watershed – Fecal Coliform Reasonable Assurance Analysis Results – Interim and Final Compliance

Analysis Region	Implementation Benefits (average load reduction as % of baseline load for critical year)							TLR	Compliance (TLR Met)?
	Non-Structural BMPs (Non-Modeled)	Public Retrofit Incentives + Redevelopment	Non-MS4	Regional BMPs	Distributed BMPs	Distributed BMP Implementation Level	Estimated Load Reduction		
SMB-5-01	5%	2%	0%	0%	0%	N/A	**7%**	**0%**	Yes
SMB-O-06	5%	2%	0%	0%	0%	N/A	**7%**	**0%**	Yes
SMB-5-02	5%	4%	2%	36%	3%	5% MFR/COM/SFR	**50%**	**46%**	Yes
SMB-5-02/5-03	5%	3%	0%	0%	0%	N/A	**8%**	**0%**	Yes
SMB-5-03	5%	3%	0%	0%	0%	N/A	**8%**	**0%**	Yes
SMB-5-03/5-04	5%	4%	0%	5%	0%	N/A	**15%**	**0%**	Yes
SMB-5-04	5%	5%	0%	1%	1%[2]	N/A	**12%**	**0%**	Yes
SMB-5-04/5-05	5%	4%	0%	2%	0%	N/A	**11%**	**0%**	Yes
SMB-5-05	5%	4%	5%	3%	0%	N/A	**18%**	**0%**	Yes
SMB-5-05/6-01	5%	3%	0%	2%	0%	N/A	**10%**	**0%**	Yes
SMB-6-01+ BCSump[1]	5%	3%	3%	33%	2%	25% MFR/COM/SFR	**46%**	**45%**	Yes
SMB-6-01/6-02	5%	2%	4%	0%	0%	N/A	**11%**	**0%**	Yes
SMB-6-02	5%	3%	1%	4%	0%	N/A	**13%**	**0%**	Yes
SMB-6-03	5%	3%	5%	10%	0%	N/A	**23%**	**0%**	Yes
SMB-6-04	5%	4%	3%	0%	0%	N/A	**12%**	**0%**	Yes
SMB-6-05	5%	3%	6%	0%	0%	N/A	**15%**	**0%**	Yes
SMB-O-08	5%	2%	0%	0%	0%	N/A	**7%**	**0%**	Yes
SMB-6-06	5%	5%	0%	0%	0%	N/A	**10%**	**0%**	Yes
Final Compliance Deadline (2021)	**5%**	**3%**	**3%**	**21%**	**1%**	**N/A**	**33%**	**26%**	**Yes**
Interim Compliance Deadline (2018)	**2.5%**	**0.8%**	**1.5%**	**9.6%**	**0%**	**N/A**	**14.4%**	**13%**	**Yes**

[1] "BCSump" was defined as a separate analysis region for modeling purposes. The baseline load for "BCSump" analysis region was combined with the baseline load of the "SMB-6-01" analysis region to equal the total baseline load contributing to the SMB-6-01 CML ("SMB-6-01+BCSump").

[2] Distributed green street BMP load reduction in SMB-5-04 is a result of the existing filter/infiltration boxes retrofitted on the east side of Hermosa Avenue in the City of Hermosa Beach.

Schedule – Santa Monica Bay

In order to meet the compliance deadlines for the water body-pollutant combinations discussed above based on load reduction projections in the Reasonable Assurance Analysis, the proposed structural BMPs within the SMB Watershed would be implemented as described in **Figure ES-3**.

Figure ES-3. Proposed Project Sequencing in the Santa Monica Bay Watershed

COLOR KEY	Funding Phase	Design Phase	Construction/ Installation Phase

BMP Location/Name		Timeline						
		2015	2016	2017	2018	2019	2020	2021
Santa Monica Bay Watershed	Catch basin retrofits for trash							
	Manhattan Beach Infiltration Trench[1]							
	Manhattan Beach Green streets application in SMB-5-02							
	Hermosa Beach Greenbelt Infiltration[1]							
	Hermosa Beach Infiltration Trench							
	Redondo Beach Park #3							
	Green streets application in SMB-6-01 for All Cities							

[1] Alternative project locations have also been identified

Dominguez Channel Watershed

Within the Dominguez Channel Watershed, water body-pollutant combinations were classified into one of three categories, in accordance with Section VI.C.5(a).ii of the Permit. **Table ES-7** presents the prioritized water body-pollutant combinations within the Dominguez Channel Watershed portion of the Beach Cities EWMP Area. Water body-pollutant combinations categorized below are subject to change based on future data collected as part of the CIMP or other monitoring program.

Table ES-7. Water Body-Pollutant Prioritization for the Dominguez Channel Watershed

Category	Water Body	Pollutant	Reason for Categorization
1: Highest Priority	Dominguez Channel (including Torrance Lateral) [1]	Toxicity	Dominguez Channel Toxics TMDL
		Total Copper	Dominguez Channel Toxics TMDL
		Total Lead	Dominguez Channel Toxics TMDL
		Total Zinc	Dominguez Channel Toxics TMDL
	Dominguez Channel Estuary	Total Copper	Dominguez Channel Toxics TMDL
		Total Lead	Dominguez Channel Toxics TMDL
		Total Zinc	Dominguez Channel Toxics TMDL
		Cadmium	Dominguez Channel Toxics TMDL
		DDT	Dominguez Channel Toxics TMDL
		Total PAHs	Dominguez Channel Toxics TMDL
		PCBs	Dominguez Channel Toxics TMDL
2: High Priority	Dominguez Channel (including Torrance Lateral)	Indicator Bacteria	303(d) List
		Ammonia	303(d) List
	Dominguez Channel Estuary	Indicator Bacteria	303(d) List
		Ammonia	303(d) List
3: Medium Priority	Dominguez Channel (including Torrance Lateral)	Cyanide	Historic exceedances of the California Toxics Rule (CTR) continuous concentration water quality objective (5.2 ug/L)
		pH	Historic exceedance of the Basin Plan Objective (6.5 – 8.5)
		Selenium	Historic exceedances of the CTR continuous concentration water quality objective (5.0 ug/L)
		Mercury	Historic exceedances of the CTR human health criterion for organisms only (0.051 ug/L)
		Cadmium	Historic exceedances of the CTR continuous concentration water quality objective (2.2 ug/L)
	Dominguez Channel Estuary	Arsenic	Historic exceedances of the Effects Range-Low (ERL) proposed sediment quality guidelines from the National Status and Trends database (8.2 mg/kg sediment)
		Chromium	Historic exceedances of the ERL proposed sediment quality guidelines from the National Status and Trends database (81 mg/kg sediment)
		Silver	Historic exceedances of the CTR continuous saltwater objective (1.9 ug/L)
		Nickel	Historic exceedances of the CTR maximum saltwater objective (74 ug/L) and the CTR continuous saltwater objective (8.2 ug/L)
		Mercury	Historic exceedances of the ERL proposed sediment quality guidelines from the National Status and Trends database (0.15 mg/kg sediment) and the CTR human health criterion for organisms only (0.051 ug/L)
		Thallium	Historic exceedances of the ERL proposed sediment quality guidelines from the National Status and Trends database (6.3 ug/L sediment)

For the purposes of the wet weather Reasonable Assurance Analysis, the EWMP area directly draining to Dominguez Channel was combined into a single analysis region to establish TLRs and into two analysis regions, one including the portion of the Cities of Redondo Beach and Manhattan Beach (Dominguez Channel – Redondo Beach/Manhattan Beach [DC–RB/MB]) and one including the portion of the City of Torrance (DC – Torrance), to evaluate the performance of BMPs. For the purposes of the dry weather Reasonable Assurance Analysis for which bacteria are the only water body-pollutant combination, the EWMP area draining to Dominguez Channel was combined into the same single analysis region. The Dominguez Channel watershed analysis regions are shown in **Figure ES-4.**

The wet weather Reasonable Assurance Analysis was performed on copper, lead, zinc, and bacteria (fecal coliform) within the Dominguez Channel Watershed. Water quality targets were identified for Dominguez Channel Watershed in the same manner as in SMB Watershed. According to the Dominguez Channel WMA EWMP (DC WMG, 2015), relationships between TSS and historical organics were evaluated to determine if TSS could be used as a surrogate for historical organics. As there were significant non-detects in the available water quality data, a relationship between historic organics and TSS could not be established in the available Dominguez Channel monitoring data. Other studies have shown that relationship between TSS and historical organics can exist; however, the water quality depends on the storm event, soil disturbance, and other factors. It was assumed that if water column pollutant targets were met in Dominguez Channel, the targets would also be met downstream in the Dominguez Channel Estuary, which is the receiving water to Dominguez Channel. Sediment-borne pollutants would also be reduced by the same BMPs that are being used to address the water column pollutants. For these reasons, it was not necessary to perform a separate Reasonable Assurance Analysis for the Dominguez Channel Estuary. If monitoring data show that Dominguez Channel discharges are not meeting sediment objectives, a Reasonable Assurance Analysis will be conducted for sediment and the EWMP will be revised accordingly.

For metals, the waste load allocation (WLA) assigned to MS4 discharges, as shown in **Table ES-8,** is a mass-based allocation based on the freshwater targets for Dominguez Channel and Torrance Lateral (using ambient hardness at the time of sampling) multiplied by the daily volume and is shared amongst all MS4 Permittees that discharge to the freshwater portion of Dominguez Channel and Torrance Lateral. The water quality targets for prioritized water body-pollutant combinations are summarized in **Table ES-8**.

Table ES-8. Water Quality Targets for the Dominguez Channel Watershed

Water Body	Pollutant	RWL/WQBEL from the Permit or Assumed Based on Other Similar Los Angeles Region TMDLs[1]	Approach for Applying the Critical Period
Dominguez Channel	Fecal Coliform	19% allowed exceedance of the REC-1 water quality objective, (400 MPN/100mL) on non-high flow suspension days	90th percentile year (based on wet days) was used as the critical condition. Allowable number of wet weather exceedance days for the critical year was set to 19% of non-high flow suspension wet days, rounding down.

Water Body	Pollutant	RWL/WQBEL from the Permit or Assumed Based on Other Similar Los Angeles Region TMDLs[1]	Approach for Applying the Critical Period
	Total Copper	WQBEL=9.7 ug/L Waste load allocation (WLA)= Concentration*Daily Volume	90th percentile daily load during wet weather was used as the critical condition. This calendar day was identified for each metal by ranking daily loads for metal wet days between 2003 and 2012.
	Total Lead	WQBEL=42.7 ug/L WLA= Concentration*Daily Volume	
	Total Zinc	WQBEL=69.7 ug/L WLA= Concentration*Daily Volume	

[1] MS4 Permittees may demonstrate compliance with the freshwater metals allocations for Dominguez Channel and Torrance Lateral via any one of three different means:

a. Final allocations are met.
b. CTR total metals criteria are met instream.
c. CTR total metals criteria are met in the discharge.

Although toxicity was identified as a Category 1 water body-pollutant combination, it was not modeled for Dominguez Channel and the Torrance Lateral since it is not a wet weather parameter that can be modeled using currently available Reasonable Assurance Analysis tools for the Los Angeles Region. Instead, the Reasonable Assurance Analysis qualitatively describes how the Beach Cities WMG Agencies will comply with the TMDL WQBELs. Toxicity will continue to be monitored under the Beach Cities' CIMP. Although ammonia was identified as a Category 2 water body-pollutant combination (**Table ES-7**), monitoring data since 2003 show that all water quality samples at monitoring locations S28 and TS19 meet the freshwater Basin Plan Objective for ammonia, and as a result, ammonia was not modeled as part of the Beach Cities' Reasonable Assurance Analysis. Similarly, the Category 3 water body-pollutant combinations cyanide, pH, selenium, mercury, and cadmium, all within the Torrance Lateral, were not modeled either due to a lack of demonstrated MS4 linkage or due to data limitations. These Category 2 and 3 parameters will also be monitored under the Beach Cities' CIMP and if future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to exceedances of these pollutants in the receiving water, the EWMP will be revised to address these pollutants.

Dominguez Channel is also 303(d)-listed for diazinon, although data are not available on the SWRCB's website since this listing was made prior to 2006. However, as the Dominguez Channel Toxics TMDL staff report states, the USEPA banned diazinon on December 31, 2005. The Dominguez Channel Toxics TMDL staff report (Section 2.6.1) states, "Whereas elevated diazinon levels had been observed concurrently with toxicity in 2002-2005 wet weather samples and therefore diazinon was presumed to be contributing to adverse toxicity results; post-2005 results show no diazinon concentrations above the freshwater guideline. Therefore, it is appropriate to develop freshwater metals and toxicity TMDLs for wet weather; however, the more recent toxicity results are not attributable to diazinon and therefore no diazinon TMDLs have been developed for Dominguez Channel." Dominguez Channel and Torrance Lateral data from 2006-2013, which includes 85 total samples between the two monitoring sites, show no exceedances of the chronic diazinon criteria established by the California Department of Fish and Game (0.10 ug/L). Due to the fact that monitoring data since 2006 show that all samples at S28 and TS19 meet the applicable water quality criteria for diazinon, diazinon could reasonably be removed from the State's 303(d) list for Dominguez Channel and therefore is not included as a Category 2 pollutant for Dominguez Channel (including Torrance Lateral).

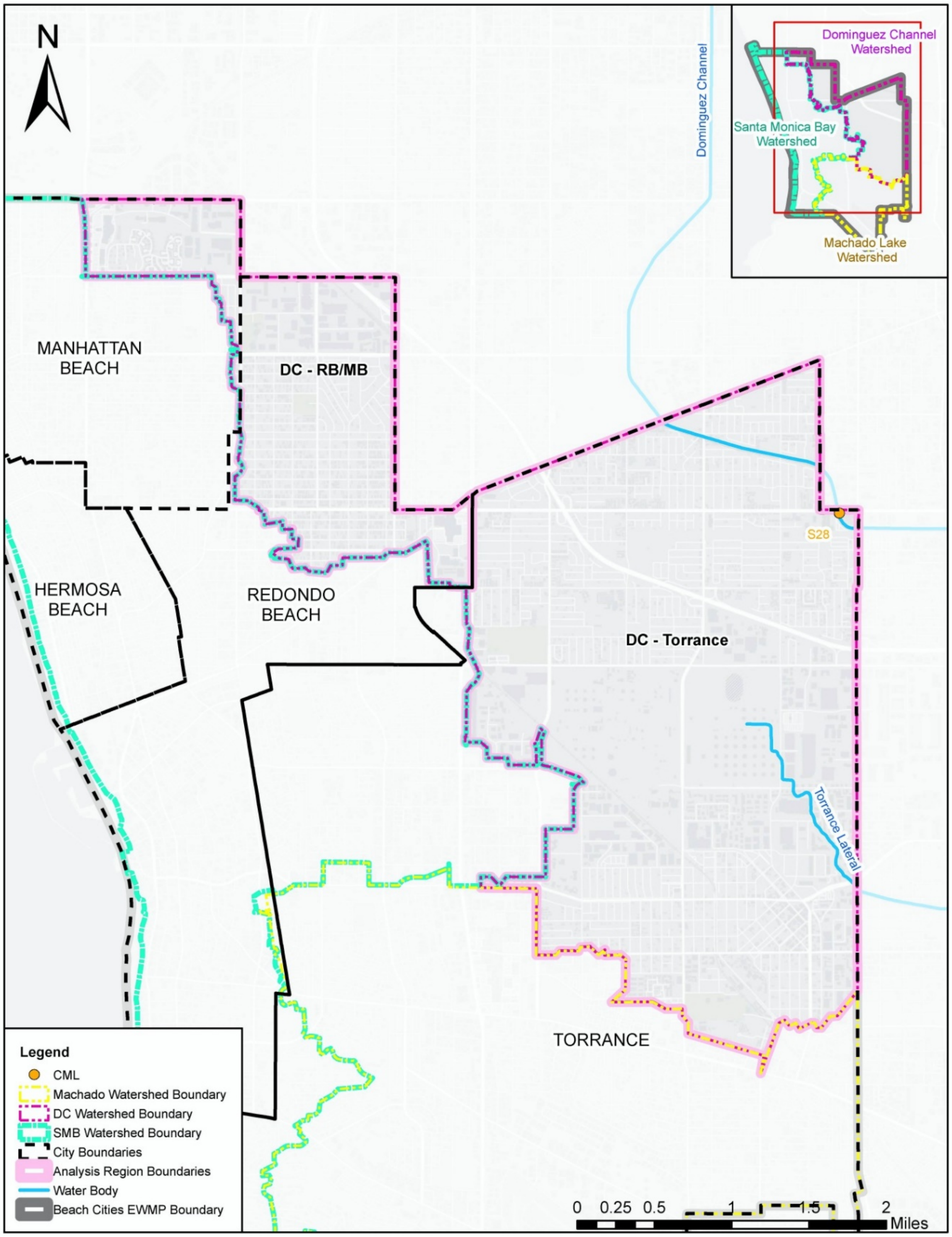

Figure ES-4. Analysis Regions within the Dominguez Channel Watershed portion of the Beach Cities EWMP Area

Targets – Dominguez Channel

As discussed previously, TLRs represent a numerical expression of the Permit compliance metrics (e.g., allowed mass per day for metals for wet weather and allowable exceedance days per year for bacteria) that can be modeled and can serve as a basis for confirming, with reasonable assurance, that implementation of the proposed BMPs will result in attainment of the applicable TMDL-based WQBELs and RWLs in the Permit for Category 1 pollutants, or the Water Quality Objectives for Category 2 and Category 3 pollutants. TLRs were developed for the single combined analysis region (**Table ES-9**).

Table ES-9. TLRs and Baseline Conditions for Pollutants in the Dominguez Channel Watershed

Pollutant	Compliance Deadline	Baseline Data for Critical Condition			Allowable Discharge for Critical Condition			Interim Target Load Reduction[4]		Final Target Load Reduction[4]	
		Runoff Volume	Pollutant Conc.[3]	Pollutant Load	Runoff Volume	Pollutant Conc. [3]	Pollutant Load	Absolute Load	% of Baseline Load	Absolute Load	% of Baseline Load
Copper	2032	301 ac-ft/day	25.8 ug/L	21 lb/day	301 ac-ft/day	9.7ug/L	8 lb/day	N/A[1]		13 lb/day	62%
Lead	2032	275 ac-ft/day	11.6 ug/L	8.7 lb/day	275 ac-ft/day	42.7 ug/L	32 lb/day			0 lb/day	0%
Zinc	2032	291 ac-ft/day	290.2 ug/L	230 lb/day	291 ac-ft/day	69.7 ug/L	55 lb/day			175 lb/day	76%
Fecal coliform	2022[2]	6,048 ac-ft/year	20,080 MPN/100 mL	1,498 $*10^{12}$ MPN/yr	6,048 ac-ft/year	18,413 MPN/100mL	1,373$*10^{12}$ MPN/yr	124$*10^{12}$ MPN/yr	8.3%	-	-
	2027[2]	6,048 ac-ft/year	20,080 MPN/100 mL	1,498 $*10^{12}$ MPN/yr	6,048 ac-ft/year	16,667 MPN/100mL	1,243$*10^{12}$ MPN/yr	255$*10^{12}$ MPN/yr	17%	-	-
	2032[2]	6,048 ac-ft/year	20,080 MPN/100 mL	1,498 $*10^{12}$ MPN/yr	6,048 ac-ft/year	13,454 MPN/100 mL	1,004$*10^{12}$ MPN/yr	-	-	493$*10^{12}$ MPN/yr	33%

[1] The interim deadline for Dominguez Channel Toxic TMDL was March 23, 2012. Hence the interim target load reduction is not applicable since this date has passed.

[2] Proposed, non-TMDL compliance schedule.

[3] Fecal coliform concentrations are estimated as the total annual load divided by the total annual runoff volume. The pollutant concentrations presented for the Dominguez Channel Toxics TMDL are a direct output from the LSPC model used for the RAA.

[4] RAA demonstration is made based on the achievement of the TLR values in terms of absolute load removed by the proposed suite of BMPs in each analysis region. The allowed conditions in terms of runoff volume and concentration are shown for informational purposes only.

BMPs – Dominguez Channel

Both existing and proposed regional and distributed BMPs are included in this EWMP to address water quality targets in the Dominguez Channel Watershed. Distributed green streets BMPs are proposed and were modeled as part of the Reasonable Assurance Analysis within the DC-RB/MB analysis region, at an implementation level of 14% (i.e., runoff from 14% of single family residential, multi-family residential, commercial, and industrial land uses would be treated by green streets BMPs). General design criteria for proposed structural BMPs are summarized in **Table ES-10**.

Table ES-10. Proposed Structural BMPs in the Dominguez Channel Watershed

Analysis Region	Project Name[1]	Description	Design Storage Volume (cu-ft)	Tributary Area (acres)
DC – MB/RB	Powerline Easement Infiltration*	Located along powerline easements and/or adjacent to Marine Avenue and Manhattan Beach Boulevard, the sub-surface biofilter has a potential surface area of 7.2 ac, an average depth of 5 ft, a diversion flowrate of 132 cfs, and a negligible infiltration rate.	N/A (Flow-through BMP)	1,500
DC – MB/RB	Artesia Blvd. and Hawthorne Blvd. Filtration	Located near the intersection of Artesia Blvd. and Hawthorne Blvd., the sub-surface biofilter has a potential surface area of 1 ac, an average depth of 5 ft, a diversion flowrate of 13.6 cfs, and a negligible infiltration rate.	N/A (Flow-through BMP)	130
DC-MB/RB	Distributed Green Streets BMPs	The distributed green streets (to address runoff from 14% of single family residential, multi-family residential, commercial, and industrial land uses) are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	636,300	200
DC-Torrance	Catch Basin Inlet Filters	The City of Torrance plans to retrofit catch basins with inlet filters.	N/A	5,760

[1] All projects listed in this table (except for the catch basin inlet filters in DC-Torrance) were modeled in the RAA and sized to collectively comply with the WQBELs and RWLs in combination with other existing and proposed structural and non-structural BMPs. Within the DC-Torrance analysis region, catch basin inlet filters are assumed to achieve WQBEL/RWL compliance based on a review of literature/studies on their performance. The total load reduction from inlet filters will be evaluated in the future through CIMP monitoring, as part of the EWMP adaptive management process. At that time, the catch basin BMPs will be modified, with additional filters installed as necessary and additional structural/non-structural BMPs proposed as needed to meet the TLRs required to achieve water quality objectives by the compliance deadlines.

*Alternative project location has also been identified

It should be noted that if at any time specific distributed green streets or regional/centralized BMPs are found to be infeasible for implementation, or new innovative BMPs are developed, alternative BMPs or operational changes will be planned within the same analysis region and within the same timeline, to meet an equivalent analysis region load reduction. The performance of the proposed catch basin inlet filters within the City of Torrance will also be evaluated as potential alternatives to the proposed structural BMPs within the Cities of Redondo Beach and Manhattan Beach. The

Beach Cities WMG will provide timely notification and project details to the Regional Board in the case of any project substitutions.

Demonstration of Compliance – Dominguez Channel

To demonstrate wet weather compliance, the Reasonable Assurance Analysis was performed according to the following steps:

1. For each analysis region, develop TLRs for the critical condition (90^{th} percentile year for bacteria and 90^{th} percentile load day for metals) based on Permit requirements and LARWQCB guidance;
2. Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future:
    a. Assume a load reduction for non-modeled non-structural (or programmatic) BMPs (five percent of baseline pollutant load);
    b. Calculate load reductions for public incentives for private retrofit (e.g., downspout disconnects) and redevelopment;
    c. Calculate load reductions attributable to anticipated new permit compliance activities of non-MS4 entities (e.g., Industrial General Permit holders and Caltrans); and
    d. Calculate load reductions for proposed regional BMPs that were identified in existing plans;
3. Compare total estimated load reduction for each analysis region with the TLRs; and
4. Meet the TLRs by backfilling the remaining load reduction with new regional or distributed green streets BMPs, with green streets modeled by assuming treatment of runoff from a percentage of specific developed land uses. Within the DC-Torrance analysis region, an estimated load reduction attributable to distributed catch basin inlet filters was derived from a review of literature/studies on their performance (**Appendix B**). If the estimated performance is supported by future monitoring data, these filters may be used as alternative BMPs in other portions of the Dominguez Channel Watershed.

Results of the wet weather Reasonable Assurance Analysis for each analysis region are presented in **Table ES-11** below. The values provided correspond to the load reductions attributable to the BMP types following the applicable compliance deadline. As shown, the TLRs are predicted to be met in the DC-RB/MB analysis region for metals and fecal coliforms with varying applications of non-structural and regional BMPs as described previously. Within the DC-Torrance analysis region, the TLRs will be met through implementation of catch basin inlet filters as needed. Monitoring and subsequent adaptive management will be employed to evaluate the achieved load reductions prior to each of the compliance deadlines, installing additional filters as needed until compliance is achieved for every applicable WQBEL or RWL.

For dry weather, bacteria is the only applicable pollutant in the Dominguez Channel Watershed, and it is a Category 2 water body-pollutant combination (i.e., 303(d)-listed but not currently subject to a TMDL).

The City of Torrance's dry weather load reduction strategy will focus on non-structural source control and pollution prevention measures that are designed to reduce the amount of pollutants and understand the effect of pollutants entering runoff though education, enforcement and behavioral modification programs.

Within the Cities of Redondo Beach and Manhattan Beach, the implementation of the two regional BMPs at both outlets from the DC-RB/MB analysis region to address wet weather pollutants will control dry weather flows by capturing the small flows in the pre-treatment volume and either retaining them or treating them in the media filter.

In addition, each of the EWMP WMG cities has water conservation regulations which will reduce dry weather runoff at its source. Collectively, by controlling dry weather MS4 flows prior to entering Dominguez Channel using the proposed suite of BMPs, bacteria will be addressed. If necessary, the EWMP Group agencies retain the option of installing low flow diversions sized to effectively eliminate discharges to the receiving water year-round dry weather days. Therefore, reasonable assurance of meeting the applicable RWLs was demonstrated in this EWMP through a qualitative assessment of the proposed BMPs and their overall approach of eliminating or substantially reducing MS4 discharges during dry weather.

Table ES-11. Dominguez Channel Watershed – Reasonable Assurance Analysis Results – Interim and Final Compliance

Pollutant	Date	Implementation Benefits (average load reduction as % of baseline for the critical condition[1])							TLR	Compliance (TLR Met)?
		Non-Structural BMPs (Non-Modeled)	Public Retrofit Incentives + Redevelopment	Non-MS4	Regional BMPs	Distributed BMPs	Distributed BMP Implementation Level	Estimated Load Reduction		
Analysis Region DC-RB/MB										
Zinc	2032 (Final)	5%	9%	6%	39%	20%	14% SFR, MFR, COM, IND	**79%**	**76%**	Yes
Copper	2032 (Final)	24%[2]	0%	5%	30%	26%		**85%**	**62%**	Yes
Fecal coliform	2022 (Interim)	2.1%	1.5%	0.7%	0%	4.1%	3% SFR, MFR, COM, IND	**8.4%**	**8.3%**	Yes
	2027 (Interim)	3.5%	2.4%	1.3%	0%	10%	7% SFR, MFR, COM, IND	**17%**	**17%**	Yes
	2032 (Final)	5%	3.2%	1.8%	45%	20%	14% SFR, MFR, COM, IND	**74%**	**33%**	Yes
Analysis Region DC-Torrance										
Zinc	2032 (Final)	5%	0%	0%	0%	75% per filter	Catch basin inlet filters	See note 3	**76%**	See note 3
Copper	2032 (Final)	14%[2]	0%	0%	0%	75% per filter	Catch basin inlet filters	See note 3	**62%**	See note 3
Fecal coliform	2022 (Interim)	2.1%	0%	0%	0%	33% per filter	Catch basin inlet filters	See note 3	**8.3%**	See note 3
	2027 (Interim)	3.5%	0%	0%	0%	33% per filter	Catch basin inlet filters	See note 3	**17%**	See note 3
	2032 (Final)	5%	0%	0%	0%	33% per filter	Catch basin inlet filters	See note 3	**33%**	See note 3

[1] The critical condition is TMDL year 1995 for fecal coliform, 11/30/2007 for copper, 2/5/2010 for lead, and 2/26/2006 for zinc.

[2] Load reduction attributable to copper brake pad phase-out, after accounting for other BMPs, up to 55%.

[3] Load reduction sum cannot be estimated at this time. The individual load reduction for each inlet filter's drainage area is shown under the "Distributed BMPs" column. Initially, 200 of 643 catch basins are planned to be retrofitted in high priority catchments. The total load reduction from inlet filters will be evaluated in the future through CIMP monitoring, as part of the EWMP adaptive management process. At that time, the catch basin BMPs will be modified, with additional filters installed as necessary and additional structural/non-structural BMPs proposed as needed to meet the TLRs required to achieve water quality objectives by the compliance deadlines.

Schedule – Dominguez Channel

In order to meet the compliance deadlines for the water body-pollutant combinations based on load reduction projections in the Reasonable Assurance Analysis, the proposed structural BMPs within the Dominguez Channel Watershed would be implemented per the timeline provided in **Figure ES-5.** Project construction is proposed to be complete with project start-up beginning in 2020, at which point load reduction credit begins in the Reasonable Assurance Analysis.

Figure ES-5. Project Sequencing in the Dominguez Channel Watershed

COLOR KEY	Funding Phase	Design Phase	Construction/ Installation Phase

BMP Location/Name			Timeline														
			2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Dominguez Channel Watershed	Catch basin inlet filters in DC-Torrance				Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation	Construction/ Installation
	Green Streets (Redondo Beach and Manhattan Beach)	Treatment of 3% of Land Uses	Funding	Design	Construction/ Installation	Construction/ Installation											
		Treatment of Additional 4% of Land Uses						Funding	Design	Construction/ Installation	Construction/ Installation						
		Treatment of Additional 7% of Land Uses											Funding	Design	Construction/ Installation	Construction/ Installation	
	Redondo Beach Powerline Easement Filtration[1,2]				Funding	Design	Construction/ Installation	Construction/ Installation									
	Artesia Boulevard and Hawthorne Boulevard Filtration[2] in Redondo Beach						Funding	Design	Construction/ Installation	Construction/ Installation							

[1]Alternative project locations have also been identified.
[2]Current regional BMP project sequencing in Dominguez Channel helps achieve dry weather bacteria TMDL compliance. If compliance is met through other means, regional BMP scheduling in Dominguez Channel may be pushed back so that regional projects are instead complete by March 2032.

COMPLIANCE SCHEDULE

Table ES-12 summarizes the existing and proposed implementation actions and dates within the Santa Monica Bay and Dominguez Channel Watersheds, for each identified water body-pollutant combination. The compliance schedule for Category 1 water body-pollutant combinations is consistent with the associated TMDLs. The compliance schedule for the Category 2 water body-pollutant combinations has been selected to achieve the proposed wet and dry weather bacteria milestones, with implementation actions not exceeding one year, in accordance with the Permit (Section ii(5)9B). As described in **Table ES-12,** the compliance schedule for the Category 3 water body-pollutant combinations will be dependent on the results of the CIMP.

Table ES-12. Compliance Schedule for the Santa Monica Bay and Dominguez Channel Watersheds

<table>
<tr><th>Category</th><th>Watershed</th><th>Pollutant(s)</th><th>Wet/Dry Weather</th><th>Date</th><th>Implementation Action</th></tr>
<tr><td rowspan="15">1: Highest Priority</td><td rowspan="2">Dominguez Channel and Dominguez Channel Estuary</td><td rowspan="2">Toxicity[1]
Total Copper[1,2]
Total Lead[1,2]
Total Zinc[1,2]
Cadmium[2]</td><td rowspan="2">Wet/Dry</td><td>Current[4]</td><td>Interim: Comply with the interim water quality-based effluent limitations as listed in the TMDL[3]</td></tr>
<tr><td>March 2032</td><td>Final: Comply with the final water quality-based effluent limitations as listed in the TMDL[3]</td></tr>
<tr><td rowspan="13">Santa Monica Bay</td><td rowspan="4">Bacteria</td><td rowspan="2">Dry</td><td>July 2006</td><td>Final: Summer-dry single sample Allowable Exceedance Days (AED) met; compliance is currently in effect and attained through diversions and non-structural BMPs.</td></tr>
<tr><td>November 2009</td><td>Final: Winter-Dry period Single Sample AED met; compliance is currently in effect and attained through diversions and non-structural BMPs.</td></tr>
<tr><td rowspan="2">Wet</td><td>July 2018</td><td>Interim: 50% single sample ED reduction</td></tr>
<tr><td>July 2021</td><td>Final: Geometric Mean [GM] targets met
Final: Single sample AED targets met</td></tr>
<tr><td rowspan="5">Trash/Debris</td><td rowspan="5">N/A</td><td>March 2016</td><td>Interim: 20% load reduction met through implementation of trash excluders</td></tr>
<tr><td>March 2017</td><td>Interim: 40% load reduction met through implementation of trash excluders</td></tr>
<tr><td>March 2018</td><td>Interim: 60% load reduction met through implementation of trash excluders</td></tr>
<tr><td>March 2019</td><td>Interim: 80% load reduction met through implementation of trash excluders</td></tr>
<tr><td>March 2020</td><td>Final: 100% load reduction met through implementation of trash excluders</td></tr>
<tr><td>DDTs</td><td>N/A</td><td>N/A</td><td rowspan="2">Since the TMDL effectively implements an anti-degradation approach (i.e., historic low MS4 concentrations or loads must be kept the same or lower), and the Beach Cities EWMP Agencies are currently presumed to be achieving the WLAs (thus negating the need for Reasonable Assurance Analysis), no compliance schedule is proposed.</td></tr>
<tr><td>PCBs</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="2">2: High Priority</td><td rowspan="2">Dominguez Channel and Dominguez Channel Estuary</td><td rowspan="2">Bacteria</td><td rowspan="2">Dry</td><td>December 2023</td><td>Interim: 50% load reduction</td></tr>
<tr><td>December 2025[5]</td><td>Final: 100% compliance may be demonstrated by the Permittee in one of three ways:
1. Meeting the allowed exceedance days (5 days during the dry weather period); or</td></tr>
</table>

Category	Watershed	Pollutant(s)	Wet/Dry Weather	Date	Implementation Action
					2. Meet the allowed exceedance percentage (1.6% during a dry weather period) within the total drainage area served by the MS4. 3. Diversions are in place such that they are consistently operational, well maintained, and sized to effectively eliminate discharges to the receiving water year-round dry weather days.
			Wet	December 2016	Provide documentation supporting minimum control measure (MCM) enhancements implemented over the past year[6]
				December 2017	Provide documentation supporting MCM enhancements implemented over the past year[6]
				December 2018	Identify planned green streets locations to treat runoff from 3% of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.
				December 2019	City Council approval of Plans & Specifications for green streets to treat runoff from 3% of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach. Begin installation of catch basin inlet filters in the DC-Torrance analysis region.
				December 2020	Develop concept reports for regional BMPs in the cities of Redondo Beach and Manhattan Beach. Begin construction on green streets to treat runoff from 3% of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.
				December 2021	Submit grant application for any one of the proposed regional projects in the cities of Redondo Beach and Manhattan Beach.
				December 2022	Interim Milestone: 25% of target load reduction
				December 2023	Identify planned green streets locations to treat runoff from an additional 4% (7% total) of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.
				December 2024	Begin construction on planned green streets to treat runoff from an additional 4% (7% total) of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach. Continue installation of catch basin inlet filters in the DC-Torrance analysis region.
				December 2025	Release Request for Proposals for regional BMP designs in Redondo Beach and/or Manhattan Beach
				December 2026	Complete construction on planned green streets to treat runoff from an additional 4% (7% total) of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.

Category	Watershed	Pollutant(s)	Wet/Dry Weather	Date	Implementation Action
				December 2027	Interim Milestone: 50% of target load reduction
				December 2028	Produce regional BMP design reports; identify locations for green streets implementation to treat runoff from an additional 7% (14% total) of SFR, MFR, COM, and IND land uses in the cities of Redondo Beach and Manhattan Beach.
				December 2029	Begin regional BMP permitting process for project in Redondo Beach or Manhattan Beach.
				December 2030	Begin construction on planned green streets to treat runoff from an additional 7% (14% total) of SFR, MFR, COM, and IND land uses in the cities of Redondo Beach and Manhattan Beach.
				December 2031[7]	Begin regional BMP construction of project in Redondo Beach or Manhattan Beach.
				March 2032[8]	Final Milestone: 100% compliance may be demonstrated by the Permittee in one of three ways: 1. Meeting the allowed exceedance days (10 days during a wet weather period, plus high flow suspension days) 2. Meeting the target load reduction (33%); or 3. Meeting the allowed exceedance percentage (19% during a wet weather period) within the total drainage area served by the MS4.
3: Medium Priority[9]	Dominguez Channel and Dominguez Channel Estuary	Cyanide pH Selenium Mercury Cadmium Arsenic Chromium Silver Nickel Thallium	N/A	March 2032[8]	Final: Comply with the applicable water quality standards as listed in **Table ES-7.** As required by the Permit, monitoring for these pollutants will occur under the CIMP. If monitoring data suggest that the Beach Cities Agencies' MS4s may cause or contribute to exceedances of these pollutants in the receiving water,[10] these contributions will be addressed through modifications to the EWMP as a part of the adaptive management process, as described in Permit section VI.C.2.a.iii.

[1] Toxicity, copper, lead, and zinc are listed as Category 1 wet weather pollutants in Dominguez Channel.

[2] Copper, lead, zinc, and cadmium are listed as Category 1 pollutants in Dominguez Channel Estuary with annual average WQBELs that apply to both wet and dry weather.

[3] Dominguez Channel Estuary WQBELs for total copper, lead, zinc, and cadmium are addressed by the implementation actions taken for Dominguez Channel wet weather WQBELs.

[4] According to monitoring data at Dominguez Channel Mass Emission Station S28, the copper, lead, and zinc exceedance rates of the interim WQBELs are 9%, 3% 10% respectively, based on qualified sampling events between 2002 and 2013. At the Torrance Lateral Mass Emission Station TS19, the copper,

lead, and zinc exceedance rates of the interim WQBELs are 5%, 0%, and 8% respectively. These monitoring locations receive flow contributions from the Beach Cities WMG, as well as other WMGs. CIMP monitoring and subsequent adaptive management will evaluate if the Beach Cities WMG are exceeding the interim Category 1 WQBELs and evaluate compliance with the Dominguez Channel Toxics TMDL.

[5] The proposed compliance schedule for dry weather bacteria is the minimum time expected to be necessary for the agencies to plan, design, permit, construct, monitor, and adaptively manage the proposed dry weather BMPs, and is also consistent with the 10-year MS4 compliance schedule for dry weather from the TMDL for indicator bacteria in the San Gabriel River, Estuary and Tributaries, adopted by the LARWQCB in 2015 (Water Quality Control Plan, Attachment A to Resolution No. R15-005, adopted by the RWQCB in 2015).

[6] Proposed milestones for MCM enhancement implementation are detailed in **Table 2-8**.

[7] If regional BMPs are deemed necessary for dry weather compliance, their construction dates will be moved up to meet the dry weather deadlines.

[8] The proposed compliance schedule for wet weather bacteria and all Category 3 pollutants was selected to be consistent with the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (Dominguez Channel Toxics TMDL) (RWQCB, 2011). This compliance schedule is the minimum time expected to be necessary for the agencies to plan, design, permit, construct, monitor, and adaptively manage the proposed wet weather BMPs.

[9] Cyanide, pH, selenium, mercury, and cadmium are Category 3 pollutants in Dominguez Channel. Arsenic, chromium, silver, nickel, mercury, and thallium are Category 3 pollutants in Dominguez Channel Estuary.

[10] This will be assumed to be the case if monitoring data show that outfall concentrations and receiving water concentrations are in excess of the applicable water quality criteria for the same monitoring event.

Planning Level Cost Opinion

Planning-level cost opinions associated with implementation of the proposed structural best management practices within the Beach Cities WMG area are provided based on results from the Reasonable Assurance Analysis for the Beach Cities EWMP. Cost opinions are presented as an aid for decision makers, and contain considerable uncertainties. Given the iterative and adaptive nature of the EWMP and the many variables associated with the projects, the budget forecasts are order-of magnitude opinions, and are subject to change based on site-specific BMP feasibility assessment findings, preliminary and final BMP designs and landscaping, BMP effectiveness assessments, results of outfall and receiving water monitoring, and special studies such as those that might result in site specific objectives which could modify water quality objectives or TMDL Waste Load Allocations for a specific water body-pollutant combination.

EWMP planning-level cost opinions were developed for the proposed structural BMPs in addition to programmatic costs. Costs approximated for structural BMPs include "hard" costs for tangible assets and "soft" costs, which include considerations such as design and permitting. **Table ES-13** summarizes the total 20-year life-cycle costs for each proposed structural BMP, which are composed of the cost to construct or implement each structural BMP plus the associated annual O&M costs over 20 years. In order to account for possible variations in BMP design, BMP configurations, and site-specific constraints, as well as for uncertainties in available BMP unit costs from literature or estimated BMP unit costs, a range of costs is presented. These cost opinions are provided for information only, and it is recognized that should monitoring information demonstrate that alternative, less-expensive BMPs are equally (or superior) to those described herein, that these alternative BMPs may be implemented at the discretion of the WMG agencies. Not included in these costs are the annual monitoring costs for implementing the CIMP or the costs associated with implementing baseline and enhanced MCMs.

Table ES-13. Cost Opinion for Proposed Structural BMPs in Santa Monica Bay and Dominguez Channel Watersheds

Watershed/ Analysis Region		Location of BMP	Project Name	Construction Cost Range		Annual O&M Range		Total 20-Year Life-Cycle[1] Range	
				Low	High	Low	High	Low	High
Santa Monica Bay Watershed	SMB-5-02, Alternative 1	Manhattan Beach	Manhattan Beach Infiltration Trench[2]	$3.7M	$6.8M	$140K	$190K	$6.5M	$11M
		Manhattan Beach	Distributed Green Streets	$2.4M	$6.5M	$110K	$220K	$4.6M	$11M
		SMB-5-02 Alternative 1 Combined Costs		**$6.1M**	**$13M**	**$250K**	**$410K**	**$11M**	**$22M**
	SMB-6-01	Hermosa Beach	Hermosa Beach Infiltration Trench	$500K	$1.1M	$18K	$32K	$860K	$1.7M
		Hermosa Beach	Hermosa Beach Greenbelt Infiltration[2]	$5.5M	$8.0M	$81K	$90K	$7.1M	$9.8M
		Redondo Beach	Park #3	$1.9M	$3.0M	$28K	$33K	$2.5M	$3.7M
		Hermosa Beach	Distributed Green Streets	$7.0M	$19M	$310K	$640K	$13M	$32M
		SMB-6-01 Combined Costs		**$15M**	**$31M**	**$440K**	**$800K**	**$23M**	**$47M**
	All Analysis Regions	Hermosa Beach	Trash exclusion devices	$160K	$430K	$50K	$64K	$1.1M	$1.7M
		Redondo Beach	Trash exclusion devices	$1.1M	$3.1M	$360K	$460K	$8.3M	$12M
		Manhattan Beach	Trash exclusion devices	$590K	$1.7M	$210K	$270K	$4.8M	$7.1M
	Combined Costs in Santa Monica Bay Watershed			**$23M**	**$50M**	**$1.3M**	**$2.0M**	**$49M**	**$90M**
Dominguez Channel Watershed	DC-RB/MB	Redondo Beach	Powerline Easement Infiltration[2]	$11M	$16M	$160K	$180K	$14M	$20M
		Redondo Beach	Artesia Blvd Infiltration	$2.0M	$3.1M	$30K	$35K	$2.6M	$3.8M
		Redondo Beach + Manhattan Beach	Distributed Green Streets	$7.4M	$20M	$330K	$670K	$14M	$33M
		DC-RB/MB Combined Costs		**$20M**	**$39M**	**$520K**	**$890K**	**$31M**	**$57M**
	DC-Torrance	Torrance	Catch basin inlet filters	$240K	$360k	$130K	$170k	$2.8M	$3.7M
		DC-Torrance Combined Costs		**$240K**	**$360k**	**$130K**	**$170k**	**$2.8M**	**$3.7M**
	Combined Costs in Dominguez Channel Watershed			**$20M**	**$39M**	**$650K**	**$1.1M**	**$33M**	**$61M**
Combined Costs of All Proposed Structural BMPs				**$43M**	**$89M**	**$2.0M**	**$3.1M**	**$82M**	**$150M**

M = Million dollars, K = Thousand dollars

[1] Life-cycle costs include construction costs and 20 years of annual O&M (in 2015 dollars) and are not discounted.

[2] Alternative project locations have also been identified, but are not included in combined cost opinion

Financing Discussion

The availability of funds will be critical for the implementation of the EWMP. Section 7 of this EWMP provides an overview of potentially available funding sources to pay for programs proposed in the EWMP. Examples show that a multi-pronged funding strategy using multiple sources rather than rely on a single storm drain fee may be the most prudent approach. A list of potential fees and charges has been developed, which will be further considered and explored by the Beach Cities WMG in the future:

- Vehicle license and vehicle rental fees
- Solid waste management surcharge
- Water service surcharge (under AB850)
- Property assessment
- Fines (not a stable source, it is an exemption under Proposition 26)
- Financial subsidy to encourage private sector participation to develop local and district projects
- One time capital recovery fee
- Dedicated storm drain fee
- Taxes (e.g. fuel taxes)
- A TMDL fee / tax could be developed based on the pollutant contribution from polluters / activities

In addition, Public Private Partnerships and alternative delivery and financing methods may facilitate and streamline implementation, and could result in program cost reductions.

From the analysis of potential costs in this section as summarized in **Table ES-13**, it is clear that projected costs of implementing the EWMP are substantial and orders of magnitude higher than have previously been expended by the agencies under the previous MS4 Permit. Thus availability of funds will be critical for the implementation of the EWMP. Currently, the Beach Cities do not have sufficient funds or dedicated funding streams to construct and maintain the projects proposed in this EWMP.

The Beach Cities agencies are working with the Los Angeles County Division of the League of California Cities and the California Contract Cities Association to partner with other affected agencies to collectively influence State policies, pursue changes in legislation and lobby high level officials for additional stormwater funding. Working together with the other cities will increase effectiveness, communication, collaboration, and reduce redundant efforts. The LACFCD will also work with the Beach Cities in their efforts to address source controls; assess, develop, and pursue funding for structural BMPs, and promote the use of water reuse and infiltration. As regional project scopes are further refined, the LACFCD will determine on a case-by-case basis their contribution to the projects.

In addition to working with other affected cities on a regional level, the Beach Cities WMG individually and collaboratively are committed to pursue funding sources at a local level including but not limited to:

- *Grants* - Collaboration and coordination between the Beach Cities will be important to increase accessible grant funding opportunities for stormwater projects, however alternative funding sources will also be needed to provide stable O&M revenues since grants typically do not provide for O&M.
- *Interagency Partnerships* – Interagency partnerships, like the Beach Cities WMG, can allow agencies to leverage local funding resources to make cost intensive projects possible.
- *Local Bond Issuance* - Two types of local bonds can be utilized. General Obligation (GO) bonds are issued by local governments and repaid through a property tax surcharge. Revenue bonds are tax-exempt securitized bonds repaid through utility rate increases charged directly to customers.
- *Local Stormwater Assessments* - Stormwater charges are potentially the most critical local funding source to finance stormwater programs. These charges include stormwater fees and taxes.
- *Direct Subsidies* - Direct financial subsidies to local projects do not contribute to cash revenue generation. However, subsidies can create a financial incentive to encourage local participation without providing the full cost for project implementation. Such an approach can increase financial efficiency by leveraging financial input from communities.

These potential sources of funding are discussed in greater detail in Section 7.

1 INTRODUCTION

Following adoption of the 2012 Los Angeles Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit[4] (Permit), the Cities of Hermosa Beach, Manhattan Beach, Redondo Beach and Torrance, together with the Los Angeles County Flood Control District (LACFCD), collectively referred to as the Beach Cities Watershed Management Group (Beach Cities WMG) agreed to collaborate on the development of an Enhanced Watershed Management Program (EWMP) for the Santa Monica Bay (SMB) and Dominguez Channel areas within their jurisdictions (referred to herein as the Beach Cities EWMP Area). This EWMP is intended to facilitate effective, watershed-specific Permit implementation strategies in accordance with Permit Part VI.C. and summarizes the SMB and Dominguez Channel-specific water quality priorities identified jointly by the Beach Cities WMG, outlines the program plan, including specific strategies, control measures and best management practices (BMPs)[5], necessary to achieve water quality targets (Water Quality-Based Effluent Limitations [WQBELs] and Receiving Water Limitations [RWLs]), and describes the quantitative analyses completed to support target achievement and Permit compliance.

In compliance with Section VI.C.4.b of the Permit, the Beach Cities WMG submitted to the Los Angeles Regional Water Quality Control Board (LARWQCB) a Notice of Intent (NOI) to develop an EWMP on June 28, 2013 with a revised NOI submitted December 17, 2013. On March 27, 2014, the Beach Cities WMG received a letter from the Executive Officer of the LARWQCB approving the revised NOI submittal. In compliance with Section VI.C.4.c.iv of the Permit, the Beach Cities WMG then submitted a draft EWMP Work Plan to the LARWQCB on June 26, 2014. Comments were not received. As the next step in EWMP development, the Beach Cities WMG was required by Section VI.C.4.c.iv of the Permit to submit a draft EWMP no later than June 30, 2015. This document has been developed to serve as the Beach Cities Draft EWMP and is consistent with the Work Plan previously submitted to the LARWQCB.

1.1 PURPOSE AND REGULATORY FRAMEWORK

Watershed Management Programs (WMPs) are a voluntary opportunity afforded by Section VI.C.1 of the Permit for Permittees to collaboratively or individually develop comprehensive watershed-specific control plans and are intended to facilitate Permit compliance and water quality target achievement. Enhanced WMPs (EWMPS) are WMPs which comprehensively evaluate opportunities for collaboration on multi-benefit regional projects that retain all non-stormwater runoff and runoff from the 85th percentile, 24 hour storm event while also achieving benefits associated with issues such as flood control and water supply. Additional details on the regulatory background for NPDES

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

[5] For simplification, the term “BMP” will be used to collectively refer to strategies, control measures, and/or best management practices. The Permit also refers to these measures as Watershed Control Measures.

Permit and Water Quality Standards and the Permit specifics of WMPs and EWMPs are provided below.

1.1.1 NPDES Permit

The 1972 Clean Water Act (CWA) established the NPDES Program to regulate the discharge of pollutants from point sources to waters of the United States. In 1990, the United States Environmental Protection Agency (USEPA) developed Phase I of the NPDES Stormwater Permitting Program, which established a framework for regulating municipal and industrial discharges of stormwater and non-stormwater that had the greatest potential to negatively impact water quality within waters of the United States. In particular, under Phase I, USEPA required NPDES Permit coverage for discharges from medium and large MS4 servicing populations greater than 100,000 persons. Operators of MS4s regulated under the Phase I NPDES Stormwater Program were required to obtain permit coverage for municipal discharges of stormwater and non-stormwater to waters of the United States.

The LARWQCB designated the MS4s owned and/or operated by the incorporated cities and Los Angeles County unincorporated areas within the Coastal Watersheds of Los Angeles County as a large MS4 due to the total population of Los Angeles County. All MS4s within the Coastal Watersheds of Los Angeles County except for the City of Long Beach MS4 are subject to the waste discharge requirements set forth in Order No. R4-2012-0175 Permit No. CAS004001. General permit requirements, which are relevant to and must be ensured by WMPs, include (i) a requirement to effectively prohibit non-stormwater discharges through the MS4, (ii) requirements to implement controls to reduce the discharge of pollutants to the maximum extent practicable, and (iii) other provisions the LARWQCB has determined appropriate for the control of such pollutants.

1.1.2 Water Quality Standards and Total Maximum Daily Loads (TMDLs)

The CWA also required that the RWQCB establish water quality standards for each water body in its region. Water quality standards include beneficial uses, water quality objectives and criteria that are established at levels sufficient to protect those beneficial uses, and an anti-degradation policy to prevent degrading waters. The LARWQCB adopted a Water Quality Control Plan - Los Angeles Region (hereinafter Basin Plan) on June 13, 1994 addressing this portion of the CWA which designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters in the Los Angeles Region. Pursuant to California Water Code section 13263(a), the requirements of the Permit implement the Basin Plan.

The State Water Resources Control Board (State Water Board) adopted the Water Quality Control Plan for Ocean Waters in California, California Ocean Plan (hereinafter Ocean Plan) in 1972 and adopted the most recent amended Ocean Plan on September 15, 2009. The Ocean Plan also establishes water quality objectives and a program of implementation to protect beneficial uses at all MS4 discharge points within Los Angeles County coastal watersheds with the exception of Long Beach.

CWA Section 303(d)(1) requires each state to identify the waters within its boundaries that do not meet water quality standards. Water bodies that do not meet water quality standards are considered impaired and are placed on the state's "CWA Section 303(d) List". For each listed water body, the state is required to establish a TMDL for each pollutant impairing the water quality standards in that water body. TMDLs establish the allowable pollutant loadings for a water body and provide the basis upon which to establish water quality-based controls (required by NPDES Permits). The 2010 CWA Integrated Report and updated 303(d) list were approved by the State Water Resources Control Board (SWRCB) on August 4, 2010 and by the USEPA on October 11, 2011. Provisions regarding TMDLs are included in NPDES Permits once they have been developed and adopted. Specific TMDLs applicable to the Beach Cities EWMP Area are discussed in more detail in Sections 2 and 3.

1.1.3 WMPs and Enhanced WMPs

The voluntary WMPs and EWMPs allow Permittees to collaboratively or individually develop comprehensive watershed-specific control plans which a) prioritize water quality issues, b) identify and implement focused strategies, control measures and BMPs, c) execute an integrated monitoring and assessment program, and d) allow for modification over time. In general, WMPs and EWMPs are intended to facilitate Permit compliance and water quality target achievement with the goals that: 1) discharges from covered MS4s achieve applicable WQBELs and RWLs and do not include prohibited non-stormwater discharges; and 2) control measures are implemented to reduce the discharge of pollutants to the maximum extent practicable (MEP). Per Permit Section VI.C.1.e, WMPs and EWMPs are to be developed based on the LARWQCB's Watershed Management Areas (WMAs) or subwatersheds thereof.

Permittees within a WMA may elect to prepare an EWMP, which is defined in the Permit as a WMP that comprehensively evaluates opportunities for collaboration amongst Permittees and other partners on multi-benefit regional projects that, wherever feasible, retain, 1) all non-stormwater runoff, and 2) all stormwater runoff from the 85th percentile 24 hour storm event while also achieving benefits associated with issues such as flood control and water supply. Where regional projects cannot achieve these standards, the EWMP must demonstrate through a Reasonable Assurance Analysis (RAA), that applicable water quality targets are achieved.

The Permit specifies that an EWMP shall:

1. Be consistent with Permit provisions in Part VI.C.1.a.-f and Part VI.C.5-C.8,
2. Incorporate applicable State agency input on priorities and key implementation factors,
3. Provide for meeting water quality standards and other CWA obligations,
4. Include multi-benefit[6] regional projects which retain stormwater from the 85th percentile 24 hour storm

[6] Potential multiple benefits include neighborhood greening, water conservation and/or supply, groundwater recharge, public education and/or awareness, etc.

5. Include watershed control measures which achieve compliance with all interim and final WQBELs in drainage areas where retention of the 85th percentile 24 hour storm is infeasible with reasonable assurance,
6. Maximize the effectiveness of funding,
7. Incorporate effective innovative technologies,
8. Ensure existing requirements to comply with technology based effluent limitations and core requirements are not delayed, and
9. Ensure a financial strategy is in place.

1.2 Applicability of EWMP

The agencies of the Beach Cities WMG have been working together since 2004 to implement the previously developed Jurisdictional Groups 5 and 6 Implementation Plan for the Santa Monica Bay Beaches Bacteria (SMBBB) TMDLs, including a BMP Siting Study (Geosyntec, 2011a) and Dry Weather Source Characterization and Control Study (Geosyntec, 2011b) for two high priority subwatersheds, along with joint implementation of programmatic solutions. Since 2004, the Beach Cities have also been jointly funding receiving water monitoring consistent with the Coordinated Shoreline Monitoring Plan for the SMBBB TMDLs along the shoreline of the Beach Cities WMG EWMP Area. These ongoing efforts by the Beach Cities WMG to comply with the SMBBB TMDLs have been an effective facilitator for the development of the EWMP.

This EWMP is applicable to the Beach Cities EWMP Area, which consists of all of the incorporated MS4 areas of the cities of Redondo Beach, Manhattan Beach, Hermosa Beach and Torrance and includes the infrastructure of the LACFCD within those jurisdictions (**Figure 1-1**), with the exception of the Machado Lake Watershed which is being addressed separately by the City of Torrance, and is not addressed in this EWMP. A small portion of the City of Redondo Beach is located within the Machado Lake Watershed boundary but has requested to be removed from the Machado Lake Implementation Plan and other compliance requirements pertaining to the Machado Lake Watershed. Further details are described in Section 1.2.1.

The beach areas within the geographic area of the Beach Cities WMG do not have any storm drain infrastructure that collect and discharges beach runoff directly to the receiving water and are therefore considered non-point sources and not subject to the MS4 Permit or EWMP requirements. Similarly, the Hermosa Beach and Manhattan Beach piers are not part of the MS4; they are non-point sources excluded from the MS4 Permit scope and therefore the EWMP. The Redondo Beach Pier including the King Harbor Marina are included in the geographic scope of the Beach Cities WMG EWMP as these areas are equipped with MS4 infrastructure. The Wylie Sump, Bishop Montgomery Basin, and Ocean Basin are all retention basins with no outlet. Therefore, their drainage areas have been excluded from the EWMP, with no analyses required. The Del Amo Retention Basin also has not outlet, and is sized to capture runoff from at least the 85th percentile, 24 hour storm event. Because the Del Amo Retention Basin is within the Machado Lake Watershed, this drainage area is excluded from the EWMP.

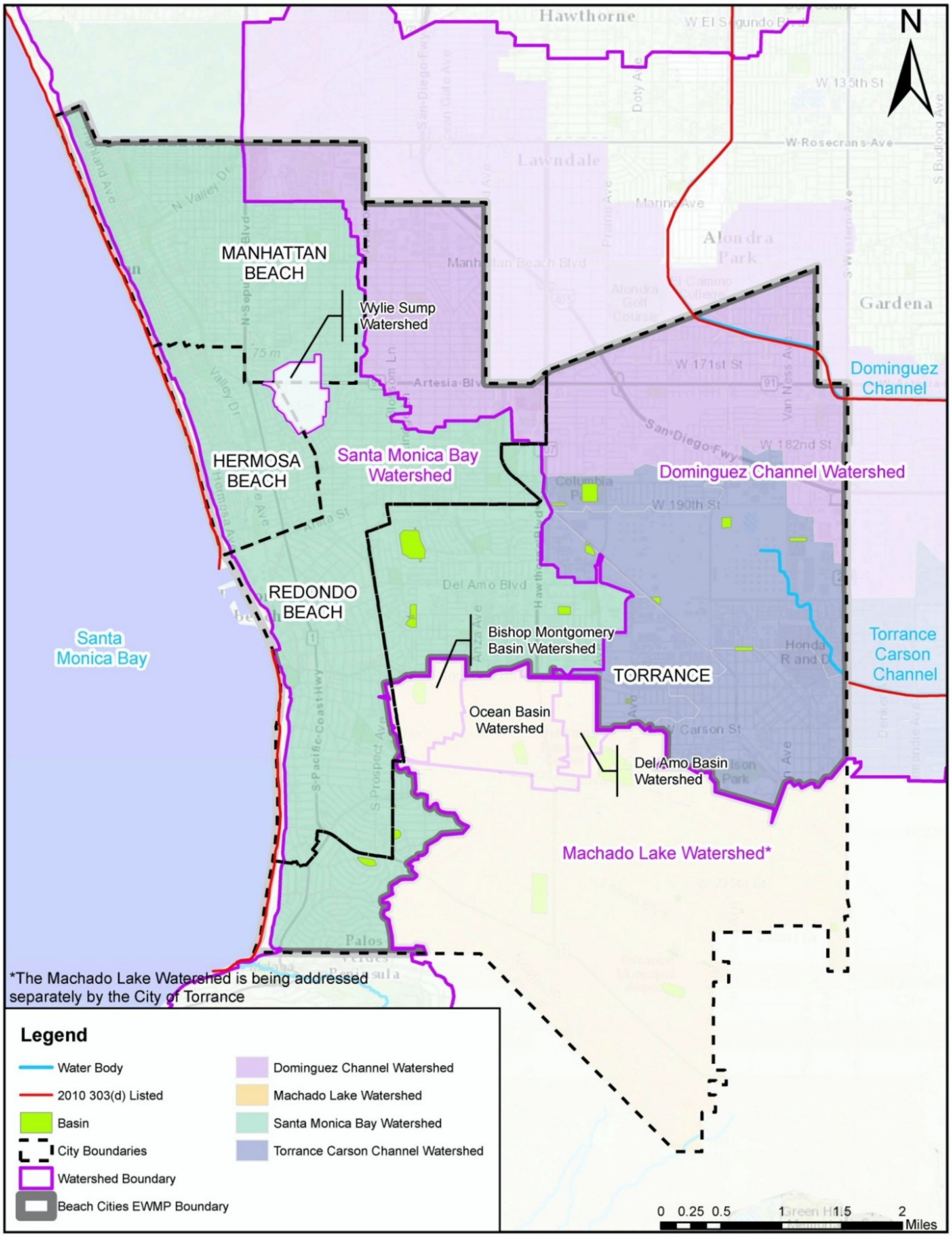

Figure 1-1. Beach Cities EWMP Area

1.2.1 City of Redondo Beach Contribution and Compliance Strategy In the Machado Lake Watershed

Machado Lake is a 40 acre lake located in the Ken Malloy Harbor Regional Park and is managed by the City of Los Angeles, Department of Recreation and Parks. The Machado Lake watershed includes portions of Lomita, Torrance, Carson, City of Los Angeles, County of Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates and California Department of Transportation.

Machado Lake is listed on the 1998, 2002, and 2006, and 2010 Clean Water Act Section 303(d) lists of impaired water bodies due to eutrophic conditions, algae and odors (Nutrients); chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, Chem A, and PCBs in tissue; and impaired sediment due to chlordane, DDT, and PCBs (Toxics). The listed impairments are caused by the overloading of nutrients, such as nitrogen and phosphorus, resulting in excessive algal growth which leads to increased turbidity, decreased levels of oxygen, and odor problems. The Los Angeles Regional Water Quality Control Board (RWQCB) established TMDLs for Machado Lake for algae, ammonia and odors (Nutrients) on May 1, 2008, and for Pesticides and PCBs (Toxics) on September 2, 2010. In addition, on June 7, 2007, the RWQCB adopted an amendment to the Water Quality Control Plan for the Los Angeles Region (Basin Plan) incorporating a TMDL for Trash in Machado Lake (March 6, 2008 was the effective date of the Machado Lake Trash TMDL).

The Machado Lake TMDL describes the watershed as:

“Machado Lake is a receiving body of urban and storm water runoff from the storm drain system covering an approximately 20-square mile watershed. The Wilmington Drain collects runoff from the surrounding cities of Lomita, Torrance, Carson, and Los Angeles, and then discharges over 50 percent of the watershed into Machado Lake at the northeast corner. The rest of the waters enter the lake through other storm drains including the Project No. 77 channel, the Harbor City Relief Drain located at the west end of the lake, the City of Los Angeles drains for runoff from streets, and the Harbor Park Municipal Golf Course. The Wilmington Drain Project 77 and the Harbor City Relief Drain collect storm water from the communities of Harbor City, Lomita, Carson, Torrance, and Wilmington, and from the Walteria Lake drainage area. In addition, two project 643 outlets discharge to the wetlands area. During the dry season, Machado Lake is replenished via a City of Los Angeles Department of Water And Power potable water pipeline and dry weather runoff.”

The City of Redondo Beach is situated in the western portion of the Machado Lake subwatershed and makes up 0.018% (approximately 0.94 acres) of the total watershed area. This has been reduced from previously reported percentages based on a staff field visit the week of January 4, 2016 during a heavy rain event when stormwater runoff from a small area was observed to drain to the Santa Monica Bay, not Machado Lake, as previously assumed. The City of Redondo Beach has no direct discharges into Machado Lake and has 0 (zero) point source area miles, which results in a calculated waste load allocation of zero for the City’s drainage area. The City’s contributory drainage area consists of no catch basins or storm drains.

Two corrected watershed maps identifying the drainage area are attached as Appendices C and D in this EWMP. The drainage from the City's area to Machado Lake has been determined to be "de minimus" and poses an insignificant threat to Machado Lake water quality and pollutant loading.

The City of Redondo Beach will manage and included this described area as part of the City's Santa Monica Bay Beaches Bacteria (SMBBB) TMDL and overall MS4 NPDES program, including the implementation of all minimum control measures and oversight.

The City of Redondo Beach sent a letter to the State Water Resources Control Board dated October 31, 2007 (Appendix E) requesting to be exempted from the Machado Lake Trash TMDL and sent another letter to the RWQCB on December 18, 2008 (Appendix F) requesting the City be removed as a responsible agency under the Machado Lake TMDL requirements. The Watershed agencies agreed to this; therefore, they did not included the City of Redondo Beach in the Machado Lake Trash TMDL Monitoring and Reporting Plan.

Based on these items, the City of Redondo Beach has requested to be deemed "in-compliance" with their Machado Lake Watershed drainage area and be removed from the Machado Lake Watershed Implementation Plan for the following reasons:

- The City of Redondo Beach's drainage area is only 0.018% (approximately 0.94 acres) of the total Machado Lake Watershed area. This area has been determined to be "de minimus" and post an insignificant threat to Machado Lake Watershed water quality and pollutant loading. The portion of the City's contributory drainage area consists of no catch basins or storm drains.

- The City of Redondo Beach proposes that it would be more reasonable for the City to focus its resources to implement the SMBBB TMDL and other relevant TMDLs. The majority of the City land area discharges into the Santa Monica Bay, which would make it more feasible and effective to use resources on projects and programs that will have the most impact on water quality improvements. The insignificant area draining into Machado Lake would be subject to the same control measures of the implementation plan developed for the SMBBB TMDL and all other MS4 NPDES measures. As a result, this area would benefit from the appropriate BMPs designed for the entire City.

1.3 EWMP Development Process

Section VI.C.1.f.v of the Permit requires a stakeholder process for collaboration on EWMP development. The development process must:

- Provide appropriate opportunity for stakeholder input;
- Include participation in the Permit-wide Technical Advisory Committee (TAC); and
- Incorporate applicable State agency input on priority setting and other key implementation issues.

The Beach Cities WMG has conducted public outreach to engage the public, LARWQCB staff, and other interested parties to support EWMP development. Input has been incorporated as appropriate. These efforts are described in more detail below.

Public Workshops. Public workshops were held on May 21, 2014 at the Joslyn Center in Manhattan Beach and on May 27, 2015 at the Redondo Beach Public Library. An informational presentation was provided followed by a question and answer period to encourage stakeholder input. Concerns were noted and considered during EWMP development by the Beach Cities WMG.

Technical Advisory Committee (TAC). The Beach Cities WMG has, and will continue to, actively participate in the Los Angeles region TAC and applicable subcommittees throughout the EWMP process.

LARWQCB Presentations. The Beach Cities WMG presented the proposed RAA approach to LARWQCB staff on April 9 and June 6, 2014. LARWQCB staff provided feedback during these meetings and in general they were supportive of the proposed approach. One additional meeting was held on July 31, 2014 to discuss Torrance-specific matters.

The EWMP also addressed other State agency priorities, including the following:

California Water Action Plan (2014). The California Water Action Plan proposes several statewide actions that are well aligned with the expected benefits of the proposed projects in this EWMP, including:

- Expand Water Storage Capacity and Improve Groundwater Management (infiltration BMPs): This action aims to address the need to expand the state's storage capacity, whether in surface or groundwater to provide widespread public and environmental benefits. The California Water Action Plan states that "state agencies will work with tribes and federal, regional and local agencies on other actions related to promoting groundwater recharge and increasing storage, including improving interagency coordination, aligning land use planning with groundwater recharge..." The regional and distributed BMP projects proposed in the Beach Cities EWMP may contribute to groundwater recharge and expanding storage capacity throughout the Beach Cities WMG.

- Increase Operational and Regulatory Efficiency: Monitoring data collected under the CIMP to measure progress toward achieving RWLs and WQBELs and to determine if modifications to the Beach Cities EWMP are necessary may provide the benefit of increased operational and regulatory efficiency. Improving data availability may also improve coordination of operations of all major water supply, flood control, hatchery facilities, and habitat restoration projects.

2014 Greater Los Angeles County Integrated Regional Water Management Plan (GLAC IRWM Plan). The goal of the GLACR IRWM Plan is to achieve sustainable management of water resources in the Greater Los Angeles County. The plan lists several regional objectives to achieve this goal. The Beach Cities EWMP contributes to some of the objectives outlined in the plan, including the following:

- Water Quality: This objective aims to comply with water quality regulations by improving the quality of urban runoff, stormwater, and wastewater. The Beach Cities EWMP contributes to this objective by proposing new distributed and regional stormwater capture opportunities in areas prioritized by statewide and regional regulations and water quality conditions.

- Open Space and Recreation: This objective aims to protect, restore, and enhance natural process and habitats. Several of the regional EWMP projects (i.e. Park #3 BMP and the Powerline Easement in Analysis Region SMB-6-01) provide opportunity for expanded habitat and increased green space.

STORMS Storm Water Strategy (California Water Boards, 2015). The Storm Water Strategy assists in achieving the actions identified in the California Water Action Plan, including the aforementioned action of expanding water storage capacity and improving groundwater management. The Storm Water Strategy supports efforts to improve interagency coordination and identify needs for groundwater recharge opportunity. The Storm Water Strategy also lists six overarching objectives. The Beach Cities EWMP contributes to some of these objectives, including the following:

- Increase Stakeholder Collaboration on a Watershed Scale: the Beach Cities WMG agreed to collaborate on the development of this EWMP for the Santa Monica Bay and Dominguez Channel Watershed areas within their jurisdictions to facilitate effective, watershed-specific Permit implementation strategies in accordance with Permit Part VI.C.

- Establish Financially Sustainable Storm Water Programs: This EWMP provides an overview of potentially available funding sources for programs proposed in the EWMP. The funding sources identified for consideration are grants, interagency partnerships, bonds, State Revolving Funds, local funding opportunities, and public private partnerships.

- Increase Source Control and Pollution Prevention: This EWMP identifies the cumulative benefits from non-modeled programmatic source control BMPs that target the pollutants addressed in this EWMP.

Final Storm Water Resource Plan Guidelines (Guidelines) (December 2015). The Guidelines establish guidance for public agencies to develop Storm Water Resource Plans (Plans) consistent with Water Code sections 10561 through 10565. The Water Code states that a Plan is required as a condition to receive funding for stormwater and dry weather runoff capture projects from any bond approved by voters after January 2014, which also applies to Proposition 1 funding. The Guidelines provide guidance such as clarification on the applicability of the Guidelines, appropriate geographic scale of watersheds for stormwater resource planning, guidance on agencies and organizations to be consulted during Plan development, methods for identifying and prioritizing stormwater and runoff capture projects, project scheduling and implementation strategies, and so forth.

A Self-Certified Checklist provided in the Guidelines includes a complete list of the elements of a Stormwater Resource Plan that are considered mandatory per the California Water Code. Fulfilling the mandatory requirements would make the Beach Cities WMG eligible for Proposition 1 Stormwater Grant funding which would be applied toward the proposed Beach Cities EWMP projects. The mandatory required elements highlighted in the Checklist and Self-Certification are either entirely fulfilled by the Beach Cities EWMP (including appended documents) or will be fulfilled on a project-specific basis. For example, maximizing flood control will be part of detailed design at the project level.

1.4 REPORT ORGANIZATION

This Beach Cities EWMP addresses the required EWMP elements from Section VI.C. of the Permit for both the SMB and Dominguez Channel Watersheds. Because the SMB and Dominguez Channel Watersheds have their own unique water quality conditions, their technical evaluations were performed independently and are documented in separate sections in this EWMP. This includes the water quality prioritization, RAA, and BMP identification. Section 2 summarizes the technical aspects of the EWMP for Santa Monica Bay watershed while Section 3 covers the same technical elements for Dominguez Channel Watershed. Section 4 presents individual EMWP implementation schedules for both watersheds. In Section 5, the adaptive management process proposed by the Beach Cities WMG is described, and in Section 6, the cost opinions associated with EWMP implementation are summarized. Section 7 describes potential funding sources and financial strategies. Sections 8 and 9 include the legal authority and references, respectively.

1.5 TERMS OF REFERENCE

This work was conducted by Geosyntec Consultants for the Beach Cities WMG with the purpose of developing a comprehensive control plan to facilitate Permit compliance and achievement of water quality standards and serves as the deliverable for Task 4.5 of the Beach Cities WMP contract. This work was managed by Ken Susilo, P.E., D.WRE., CPSWQ, with support from Megan Otto, P.E., Chris Wessel, P.E., Stacy Luell, P.E, Stacey Schal, Curtis Fang, and Scott Mansell, Ph.D. Peer review was provided by Megan Otto, P.E., Chris Wessel, P.E., and Lucas Nguyen. Senior review was provided by Brandon Steets, P.E. and Ken Susilo, P.E., in accordance with Geosyntec's quality assurance policies.

2 Santa Monica Bay Watershed

2.1 Background

2.1.1 Geographical Context

The western portion of the Beach Cities EWMP Area consists of approximately 7,840 acres of land that drains to SMB. This accounts for 52% of the total Beach Cities WMG area, and includes portions of the cities of Manhattan Beach, Redondo Beach, and Torrance, and the entirety of the City of Hermosa Beach (**Figure 2-1**). This portion of the study area is hereinafter referred to as the SMB Watershed. The majority of the SMB Watershed consists of residential land uses (**Figure 2-2**).

The LACFCD is not responsible for land within the Beach Cities EWMP Area, but does own and maintain infrastructure within all three watersheds. Background information on the LACFCD is provided in **Appendix G**. **Table 2-1** provides a breakdown of the Beach Cities EWMP Area by agency and watershed. This section of the EWMP focuses on the SMB Watershed only.

Table 2-1. Beach Cities WMG EWMP Area Distribution by Participating Agency

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

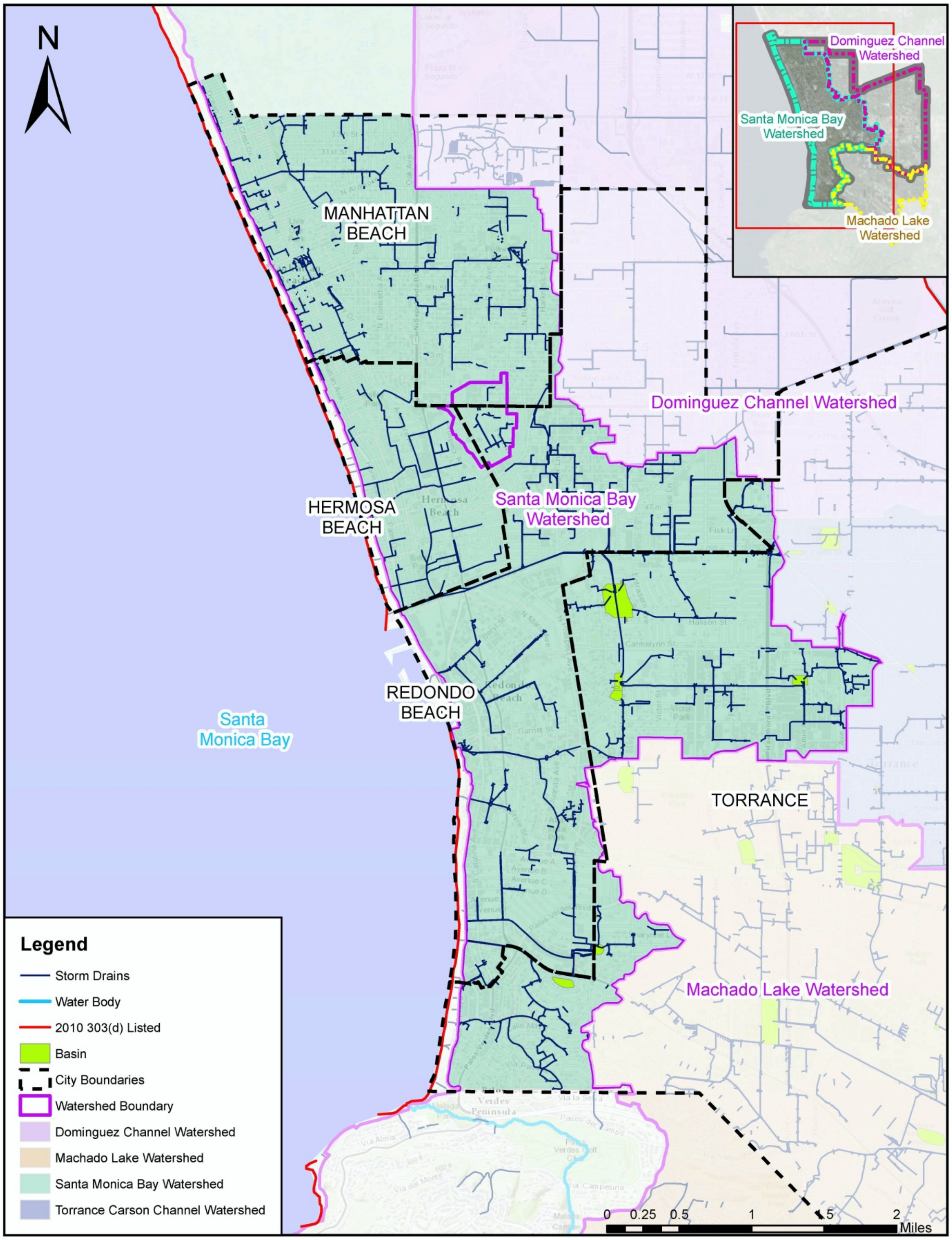

Figure 2-1. Beach Cities WMG MS4 Infrastructure within the Santa Monica Bay Watershed

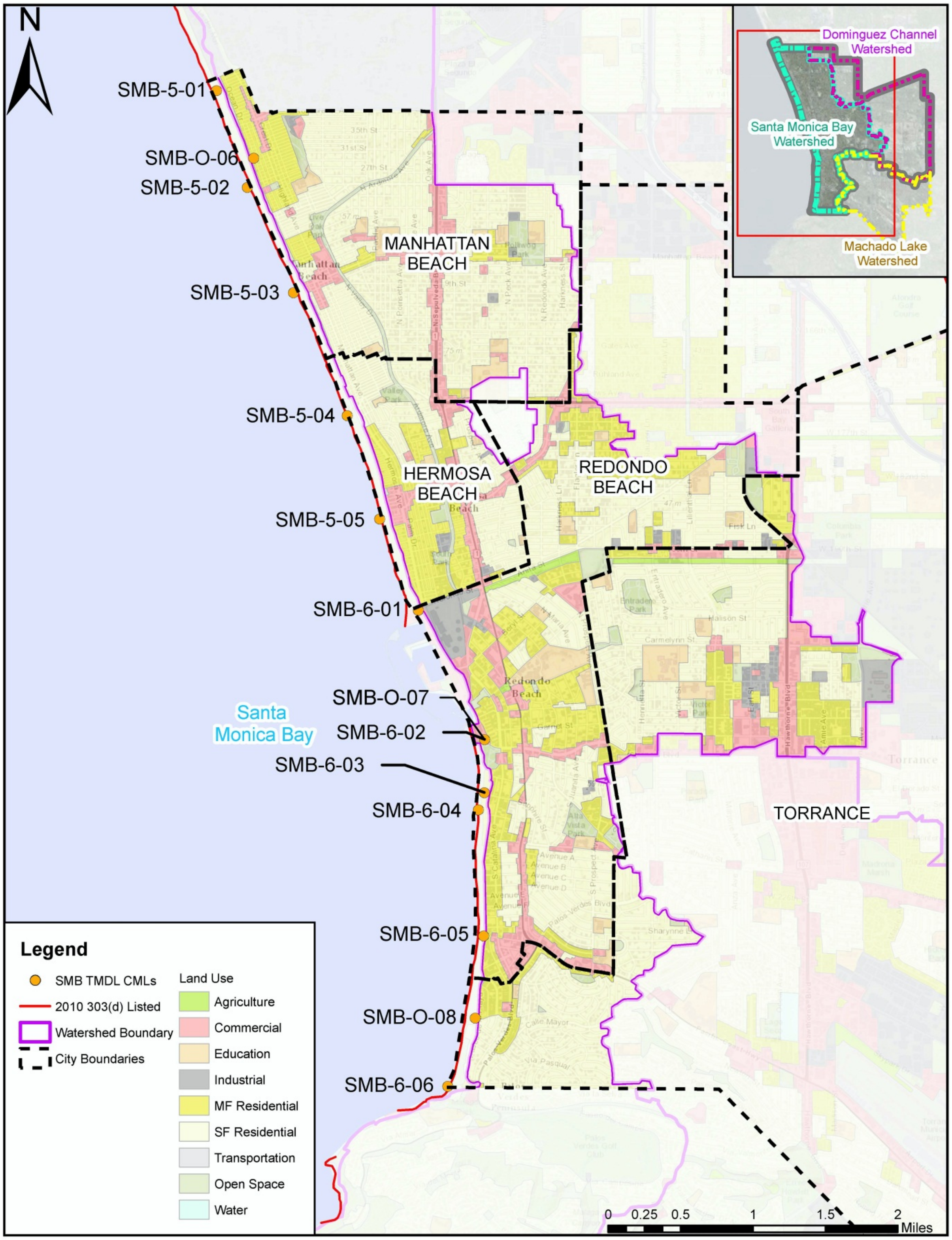

Figure 2-2. Beach Cities WMG Land Uses within the Santa Monica Bay Watershed

2.2 Identification of Water Quality Priorities

As part of the EWMP, the Permit requires the Beach Cities WMG to identify water quality priorities within their WMA. To accomplish this per Permit Section VI.C.5.a, the Beach Cities WMG conducted the following for the Santa Monica Bay watershed portion of the Beach Cities EWMP Area:

1. Characterize the water quality of stormwater and non-stormwater discharges from the MS4 as well as receiving water bodies;
2. Prioritize water body-pollutant combinations (WBPCs); and
3. Assess sources for high priority water body.

A summary of results is provided below.

2.2.1 Water Quality Characterization

Beneficial Uses

The Basin Plan (LARWQCB, 1995, updated 2011) identifies receiving waters within the Los Angeles region and sets regulatory objectives for these receiving waters. Within the SMB Watershed, identified receiving water bodies include SMB itself as well as coastal beaches within the Beach Cities WMG Area. Regulations set forth in the California Ocean Plan (SWRCB, 2012) are therefore also applicable to the SMB Watershed.

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

- **Municipal and Domestic Supply (MUN)**: Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
- **Industrial Service Supply (IND)**: Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
- **Navigation (NAV)**: Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.
- **Water Contact Recreation (REC-1)**: Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, what water activities, fishing, or use of natural hot springs.
- **Non-Contact Water Recreation (REC-2)**: Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

- **High Flow Suspension (HFS)**: Applies to water contact recreational activities associated with the swimmable goal regulated under the REC-1 use, non-contact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities.
- **Commercial and Sport Fishing (COMM)**: Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
- **Warm Freshwater Habitat (WARM)**: Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
- **Marine Habitat (MAR)**: Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
- **Wildlife Habitat (WILD)**: Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- **Rare, Threatened, or Endangered Species (RARE)**: Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.
- **Migration of Aquatic Organisms (MIGR)**: Uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.
- **Spawning, Reproduction, and/or Early Development (SPWN)**: Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.
- **Shellfish Harvesting (SHELL)**: Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sports purposes.
- **Wetland Habitat (WET)**: Uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.

According to the Ocean Plan (SWRCB, 2012), "The beneficial uses of the ocean waters of the State that shall be protected include industrial water supply (IND); water contact recreation (REC-1) and non-contact recreation (REC-2), including aesthetic enjoyment; navigation (NAV); commercial and sport fishing (COMM); mariculture; preservation and enhancement of designated Areas of Special Biological Significance (ASBS); rare and endangered species (RARE); marine habitat (MAR); fish migration (MIGR); fish spawning (SPWN) and shellfish* harvesting (SHELL)." Additional beneficial uses are defined as follows:

- **Mariculture**: The culture of plants and animals in marine waters independent of any pollution source.
- **ASBS**: Those areas designated by the State Water Board as ocean areas requiring protection of species or biological communities to the extent that maintenance of natural water quality is assured. ASBS are also referred to as State Water Quality Protection Areas – Areas of Special Biological Significance (SWQPA-ASBS).

Table 2-2 summarizes the existing beneficial uses for the Santa Monica Bay water bodies in the Beach Cities WMG Area, as designated in the Basin Plan.

Table 2-2. Beach Cities EWMP Area - Santa Monica Bay Watershed Water Bodies and Beneficial Uses

Water Body	MUN	IND	NAV	REC1	REC2	HFS	COMM	WARM	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET[2]
Santa Monica Bay Nearshore + Offshore[1]		E	E	E	E		E		E	E	E	E	E	E	
Manhattan Beach			E	E	E		E		E	E			P	E	
Hermosa Beach			E	E	E		E		E	E			E[3]	E	
King Harbor		E	E	E	E		E		E	E	E				
Redondo Beach		E	E	E	E		E		E	E	E	E	E[3]	E	
Torrance Beach			E	E	E		E		E	E		E	E[3]	E	

E = Existing beneficial use

1 The Preservation of Biological Habitats (BIOL) beneficial use is not included since no Areas of Special Biological Significance are present within the Beach Cities WMG Area.

2 Water bodies designated as WET may have wetlands habitat associated with only a portion of the water body. Any regulatory action would require a detailed analysis of the area.

3 Most frequently used grunion spawning beaches. Other beaches may be used as well.

SMB Watershed Data Analysis

An evaluation of existing water quality conditions, including characterization of stormwater discharges from the MS4 as well as receiving water quality was carried out as part of this EWMP to support identification and prioritization/sequencing of management actions, to the extent possible based on available data. To evaluate water-quality conditions within the SMB Watershed, a review of previous studies was conducted to characterize receiving water bodies within the Beach Cities WMG Area. Monitoring data analyzed were limited to bacteria data collected as part of the SMB Beaches Bacteria TMDL CSMP and limited PCB and DDT data collected as part of the 2008 Bight Regional Monitoring Program. A summary of this analysis is provided below. Additional details can be found in the Beach Cities EWMP Work Plan.

2.2.2 Water Body-Pollutant Classification

Receiving waters for stormwater runoff from the Santa Monica Bay Watershed portion of the Beach Cities EWMP Area were screened for water quality priorities by reviewing TMDLs, the State's

303(d) list, and additional water quality data. Each identified water quality priority for a given receiving water body was categorized as a WBPC. WBPCs were classified into one of three categories, in accordance with Section VI.C.5(a).ii of the Permit. No 303(d) listings exist beyond the TMDL WBPCs, and no other recent monitoring data are available beyond the SMBBB TMDL Coordinated Shoreline Monitoring Plan (CSMP) data; therefore, no Category 2 or 3 WBPCs have been identified for the Beach Cities portion of SMB at this time.

Category 1 – Highest Priority

WBPCs under Category 1 (highest priority) are defined in the Permit as "water body-pollutant combinations for which WQBELs and/or RWLs are established in Part VI.E and Attachments L through R of [the Permit]." These WBPCs include:

- SMB beaches for bacteria (wet and dry weather): These are considered Category 1 due to the SMBBB TMDL.
- SMB offshore/nearshore for dichloro-diphenyl-trichloroethanes (DDTs) and polychlorinated biphenyls (PCBs)[7]: These are considered Category 1 due to the USEPA TMDL for DDT and PCBs for SMB Offshore/Nearshore. However, the TMDL relies on a limited dataset to establish stormwater load allocations, relying on a single study (Curren *et al*., 2011) from a single creek (Ballona Creek, which is outside the Beach Cities watershed area) to establish MS4 WLAs throughout the entire SMB Watershed. It does not present sufficient data to assign MS4 contributions to the DDT and PCB concentrations observed in SMB; therefore, standard RAA modeling for these pollutants cannot reasonably be conducted at this time.

  Despite the lack of data for RAA modeling purposes, the load-based WQBELs for DDT and PCBs established by the TMDL were set to be the existing stormwater loads (i.e., based on data used in the TMDL, no MS4 load reduction is expected to be required to achieve TMDL compliance)[8]. Therefore, it is assumed that no reductions in DDT and PCB loading from the Beach Cities WMG MS4s are required to meet the TMDL and reasonable assurance of compliance is assumed to be demonstrated without modeling. Monitoring of these pollutants will occur under the Beach Cities CIMP.

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[7] SMB Offshore/Nearshore is 303(d)-listed for fish consumption advisory due to DDT and PCBs. Therefore, the fish consumption advisory will be assumed to be addressed by the DDT and PCB categorization. SMB Offshore/Nearshore is also 303(d) listed for toxicity. USEPA's data evaluation showed only 3 out of 116 samples exhibited toxicity (USEPA, 2012). USEPA made a finding in the TMDL that, following the California listing policy, Santa Monica Bay is meeting the toxicity objective and there is sufficient evidence to de-list sediment toxicity. EPA therefore concluded in the TMDL that there is no significant toxicity in Santa Monica Bay and recommended that Santa Monica Bay not be identified as impaired by toxicity in the California's next 303(d) list.

[8] The TMDL states, "Because existing stormwater loads from the watersheds are lower than the calculated total allowable loads to achieve sediment targets, the waste load allocations for stormwater in this TMDL are based on existing load estimates of 28 g/yr for DDT and 145 g/yr for PCBs." These WLAs are further divided among Los Angeles County MS4, CalTrans, the Construction General Permit, and the Industrial General Permit. The assigned WLAs for the entire LA County MS4 within the Santa Monica Bay Watershed is 27.08 g/yr for DDT and 140.25 g/yr for PCBs, which are equivalent to the TMDL-estimated existing MS4 stormwater loads.

- SMB offshore/nearshore for debris: This is considered Category 1 due to the TMDL for Debris for SMB Offshore/Nearshore. Section VI.E.5.b(i) of the Permit states, "Pursuant to California Water Code section 13360(a), Permittees may comply with the trash [debris] effluent limitations using any lawful means. Such compliance options are broadly classified as full capture, partial capture, institutional controls, or minimum frequency of assessment and collection… and any combination of these may be employed to achieve compliance." While trash was not modeled as part of the RAA, the RAA qualitatively described how the Beach Cities WMG Agencies will comply with the SMB Debris TMDL WQBELs by stating the following: "Compliance with the Debris TMDL will be met through a phased retrofit of all catch basins throughout the SMB EWMP area to meet each interim compliance deadline (20% load reduction per year between 2016 and 2019) as well as the final compliance deadline (100% load reduction) in 2020. Consistent with the Trash Monitoring and Reporting Plans (TMRP) from each of the Beach Cities agencies (Beach Cities WMP, 2014), "vertical insert[s] with 5-mm openings and flow activated opening screen covers are the best suited for implementation within the City to achieve compliance with Trash TMDLs." To date, data for trash discharges from the MS4 are unavailable for the SMB Watershed.

  The SMB Debris TMDL can be satisfied through the submittal of the TMRP and the Plastic Pellet Monitoring and Reporting Program (PMRP) or via the CIMP. Trash Monitoring and Reporting Plans (TMRPs) were submitted to the Regional Board by each Beach Cities WMG Agency before the TMDL-specified deadline of September 20, 2012. Additionally, each Beach Cities WMG Agency submitted a request to the Regional Board by September 20, 2013 to be exempt from the TMDL requirement to conduct monitoring for plastic pellets based on absence of industrial activities related to the manufacturing, handling, or transportation of plastic pellets within their jurisdictions in the SMB watershed. A review letter on the draft CIMP, dated May 22, 2015, approved the TMRP and PMRP exemption requests from the City of Hermosa Beach, the PMRP exemption request from the City of Torrance, the PMRP exemption request from the City of Manhattan Beach, and the three year extension of the final TMRP compliance date for the City of Manhattan Beach (LARWQCB, 2015). The Board approved the TMRP for the City of Redondo Beach on May 22, 2015. The City of Redondo Beach request for exemption from the PMRP was approved by the Board on November 12, 2015 [LARWQCB, 2015c]. Monitoring for trash in the City of Redondo Beach, City of Manhattan Beach, City of Hermosa Beach, and City of Torrance will begin in the SMB Watershed in accordance with each Agency's respective TMRP. Exemption of the Beach City WMG Agencies from the PMRP means that monitoring for plastic pellets within the SMB Watershed will not be conducted by the Beach Cities.

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

Category 2 – High Priority

WBPCs under Category 2 (high priority) are defined in the Permit as, "Pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality

Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) (SWRCB, 2004) and for which MS4 discharges may be causing or contributing to the impairment." There are no Category 2 WBPCs in the SMB Watershed portion of the Beach Cities EWMP area.

Category 3 – Medium Priority

WBPCs under Category 3 (medium priority) are defined in the Permit as, "Pollutants for which there are insufficient data to indicate water quality impairment in the receiving water according to the State's Listing Policy, but which exceed applicable RWLs contained in this Order and for which MS4 discharges may be causing or contributing to the exceedance." There are no Category 3 WBPCs in the SMB Watershed portion of the Beach Cities EWMP area.

The Beach Cities WMG agencies understand that data collected as part of their approved CIMP may result in future Category 3 designations in instances when RWLs are exceeded and MS4 discharges are identified as contributing to such exceedances. Under these conditions, the Beach Cities WMG agencies will adhere to Section VI.C.2.a.iii of the Permit and the EWMP will be updated.

Figure 2-3 provides a brief conceptual overview of the process used to identify and categorize the WBPCs within the Beach Cities EWMP Area.

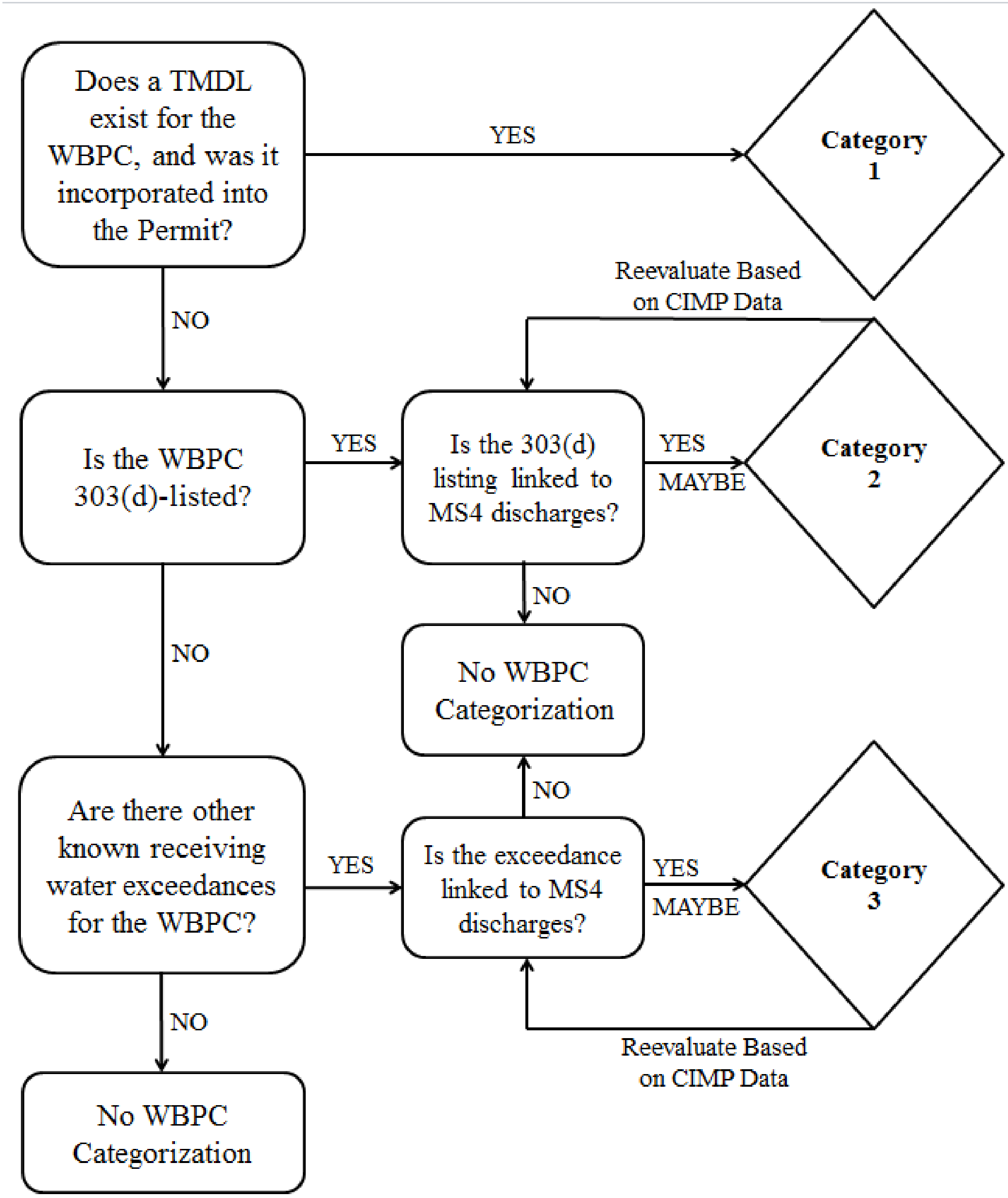

Figure 2-3. Process for Categorizing Water Body-Pollutant Combinations

Table 2-3 presents the prioritized WBPCs within the SMB Watershed portion of the Beach Cities EWMP Area. WBPCs categorized below are subject to change based on future data collected as part of the CIMP or other monitoring program. Grouped RWLs for the SMB Beaches Bacteria TMDL are also expressed in the Permit in terms of allowable exceedance days (AEDs), which vary by season and by Coordinated Shoreline Monitoring Plan (CSMP) monitoring station. These AEDs, as revised per the Reconsideration of the SMB Beaches Bacteria TMDL (LARWQCB, 2012b), are summarized in **Table 2-4**. The final grouped RWLs are effective for dry weather and will be effective July 15, 2021 for wet weather. The CSMP monitoring stations are shown in **Figure 2-5.**

Table 2-3. Water Body-Pollutant Combination Prioritization and Pollutant Interim and Final Compliance Targets for Santa Monica Bay Watershed Portion of the Beach Cities EWMP Area

Category	Water Body	Pollutant	Reason for Categorization	WQBEL/RWL/ Objective Basis	Interim WQBEL/ RWL	Final WQBEL/ RWL/Objective
1: Highest Priority	Santa Monica Bay Beaches	Dry Weather Bacteria	SMB Beaches Dry Weather Bacteria TMDL	Daily and Weekly Sampling Schedule	N/A	Summer-Dry Single Sample Allowable Exceedance Days (AED)[1] met Winter-Dry period Single Sample AED[1] met
		Wet Weather Bacteria	SMB Beaches Wet Weather Bacteria TMDL	Daily and Weekly Sampling Schedule/	50% cumulative percentage reduction from total required exceedance day reduction[2]	Single Sample and Geometric Mean AED[1] and GM target met
	Santa Monica Bay	Trash/ Debris	SMB Debris TMDL	Annual monitoring	20% incremental reduction from baseline waste load allocation[3] (6815.6 gals/year), per year	100% reduction from baseline waste load allocation[3] (6815.6 gals/year)
		DDTs	SMB PCBs and DDT TMDL	3-Year Average	N/A	27.08 g/year[4]
		PCBs	SMB PCBs and DDT TMDL	3-Year Average	N/A	140.25 g/year[4]
2: High Priority	N/A	None	No other 303(d) listings exist for the Beach Cities portion of SMB			
3: Medium Priority	N/A	None	Outfall and receiving water monitoring data are not available for the Beach Cities portion of SMB			

[1]Per the Basin Plan Objective REC1 Water Bodies Limit for Bacteria. Please refer to Table 2-4 for allowable exceedance day limits of each subwatershed.
[2] Total required exceedance day reduction is defined as the difference between existing exceedance day and the allowable exceedance day for each subwatershed
[3] Baseline WLA is the sum of baseline WLA from Manhattan Beach, Redondo Beach and Hermosa Beach
4This limit is applicable to all of Santa Monica Bay.

Table 2-4. Bacteria RLWs for Beach Cities WMG Shoreline Monitoring Stations

Station	Station Name	Summer Dry Weather (Apr 1 – Oct 31)		Winter Dry Weather (Nov 1 – Mar 31)[a]		Wet Weather (Year-Round)	
		Daily Sample[b]	Weekly Sample	Daily Sample[b]	Weekly Sample	Daily Sample[b]	Weekly Sample
SMB 5-01[c]	Manhattan State Beach at 40th St (El Porto Beach)	0	0	1	1	4	1
SMB 5-02	Terminus of 28th Street Drain in Manhattan Beach	0	0	9	2	17	3
SMB 5-03	Manhattan Beach Pier	0	0	3	1	6	1
SMB 5-04[c]	Near 26th Street on Hermosa Beach	0	0	3	1	12	2
SMB 5-05[c]	Hermosa Beach Pier	0	0	2	1	8	2
SMB 6-01	Herondo Storm Drain	0	0	9	2	17	3
SMB 6-02[c]	Redondo Municipal Pier – 100 Yards South	0	0	3	1	14	2
SMB 6-03	4'x4' Outlet at Projection of Sapphire Street	0	0	5	1	17	3
SMB 6-04[c]	120' North of Topaz groin	0	0	9	2	17	3
SMB 6-05	Storm Drain at Projection of Avenue I	0	0	4	1	11	2
SMB 6-06[c]	Malaga Cove, Palos Verdes Estates	0	0	1	1	3	1

[a] The number of allowable exceedance days established in the revised TMDL have increased from the values outlined in the original TMDL.

[b] SMB 5-02 and SMB 6-01 are the only monitoring sites that have been sampled daily (5 days/week), although SMB 6-01 switched to weekly sampling in 2013. All other monitoring sites were sampled weekly (on average).

[c] SMB 5-01, 5-04, 5-05, 6-02, 6-04, and 6-06 are all open beach monitoring locations which are not associated with major storm drain outfalls.

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

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

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

For Category 1 WBPCs, adherence to all implementation actions and compliance dates identified in the approved EWMP will constitute compliance with applicable TMDL-based interim water quality based effluent limits and interim receiving water limits. For any Category 2 and 3 WBPCs that are identified in the future through the adaptive management process, adherence to all implementation actions, milestones, and compliance schedules identified in the updated EWMP will constitute compliance with applicable receiving water limits. This approach is outlined in **Appendix H**.

2.2.3 Source Assessment

The following data sources were reviewed as part of the source assessment for the WBPCs listed previously:

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

The following source assessment is broken down by pollutants applicable to the SMB Watershed.

Indicator Bacteria

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

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

The SMBBB TMDL source assessment (LARWQCB, 2002) maintained that dry weather urban runoff and stormwater runoff were the primary sources of elevated bacteria concentrations at SMB beaches at the time of the TMDL. Although definitive information regarding the specific sources of bacteria within the watershed was not presented, speculation provided in the dry weather staff report provided some insight into possible sources at the time:

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

> of elevated levels of bacteria, and vegetation and food waste can be a source of elevated levels of total coliform bacteria, specifically" (LARWQCB, 2002).

Information on non-MS4 sources of surf zone bacteria along specific SMB beaches was provided by the City of Malibu in its comment letter on the SMBBB TMDL reconsideration, based on a comprehensive review of local and Southern California source identification studies (City of Malibu, 2012):

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

In 2009, a dry weather bacterial source identification study was undertaken at the Redondo Beach Pier (Los Angeles County Sanitation District [LACSD], 2009). This study implemented a multi-tiered toolbox approach to investigate sources of dry weather fecal indicator bacteria (FIB) exceedances near Redondo Beach Pier (CSMP monitoring location SMB 6-02).). Utilizing microbial source tracking, the sampling focused on the shoreline near the pier, a storm drain under the pier, and ponded water near the storm drain. Investigators found a lack of human fecal markers within the surf zone:

> "Lack of detectable human viruses and the de minimus quantities detection of human-associated *Bacteroidales* in the ocean water strongly implied that a human source was not present. Other sources of FIB may include bacterial persistence in the sand and sea wrack, as well as endogenous sea life and birds. Tide, wave action, wind, and other natural fluctuations may be affecting FIB levels at the shoreline monitoring locations next to the pier."

However, the study also indicated that,

> "…the storm drain under the pier and the pond that forms at the storm drain outlet are probably impacted by human fecal pollution but are not contributing to microbial contamination of the ocean water during the dry season. This conclusion is most strongly supported by the differences between the FIB concentrations and *Bacteroidales* populations at the shoreline sites compared to the pond and storm drain samples, particularly with respect to human-associated *Bacteroidales*."

Another dry weather MS4 microbial source tracking study was conducted in 2010, focusing on two high priority analysis regions (SMB-5-02 and 6-01) within the Beach Cities EWMP Area (Geosyntec Consultants, 2010). Although both of these shoreline monitoring locations are served by low flow diversions, the purpose of the study was to investigate FIB sources to inform identification of new source control measures. Observational results indicated that non-human sources include pet waste, irrigation runoff, and in-drain sources (i.e., re-growth, sediment, etc.). Similar to the Redondo Beach pier study, human *Bacteroidales* marker (HBM) was also identified in some MS4 dry weather samples, suggesting that human fecal sources may also be present. Although specific sources of human waste were not definitively identified in the study, "sources were surmised to include direct contamination (i.e., illicit connections, RV discharges, homeless deposits), and indirect contamination (i.e., sewer exfiltration)."[9]

To address the identification of dry weather bacteria sources within or to the MS4s, the Beach Cities WMG agencies have implemented measures to divert dry weather flows from all storm drains discharging at point zero shoreline monitoring locations. A total of seven low flow diversions are operational within the Beach Cities EWMP area. No wet weather bacteria source identification studies have been conducted in the Beach Cities EWMP area to date. Wet weather bacteria sources are believed to be derived from the entire watershed, and potentially include a mixture of human sources, non-human anthropogenic sources (e.g., pet waste), and non-anthropogenic sources (e.g., birds and other urban wildlife, storm drain biofilms/regrowth, beach sands and wrack). A wet weather stormwater monitoring study by the Southern California Coastal Water Research Project (SCCWRP) investigated bacteria concentrations in stormwater runoff from various land uses in the Los Angeles region (Stein *et al*, 2007). Results showed that wet weather runoff event mean concentrations (EMCs) for fecal coliform bacteria were highest for agricultural land uses, followed by commercial and educational, single family residential, multi-family residential, open space, industrial, and transportation. In this study, results showed that bacteria concentrations in stormwater are highly variable, with concentrations often varying by one to two orders of magnitude during a single storm, and by up to five orders of magnitude on seasonal and inter-annual scales.

Additional local monitoring data will be needed to quantify the contribution of MS4 discharges – particularly relative to the many other identified sources that have been documented along SMB beaches – to the elevated bacteria concentrations measured at Beach Cities WMG compliance monitoring locations during dry and wet weather. Additional data are also needed to identify the sources of bacteria within MS4 discharges as well as their potential to contribute to recreational illness risks; such source tracking data have the potential to affect the TMDL waste load allocations (WLAs) through a future reopener[10]. And the combination of MS4 outfall monitoring (through the

[9] The LACSD and Geosyntec microbial source tracking studies predate the 2013 California Source Identification Pilot Project, which identifies and recommends new, more definitive microbial source tracking markers for multiple source types, including human waste. Therefore new analytical methods may need to be applied to these previously studied areas to verify or update prior findings.

[10] For example, if human fecal sources are found to be undetected in MS4 discharges to SMB beaches using a rigorous sampling design, the latest analytical markers, and a credible laboratory, then TMDL revisions may be proposed.

CIMP) and source identification (through special studies) could support future BMP planning and EWMP updates.

DDT and PCBs

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

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

No other data or source information are available at this time. Once three years of water quality data are collected under the CIMP and evaluated consistent with the recommendations by USEPA in the TMDL to utilize a three-year averaging period, then further source assessment will be considered and the categorization and prioritization of PCB and DDTs as MS4-related pollutants of concern will be reevaluated.

Trash

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

The plastic pellet portion of the SMB Debris TMDL is not applicable to the Beach Cities WMG, as the respective Agencies have applied and have gained approval to be exempt from this portion of the TMDL.

2.2.4 Prioritization

Based on the water quality characterization above, the WBPCs have been classified into one of three categories, in accordance with Section IV.C.5(a)ii of the Permit: highest priority, high priority, and medium priority (**Table 2-3**). This categorization is intended to prioritize WBPCs in order to guide the implementation of structural and institutional BMPs. An RAA was performed on the WBPCs in Categories 1, as there are no Category 2 or 3 pollutants in the SMB Watershed within the Beach Cities WMG. WBPCs will be further prioritized based on the applicable compliance schedules, as discussed in Section 4.

2.3 Selection of Appropriate Best Management Practices

2.3.1 Objectives

The Permit requires the Beach Cities WMG to identify strategies, control measures, and BMPs to implement within their EWMP AREA. Specifically, the Permit specifies that BMPs are expected to be implemented so that MS4 discharges meet effluent limits as established in the Permit and to reduce impacts to receiving waters from stormwater and non-stormwater runoff. This expectation assumes the implementation of both types of BMPs – non-structural and structural – by the Beach Cities WMG.

The objectives of selecting and incorporating BMPs into the Beach Cities EWMP include:

1. Preventing and/or eliminating non-stormwater discharges to the MS4 that are a source of pollutants from the MS4 to receiving waters;
2. Achieving all applicable interim and final WQBELs and/or RWLs pursuant to corresponding compliance schedules; and
3. Ensuring that discharges form the MS4 do not cause or contribute to exceedances of RWLs.

2.3.2 Definition of Best Management Practices

The Permit defines BMPs as "practices or physical devices or systems designed to prevent or reduce pollutant loading from stormwater or non-stormwater discharges to receiving waters, or designed to reduce the volume of stormwater or non-stormwater discharged to the receiving water." These BMPs may include:

1. Structural and/or non-structural BMPs and operation and maintenance procedures that are designed to achieve applicable WQBELs and/or RWLs;
2. Retrofitting areas of existing development known or suspected to contribute to the highest water quality priorities with regional or sub-regional BMPs;
3. Stream and/or habitat rehabilitation or restoration projects where stream and/or habitat rehabilitation or restoration are necessary for, or will contribute to demonstrable improvements in the physical, chemical, or biological receiving water conditions and restoration and/or protection of water quality standards in receiving waters.

Structural BMPs involve the construction of a physical control measure to alter the hydrology or water quality of incoming stormwater or non-stormwater. There are two categories of structural BMPs, defined by the runoff area treated by the BMP: regional BMPs[11] and distributed BMPs. Regional BMPs are designed to treat runoff from a large drainage area expected to include multiple parcels and various land uses. These may include infiltration basins, treatment plants, and subsurface flow wetlands, among others. Distributed BMPs are designed to treat runoff from

[11] The term "regional BMP" does not necessarily indicate that the project can capture and retain the 85th percentile storm, as described in the Permit. The term "regional EWMP project" is therefore used for those regional BMPs that are expected to be able to capture and retain the 85th percentile storm.

smaller drainage areas and are normally installed to collect runoff close to the source from a limited number of parcels. Distributed BMPs typically include swales, bioretention facilities, biofiltration facilities, and cisterns, among others. Relevant regional and distributed structural BMPs are described below.

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

2.3.3 INCORPORATED PROVISIONS

Permit Section VI.C.5.b.iv sets forth the provisions regarding the types of BMPs that must be considered in development of the EWMP. These provisions are described in more detail below.

Minimum Control Measures

The Beach Cities WMG has assessed the MCMs defined in the Permit to identify opportunities for focusing resources on the high priority issues in each watershed. The Permit requires the permittees to implement prescribed MCMs in each of six categories/programs: Public Information & Participation Program (PIPP), Industrial/Commercial Facilities, Planning & Land Development, Development Construction, Public Agency Activities, and Illicit Connection & Illicit Discharges Elimination. These measures include procedures such as outreach programs, inspections, and reporting requirements designed to reduce runoff-related pollution within each permittees' MS4 area. MCMs in each of these categories are already being implemented by the Beach Cities WMG as prescribed under the previous MS4 Permit (Order 01-182), and in some cases MCM program enhancements have been implemented to address watershed priorities for TMDL implementation. Details on the selected MCMs, including proposed modifications to any programs, are provided in Section 2.6.2 (Santa Monica Bay Watershed) and Section 3.6.2 (Dominguez Channel Watershed).

Non-Stormwater Discharge Measures

The Permit requires Permittees to identify non-stormwater discharges that cause or contribute to exceedances of RWLs, and to then identify and implement BMPs to effectively eliminate the source of pollutants. These BMPs may include measures to prohibit non-stormwater discharge to the MS4, additional structural BMPs to reduce pollutants in the non-stormwater discharge, diversion to a sanitary sewer for treatment, or strategies to require the non-stormwater discharge to be separately regulated under a general NPDES permit. As previously stated, the Beach Cities WMG agencies currently operate seven low flow diversions along the Santa Monica Bay to eliminate non-stormwater discharges.

The non-stormwater screening process consists of the steps shown in **Figure 2-4**. Further details on the Beach Cities WMGs approach to meet this requirement are provided in the CIMP for the Beach Cities Watershed Management Group (Beach Cities Watershed Management Group, 2014).

The watershed control measures proposed for non-stormwater discharges meet the requirements as set forth in Parts III.A and VI.D .4.d and VI.D.10 of the LA County MS4 Permit.

The following schedule is proposed to eliminate unauthorized non-stormwater discharges that are either causing or contributing to receiving water exceedances in Santa Monica Bay watershed:

- December 28, 2016—Source investigation will be completed on 50% of the major outfalls with significant non-stormwater discharges in the Beach Cities EWMP Area (including outfall SMB-O-7).
- March 28, 2017— Outfall monitoring will be initiated as required for the investigated outfalls, based on results of source investigation in accordance with Section 5.6 of the Beach Cities CIMP, to determine compliance with applicable non-stormwater WQBELs derived from TMDL WLAs.
- June 26, 2017—Elimination of all significant, unauthorized non-stormwater contributions will be completed for the investigated outfalls.
- December 28, 2017—Source investigations will be completed on the remaining 50% of the major outfalls with significant non-stormwater discharges in the Beach Cities EWMP area, (source investigation will be 100% complete by this date).
- March 28, 2018—Outfall monitoring will be initiated as required for the remaining 50% of investigated outfalls, based on results of source identification in accordance with Section 5.6 of the Beach Cities CIMP, to determine compliance with applicable non-stormwater WQBELs derived from TMDL WLAs.
- June 26, 2018—Elimination of all significant, unauthorized non-stormwater contributions will be completed for 100% of the major outfalls in the Beach Cities EWMP Area.

Source investigations will take place in accordance with Section 5.5 of the Beach Cities CIMP. Non-stormwater discharge elimination will be prioritized in Santa Monica Bay due to the fact that the dry weather final compliance date for the Santa Monica Bay Beaches Bacteria TMDL has passed.

TMDL-Specific Control Measures

The Beach Cities WMG has evaluated BMPs that have been previously identified in TMDLs and corresponding implementation plans. Those BMPs that have been constructed are discussed in Section 2.6.4 (Santa Monica Bay Watershed) and Section 3.6.4 (Dominguez Channel Watershed). Other measures identified in TMDLs and TMDL implementation plans were evaluated as part of the RAA process in order to determine what combination of measures would achieve compliance with Permit-specified WQBELs and/or RWLs.

Additional BMPs

In addition to the MCMs, non-stormwater discharge measures, and TMDL control measures, the Beach Cities WMG has identified additional BMPs to achieve compliance with Permit-specified WQBELs and/or RWLs. These BMPs are discussed in more detail in Section 2.6 (Monica Bay Watershed) and Section 3.6 (Dominguez Channel Watershed) below.

Demonstration of BMP Performance – Introduction to the Reasonable Assurance Analysis

The EWMP is a planning document intended to lay out a framework of activities that will comply with water quality requirements. Therefore, it is necessary to demonstrate that selected BMPs are reasonably expected to meet defined goals and objectives. This demonstration of performance is described through a technically robust and rigorous RAA. Through this analysis the Beach Cities WMG identified and evaluated BMP implementation scenarios within the Beach Cities EWMP Area for each WBPC identified in Section 2.2. The RAA process demonstrates that implementation of EWMP-defined activities should result in the attainment of applicable Permit-specified WQBELs, and will also prevent discharges from causing or contributing to exceedances of applicable RWLs. Since the modeling conducted as part of the RAA serves as the basis not only for BMP evaluation but also BMP identification, Section 2.4 is devoted to providing details on the RAA process. Results from the RAA are presented in Section 2.7.

Legal Authority

The Permit-required legal authority that the Beach Cities WMG has to implement the BMPs identified in the EWMP is discussed in Section 8.

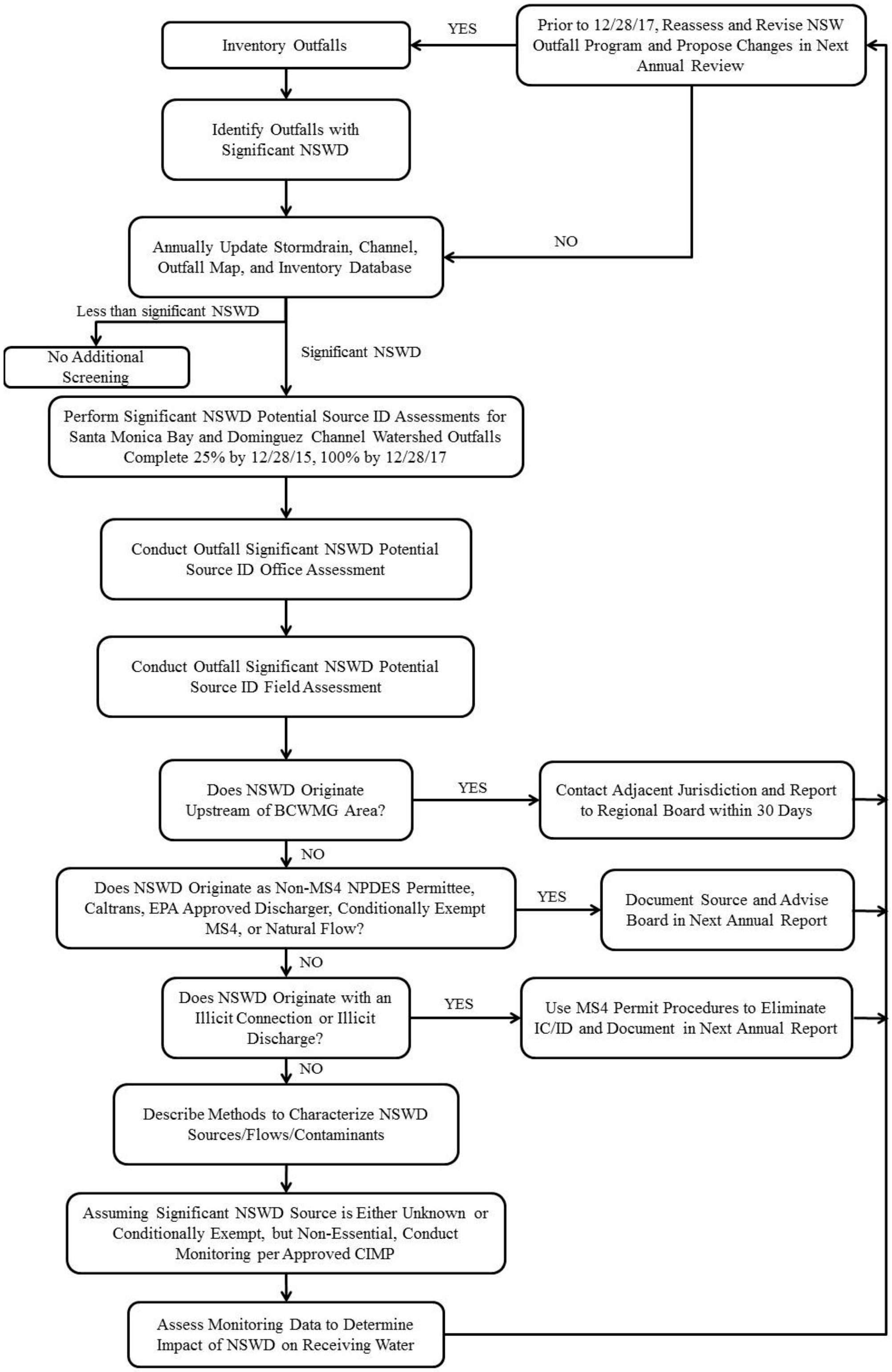

Figure 2-4. Non-Stormwater Outfall Screening Program

2.4 Reasonable Assurance Analysis Approach

The following subsections provide a summary of the modeling tools and approach, modeling data, calibration, and validation.

2.4.1 Description of RAA Tools and Approach

The approaches for performing the RAA in both dry and wet weather are described below.

Dry Weather

Demonstrating "reasonable assurance" of compliance with dry weather limits for the SMBBB TMDL requires a methodology that accounts for many factors which cannot be accurately modeled based on urban runoff processes alone (Thoe et al, 2014), despite the extensive summer-dry and winter-dry weather beach-specific monitoring datasets that are available. Therefore, to perform the RAA for dry weather for the Beach Cities WMG area, a semi-quantitative methodology has been developed to follow a permit compliance structure, as independent lines of evidence for demonstrating that MS4 discharges could not be causing or contributing to receiving water exceedances at the beaches. Because FIB are considered the "controlling" pollutants of concern during dry weather in the Beach Cities WMG area (i.e., if MS4 discharges are compliant for bacteria during dry weather, they will be compliant for all TMDL and 303(d) pollutants during dry weather), the methodology was developed to focus on bacteria (Beach Cities WMG, 2014).

The following criteria form the proposed dry weather RAA methodology. This methodology was presented to LARWQCB staff on April 9, 2014, and verbal feedback received at the time was supportive. If one criterion is met for CSMP compliance monitoring location (CML), then "reasonable assurance" is considered to be demonstrated.

1. A dry weather low flow diversion, disinfection system, or infiltration system is located at the CML. To meet this criterion, any such system should have records to show that it is consistently operational, well maintained, and sized to effectively eliminate freshwater surface discharges to the surf zone during year-round dry weather days.
2. There are no MS4 outfalls owned by the Beach Cities WMG Agencies within the CML's drainage area, and therefore MS4 discharges could not be contributing to pollutant concentrations at the CML.
3. Non-stormwater MS4 outfall discharges do not reach the wave wash and thus are effectively eliminated within the CML's drainage area. For this criterion to be met, supporting records from the non-stormwater outfall screening program should be supplied.

Wet Weather

The wet-weather RAA process consists generally of the following steps:

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

- For each analysis region (**Figure 2-5**), develop target load reductions (TLRs) for 90th percentile year for bacteria in SMB watershed based on LARWQCB RAA Guidelines, limit expressions in the Permit, and critical periods identified in the TMDLs;
- Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future;
- Evaluate the performance of these BMPs in terms of annual pollutant load reductions;
- Compare these estimates with the TLRs; and
- Revise the BMP implementation scenario until TLRs are met.

TLRs, as discussed previously, represent a numerical expression of the Permit compliance metrics (e.g., bacteria allowable exceedance days [AEDs] per year for wet weather) that can be modeled and can serve as a basis for confirming, with reasonable assurance, that implementation of the proposed BMPs will result in attainment of the applicable TMDL-based WQBELs and RWLs in the Permit for Category 1 pollutants, or the Water Quality Objectives for Category 2 and Category 3 pollutants.

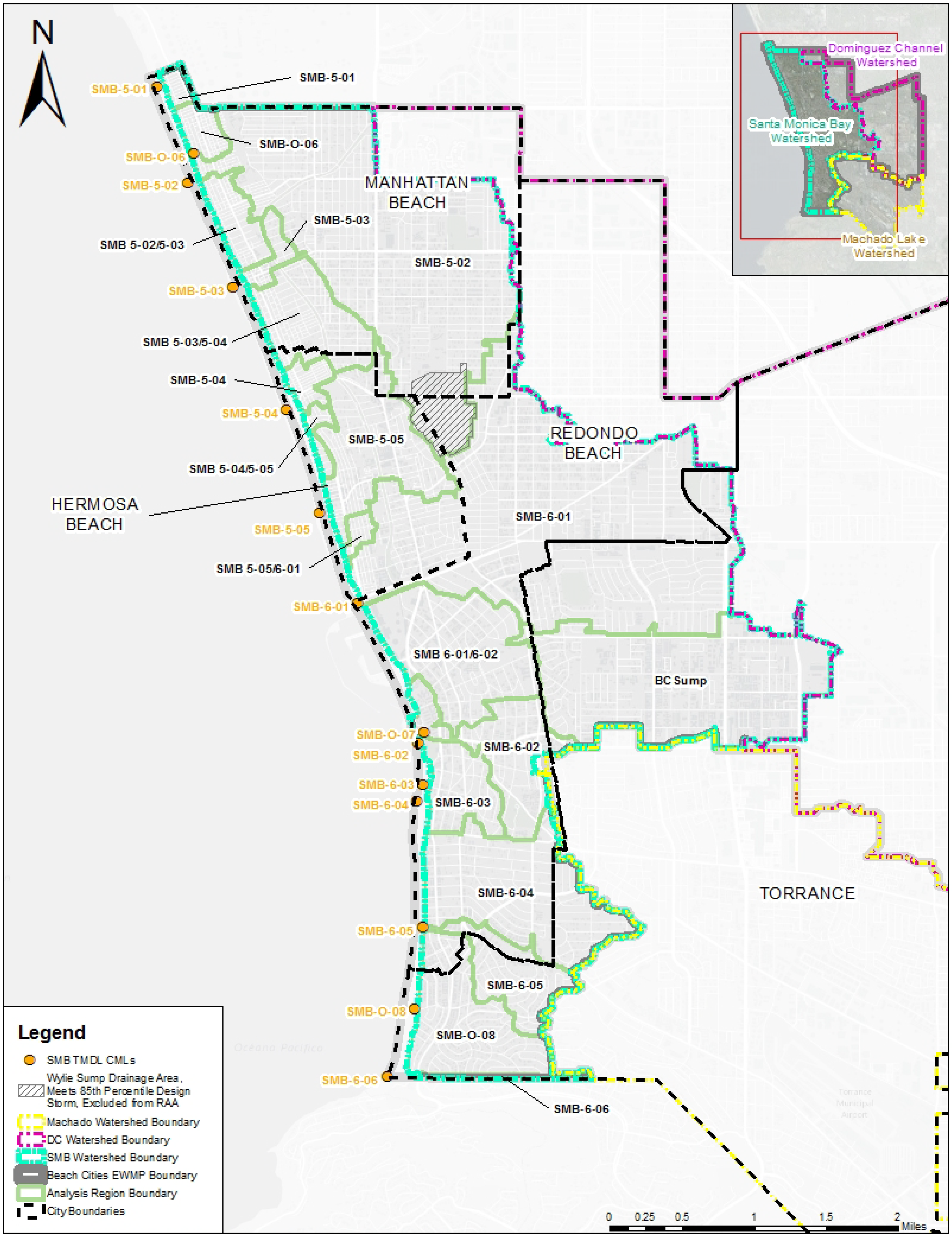

Figure 2-5. Analysis Regions and Monitoring Locations within the SMB Watershed portion of the Beach Cities EWMP Area

Structural BMP Prioritization and Analysis Tool (SBPAT) Model

The recommended RAA approach leverages the strengths of the publicly available, Permit-approved, Geographical Information System (GIS)-based model that has already been developed for the region and previously utilized in Jurisdictional Group 5 and 6 (J5&6): the Structural BMP Prioritization and Analysis Tool (SBPAT)[12].

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

1. **Modeling of SMB hydrologic and watershed processes** – SBPAT utilizes EPA's Stormwater Management Model (SWMM) as the hydrologic engine, and SBPAT has been calibrated to local rainfall and Santa Monica Bay (SMB) stream flow gauges, consistent with requirements of the RAA Guidelines;
2. **SMB pollutants of concern and their compliance metric expression** – SBPAT has been utilized for planning applications related to Bacteria TMDL compliance (and specifically exceedance-day predictions, based on SMB criteria), including a demonstrated linkage of modeled bacteria loads to measured exceedance days;
3. **Availability of new open space water quality loading data** – Recently developed EMC data are consistent with SBPAT and were also updated to reflect new data developed in SMB as part of this RAA-development effort;
4. **Capability to conduct opportunity and constraints screening** – SBPAT was designed to support structural BMP placement, prioritization, and cost-benefit quantification, and was previously successfully used for such purposes in the SMB EWMP Group area and other nearby SMB subwatersheds;
5. **Characterization of water quality variability** – SBPAT is capable of quantifying model output variability and confidence levels, which is a requirement of the LARWQCB's RAA Guidance; and
6. **Supports quantification of both structural and non-structural BMPs, and demonstrating compliance at both interim and final compliance dates** – SBPAT's modeling framework is easily compatible with methods for addressing non-structural BMPs and provides quantitative results for multiple BMP phasing milestones, as required by the Permit.

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[12] SBPAT is specifically referenced in the MS4 Permit Part VI.C.5.b.iv and was presented at the first two Permit Group TAC RAA Subcommittee meetings. Furthermore, SBPAT has been used for reasonable assurance analysis purposes in the Los Angeles region for four TMDL Implementation Plans, two WMPs, four EWMPs, and, in the San Diego region, for two Combined Load Reduction Plans and two Water Quality Improvement Plans.

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

- Calculates and tracks inflows to BMPs, treated discharge, bypassed flows, evaporation, and infiltration at each 10 minute time step;
- Distinguishes between individual runoff events by defining six-hour minimum inter-event time in the rainfall record (in order to track rain events), while also tracking inter-event antecedent conditions;
- Tracks volume captured by and bypassing BMPs, and summarizes and records these volumes by storm event; and
- Produces a table of each BMP's hydrologic performance, including concentrations and loads by storm event, and consolidates these outputs on an annual basis.

2.4.2 *Modeling Data*

Data used for the quantification/analysis module include both fixed and stochastic parameters. The model utilizes Los Angeles region land use EMCs, USEPA SWMM, USEPA/American Society of Civil Engineers/Water Environment Research Foundation (USEPA/ASCE/WERF) International BMP Database (IBD) BMP effluent concentrations, watershed/GIS data, and a Monte Carlo approach (relying on repeated random sampling) to quantify water quality benefits and uncertainties. Model data flow is provided below in **Figure 2-6**.

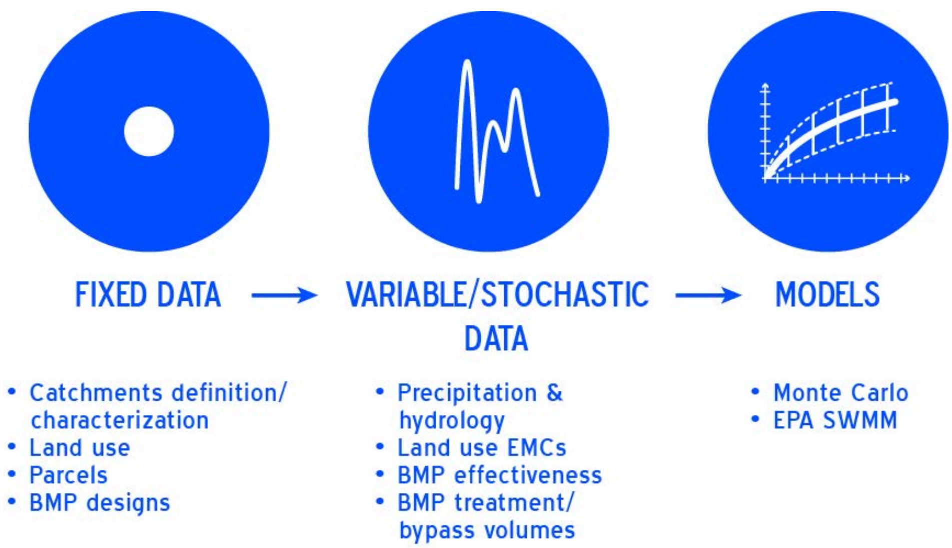


Figure 2-6. SBPAT Model Data Flow

Each model simulation integrates Monte Carlo methods that rely on repeated random sampling to obtain numerical results. Model simulations are run 20,000 to 50,000 times to calculate a distribution of outcomes that can support the definition of confidence levels and quantify variability. Consistent with the SBPAT usage, Monte Carlo methods are used in physical and mathematical problems when it is difficult to obtain a closed-form expression or when a deterministic algorithm is not desired. A schematic of SBPAT's Monte Carlo process is provided in **Figure 2-7**.

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

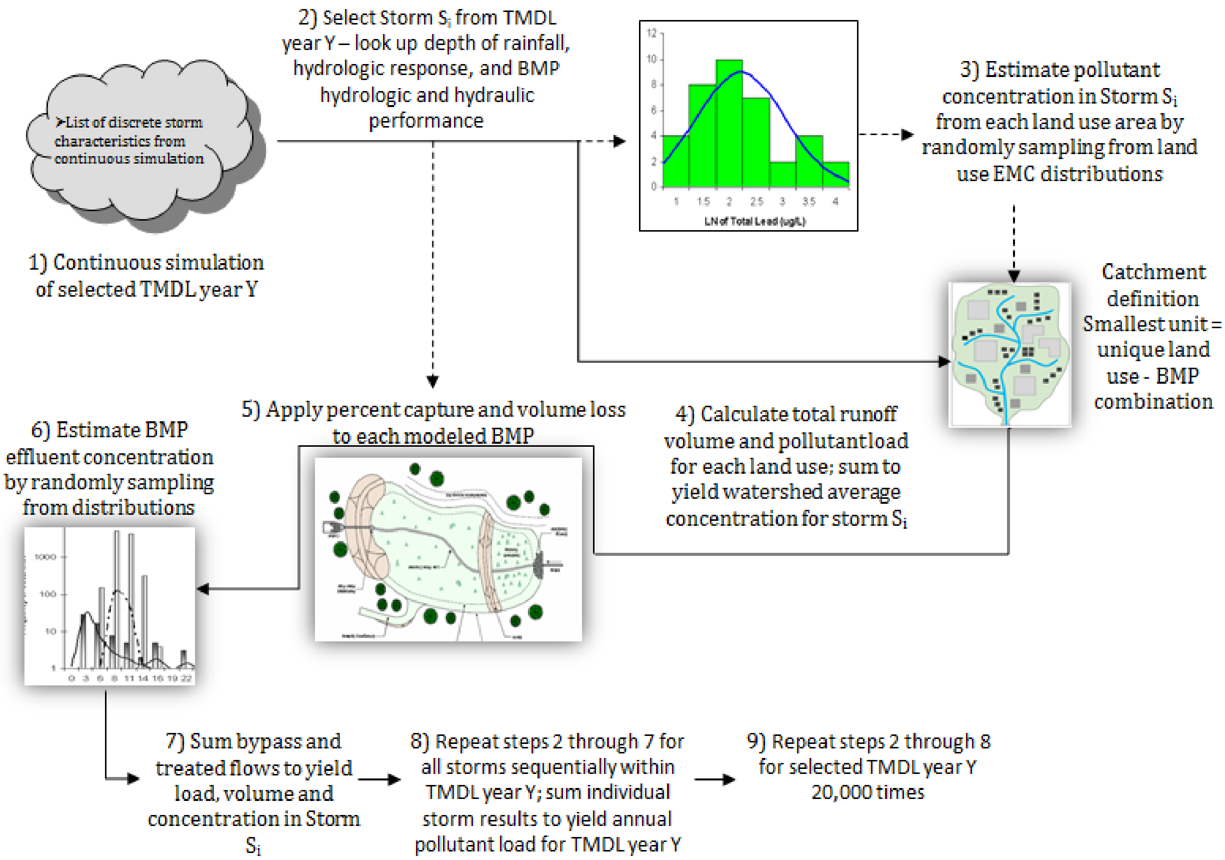


Figure 2-7. SBPAT Monte Carlo Method Components

The spatial domain of the RAA includes the land within the Beach Cities EWMP area tributary to SMB and Dominguez Channel. Adjustments were made to account for contributions from agencies not party to this EWMP (e.g., State/Federal, California Department of Transportation [Caltrans], Industrial General Permit holders, etc.) and are described in more detail later in this document.

GIS layers used in SBPAT included, but were not limited to, the following:

- Storm drains;
- Soils;
- Rain gauge polygons;
- Parcels;
- Land use; and
- Catchments.

SBPAT utilizes a customized version of SWMM for continuously simulating study area hydrology and BMP hydraulics. Long-term, hourly rainfall data and average monthly evapotranspiration values are used along with land use-linked catchment imperviousness and soil properties to estimate runoff volumes. Revised and recalibrated SBPAT database values and EWMP-defined BMP information are used to estimate the volume of runoff generated from watershed areas and captured by BMPs. Storm events are individually tracked for the entire simulation so that the volumes of runoff infiltrated, evapotranspired, captured, and released (if applicable) by BMPs are estimated for every storm event. Hourly rainfall data from LAX (NCDC ID45114) were used in the portion of the Beach Cities EWMP area draining to Santa Monica Bay. Hourly rainfall data from a Los Angeles County rainfall gauge at Manhattan Beach (Station ID 1070) was used for the portion of the Beach Cities EWMP area draining to Dominguez Channel. Rain gauges are shown in **Figure 2-8.**

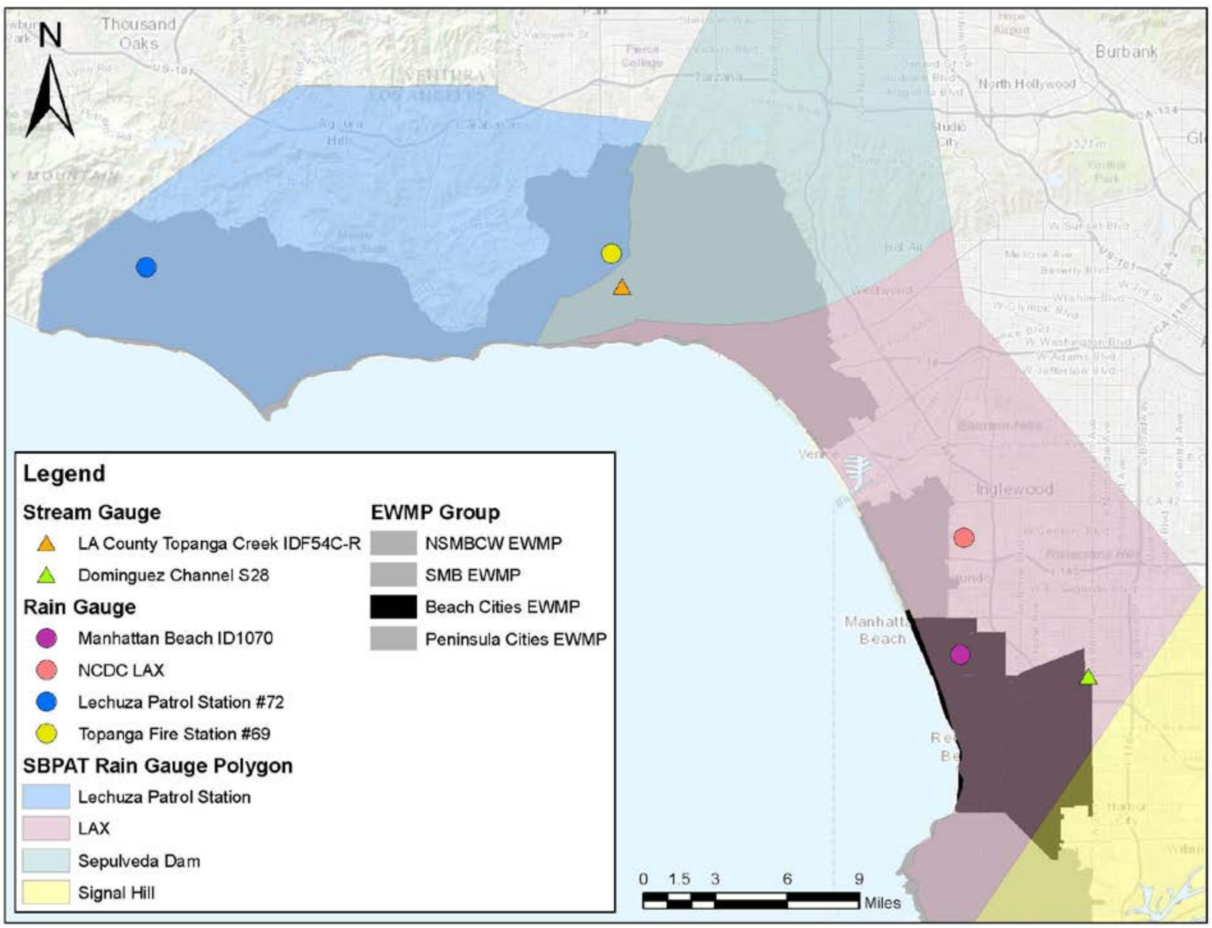


Figure 2-8. SBPAT Rain and Stream Gauges

Critical Condition Definition

Consistent with the SMBBB TMDL and the LARWQCB RAA Guidance Document, the RAA was performed on the 90th percentile critical year. This year was determined by evaluation of local rainfall records for all four EWMP Groups located along Santa Monica Bay over the 1989 to 2011 period of record, evaluating "TMDL years" as defined by the SMBBB TMDL (i.e., November 1 –

October 31). Of the local rain gauges evaluated, the Manhattan Beach gauge (Station ID 1070) (**Figure 2-8**), was determined to be the most representative of the Beach Cities WMG area. The rainfall record was analyzed to determine the 90th percentile year based on both the number of wet days (days with >=0.10-inch for rainfall and the three days following, per the SMBBB TMDL) as well as total annual rainfall. **Table 2-5** below presents these results. The 90th percentile year was determined to be either 1995 or 2005 based on wet days (73 total). TMDL year 1995 was selected to be the most conservative of these two years because while it is the 90th percentile year based on number of wet days, 1995 also had slightly more total rainfall than 2005. Therefore, the RAA was performed on TMDL year 1995. Although detailed results are only provided for the Beach Cities WMG, the 90th percentile year was determined to be 1995 across all four SMB EWMP Groups (Santa Monica Bay, North Santa Monica Bay Coastal Watersheds, Beach Cities, and Peninsula). A summary of annual rainfall data for the gauge above is provided in **Appendix Q**.

Table 2-5. Rainfall Summary at Manhattan Beach Precipitation Gauge (Station ID 1070)

90th Percentile TMDL Year (Type)	TMDL Year	Wet Days*	Total Rainfall (in)
Number of Wet Days	1995	73	22.0
Total Annual Rainfall	2005	73	21.9

*Compliance with the wet weather SMBBB TMDL is based on the number of allowable exceedance days.

The priority WBPCs for the Beach Cities EWMP area, combined with data availability, establishes the specific WBPCs addressed by the RAA. As previously described, SBPAT links the long-term hydrologic output from SWMM to a stochastic Monte Carlo water quality model to develop statistical descriptions of stormwater quantity and quality. Through this approach, the predicted runoff volumes for each storm are randomly sampled from the long-term storm event runoff volume record produced by SWMM. Land use-based wet weather pollutant EMC values (see **Appendix I)** and BMP effluent concentrations (see **Appendix J**) for each storm are then randomly sampled from their lognormal statistical distributions. The runoff volumes (including volumes treated and bypassed by BMPs), land use EMCs, and BMP effluent concentrations are combined to determine the total pollutant loads and load reductions (i.e., difference between existing and post-BMP load estimates) for each sampled storm event. This procedure is then repeated thousands of times, each time recording the volume, pollutant concentrations, loads, and load reductions for each selected storm event. The statistics of these recorded results are then used to characterize the average daily values as well as the average (mean) values for the annual volume, pollutant loads, and pollutant concentrations in stormwater runoff from the modeled area, with and without BMPs implemented.

The IBD is a comprehensive source of BMP performance information (www.bmpdatabase.org), comprised of data from a peer-reviewed collection of studies that have monitored the effectiveness of a variety of BMPs in treating water quality pollutants for a variety of land use types. Water quality performance data from the IBD were used to develop effluent concentrations (averages and standard deviations) for the BMPs and constituents in **Table 2-6**. As with land use EMCs, the effluent quality of BMPs is highly variable. To account for this variability in SBPAT, effluent quality data were analyzed and descriptive statistics were generated for use in the Monte Carlo statistical sampling technique. **Appendix J** contains detailed information on the BMP effluent statistics.

Table 2-6. BMPS and Constituents Modeled in SBPAT[1]

BMPs	Constituents
Constructed Wetland / Retention Pond (with Extended Detention)	Fecal Coliform (FC)
Constructed Wetland / Retention Pond (without Extended Detention)	Total lead (TPb)
Dry Extended Detention Basin	Total suspended solids (TSS)
Hydrodynamic Separator	Total phosphorus (TP)
Media Filter	Dissolved phosphorus as P (DP)[3]
Subsurface Flow Wetland	Ammonia as N (NH3)
Treatment Plant	Nitrate as N (NO3)
Bioswale	Total Kjeldahl nitrogen as N (TKN)
Bioretention with underdrain	Dissolved copper (DCu)
Bioretention (volume reduction only)[2]	Total copper (TCu)
Cistern (volume reduction only)[2]	Dissolved zinc (DZn)
Green Roof (volume reduction only)[2]	Total zinc (TZn)
Porous Pavement (volume reduction only)[2]	
Low Flow Diversion (volume reduction only)[2]	

[1] Constituents are addressed for BMPs that provide treatment (i.e., excluding those identified as "volume reduction only").

[2] For these BMPs, it is assumed that 100% of pollutant loads associated with the volume of water infiltrated is treated by the BMP. Water that bypasses or otherwise discharges from the BMP is assumed to receive no treatment.

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

2.4.3 *Calibration*

Hydrology

The hydrology component of SBPAT was calibrated for the only location in the entire greater SMB watershed where all data requirements (daily flow, hourly precipitation, and daily beach bacteria concentrations) were met - the Topanga Creek subwatershed. No other SMB areas have sufficient data available. The Topanga Creek subwatershed is located north of the Beach Cities WMG area.

Since primary output for SBPAT's prediction of the SMB watershed are annual volumes and pollutant loads, the calibration focused on accurate prediction of annual discharge volumes from the Topanga Creek subwatershed outlet, with estimated baseflow removed. Hourly rainfall data were used for the nearby Lechuza Patrol Station #72 gauge (gauge reference ID 352b, see **Figure 2-8**, in Malibu, with these data adjusted upward based on an annual rain depth ratio between the higher elevation Topanga Fire Station #69 gauge (gauge reference ID 6) and the coastal Lechuza gauge. Los Angeles County's Topanga Creek streamflow gauge (gauge reference ID F54C-R) was used to estimate measured annual discharge volumes for comparison with modeled volumes. The effective impervious percentage for the open space land use category and the saturated hydraulic conductivity of all mapped soil types served as calibration parameters.

Previous hydrologic calibration reported in the Beach Cities EWMP Work Plan (Beach Cities WMG, 2014) was refined to include additional precipitation and streamflow data. The refined calibration used a vacant undifferentiated land use effective imperviousness value of 1 percent. The refined calibration required the evaluation of various saturated hydraulic conductivity multipliers that would result in increased model runoff (i.e., each soil type's original hydraulic saturated conductivity was multiplied by the same value). The calibration was performed iteratively with multipliers ranging from 0.1 to 2.0 until the average annual modeled volume produced an acceptable error value when compared to the average annual observed volumes. A multiplier of 0.20 was selected as most appropriate. **Figure 2-9** is a depiction of the refined hydrologic calibration results, including the 0.20 saturated hydraulic conductivity multiplier. The emphasis of the calibration effort focused on accurate, unbiased prediction of "non-extreme" annual conditions (annual volumes exceeding a 25-year frequency, 4 percent probability, were excluded from the calibration effort). Based on available data, the period of calibration was 12 years, between 2001 and 2012, with water years 2005 and 2008 excluded due to outlying streamflow measurement results[13]. These calibrated input parameter values were used throughout the SMB watersheds in the wet weather RAAs. **Figure 2-10** presents these same results in a flow duration curve format, which compares the distribution of annual discharge volume magnitudes throughout the period analyzed between the modeled and observed data.

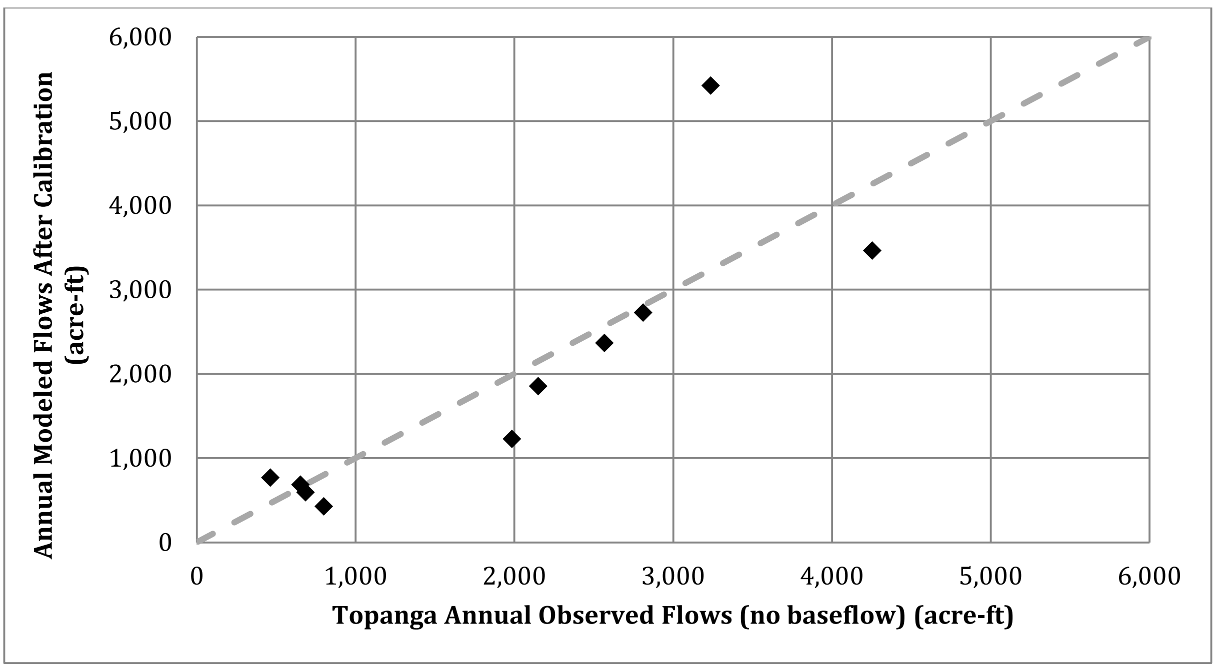


Figure 2-9. Annual Runoff Volumes for Topanga Creek Subwatershed: Modeled vs. Observed.

[13] The stream gauge annual volume measurement in 2008 was unexplainably high (corresponding to a runoff coefficient greater than one), and the 2005 year included a 15-day period of near-record rainfall levels that were anomalously high (where the mean annual rainfall depth fell between December 27 and January 10, and major landslides were reported in coastal Ventura County).

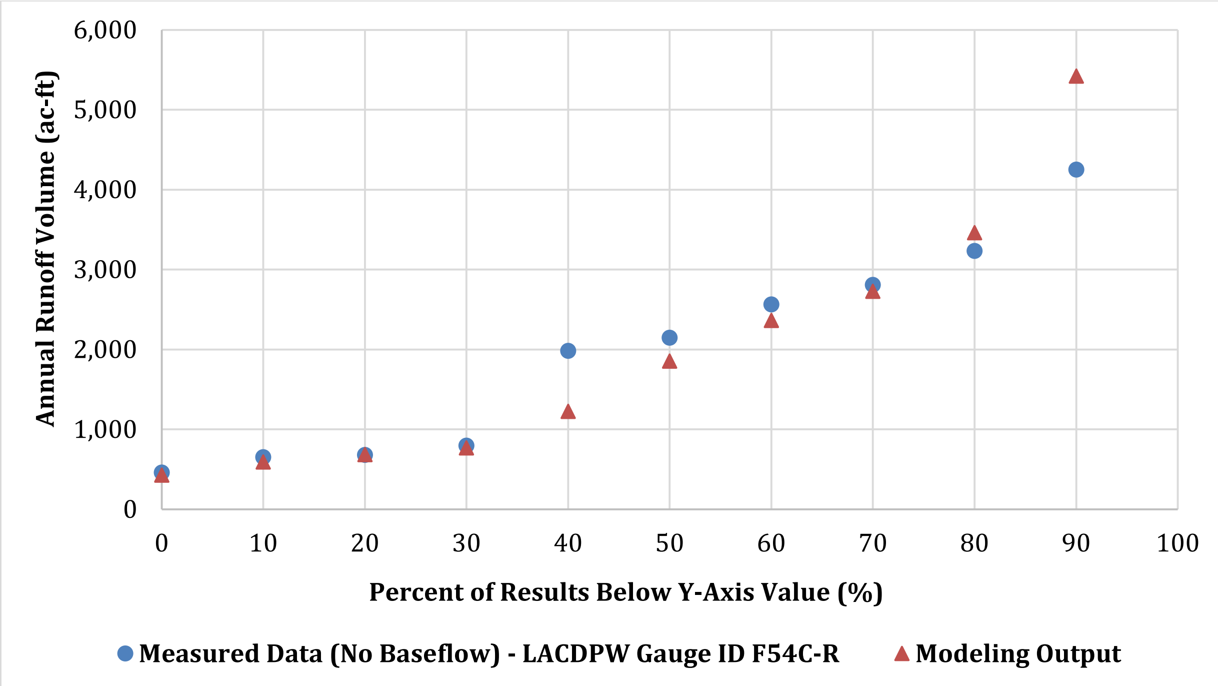


Figure 2-10. Annual Runoff Volumes for Topanga Creek Subwatershed: Modeled vs. Observed (Flow Duration Curve Format).

Following calibration, average relative prediction error (or the percent differences between the average annual observed and modeled annual runoff volume) was calculated to be -0.24%. According to the LARWQCB's RAA Guidance Document, which is based on Donigian, 2000, SBPAT model performance with respect to hydrology as a result of this calibration is in the "very good" category.

Water Quality

The RAA Guidelines require water quality calibration based on available monitoring data from each analysis region over the most recent 10 years. However, in the SMB EWMP analysis regions, freshwater (i.e., mass emission type) monitoring stations with fecal coliform data[14] are not available from a recent 10 year period. Therefore, calibration that meets the guidelines is not possible at this time. After several years of CIMP monitoring data have been collected, this may be reevaluated as part of the EWMP adaptive management process. Also, since a conventional water quality calibration was not possible at this time, a validation of baseline exceedance day output was performed for the Leo Carrillo reference watershed using recent beach bacteria monitoring results, as described below. The reference watershed was used for this validation because it is the basis of the TMDL Waste Load Allocations, which the RAA TLRs are intended to represent.

[14] Fecal coliform data and objectives were used to represent all fecal indicator bacteria because fecal coliform has the most robust land use and BMP effluent EMC datasets.

2.4.4 Validation

A validation step was performed to demonstrate that modeled annual fecal coliform loads are indeed predictive of the compliance metric, or annual exceedance days for fecal indicator bacteria. For bacteria modeling, verifying the linkage between modeled *fecal coliform loads* (i.e., discharged from the watershed outlets) and total observed wet weather *exceedance days* (in the receiving water, based on REC1 daily maximum water quality objectives) was critical to establish reasonable assurance that CMLs would be in compliance with the Permit limits. To establish this linkage, an analysis was conducted using shoreline monitoring data at Topanga Canyon[15] (SMB-1-18) between 2005 and 2013. **Figure 2-11** illustrates that decreasing fecal coliform loads should result in measurable reductions in exceedance days, and that there is a reasonable correlation between total annual modeled fecal coliform loads and total annual observed wet weather exceedance days. Each point shown represents one TMDL year.

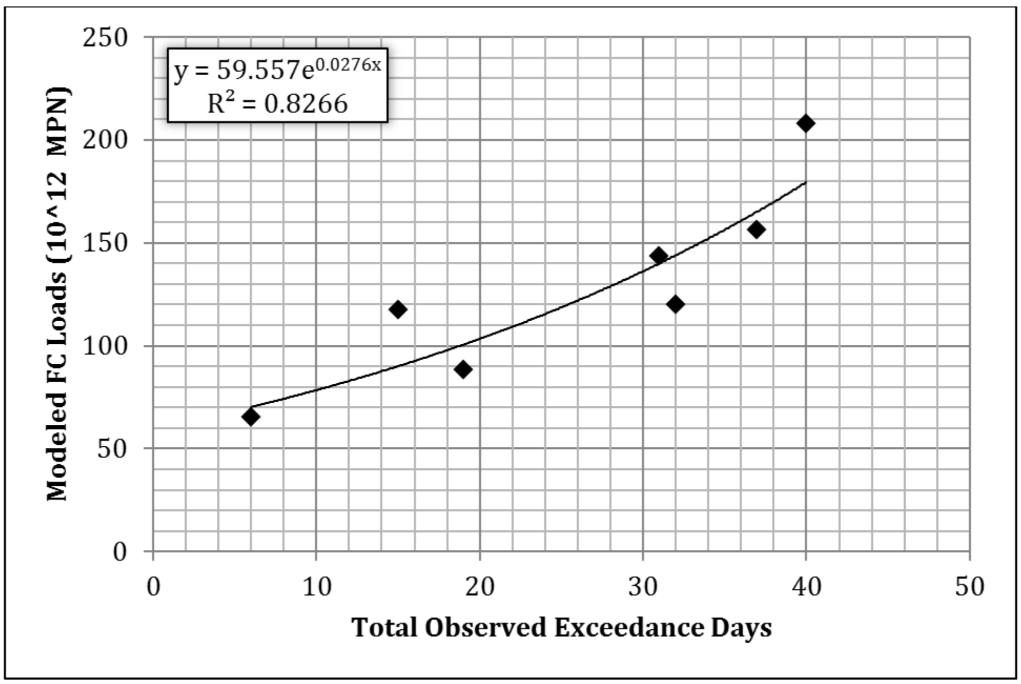


Figure 2-11. Correlation between Modeled Fecal Coliform Loads and Observed Exceedance Days (each point represents one TMDL year, 2005-2013)

2.5 Baseline Loads and Target Load Reductions

The process for establishing TLRs for the modeled WBPC (bacteria in Santa Monica Bay) is described in the following section. For analysis regions with SMBBB TMDL CMLs that have anti-degradation-based allowable exceedance days for wet weather, a target load reduction of zero was

[15] This subwatershed is 88 percent open space and was selected for water quality validation due to it being the hydrologic calibration subwatershed as well as because it had *daily* shoreline monitoring data, which was necessary in order to have a sufficiently robust dataset of annual wet weather exceedance days.

assumed consistent with the TMDL's approach which acknowledges that historic bacteria exceedance rates for each of these analysis regions are lower than that of the reference beach, on average. This assumption of zero target load reduction applies for seven of the 11 total SMBBB TMDL CMLs in this Beach Cities watershed – i.e., SMB-5-1, SMB-5-3, SMB-5-4, SMB-5-5, SMB-6-2, SMB-6-5, and SMB-6-6. Historic wet weather monitoring data (2005 – 2013) at these sampling locations confirm this understanding, as the long-term exceedance rate at all seven sites varies between 6.4 and 22%, below the long-term wet weather exceedance rate at the reference beach (26%). Bacteria reductions were still modeled using SBPAT in these analysis regions, but BMP modeling results were not compared with a target load reduction; i.e., quantification only serves to express the additional water quality benefits of existing and proposed BMPs in these analysis regions.

2.5.1 Bacteria

In order to establish a TLR for each modeled Santa Monica Bay analysis region, a modeling methodology was developed and tested to relate the annual number of modeled calendar days with rainfall-generated runoff (or "discharge days") to the expected annual bacteria exceedance days, which is the Permit's WQBEL expression for the SMBBB TMDL. To be consistent with the SMBBB TMDL for wet weather, which established the allowed exceedance day Waste Load Allocations based on monitoring results from the Leo Carrillo reference beach, this modeling methodology was first tested on Leo Carrillo and its Arroyo Sequit subwatershed for the same critical year as the TMDL (TMDL year 1993). The goal of this analysis was to validate the modeling methodology by comparing its predicted exceedance days for Leo Carrillo with the 17 exceedance days from the TMDL, for TMDL year 1993. This analysis occurred in three steps:

1. The calibrated SBPAT model, using the nearby Lechuza Patrol Station gauge for TMDL year 1993 (consistent with the TMDL), resulted in 59 discharge days for Arroyo Sequit.
2. Based on 2003 to 2013 Leo Carrillo monitoring data, 27% of wet weather samples exceeded the single sample recreational Water Quality Objectives on days with rainfall greater than 0.10-in. In other words, 27% of wet weather days when runoff discharges might be expected (i.e., days with rainfall), FIB concentrations at the beach exceeded the objectives.
3. Multiplying 59 discharge days by the 27% exceedance percentage results in 16 predicted wet weather exceedance days for Leo Carrillo for TMDL Year 1993. This result is within 6% of the 17 exceedance days that were determined through the original analysis in the SMBBB wet weather TMDL, thereby validating the proposed exceedance day calculation methodology.

After validation of the modeling methodology using the reference watershed, it was applied to all SMB analysis regions to predict baseline exceedance days for the 90th percentile year, or TMDL year 1995. Once baseline exceedance days were estimated for every analysis region, the exceedance day count was compared with allowed exceedance days from the TMDL (i.e., 17 for all non-anti-degradation compliance monitoring beaches). To determine the TLR necessary for each analysis region to meet the allowed exceedance days, a virtual retention BMP was modeled at the outlet of each analysis region. This approach was presented to LARWQCB staff on June 6, 2014 and verbal feedback received during the meeting was supportive.

Each virtual retention BMP included a diversion with a virtual hydraulic capacity that results in in a model-derived bypass frequency (or number of discharge days), during TMDL year 1995 that meets the allowable exceedance day criteria. Each diversion is modeled as a full capture system. The net load reduction resulting from this BMP scenario (i.e., baseline analysis region load minus analysis region load with the diversion system and retention BMP in place) for the 90th percentile year (1995) becomes the TLR for each analysis region. For the RAA, reasonable assurance of compliance is established when load reductions associated with proposed BMPs equal the TLR for each analysis region.

In summary, the following approach was implemented to calculate a TLR for each modeled analysis region (see **Appendix K** for example calculation):

1. Each analysis region was modeled in SBPAT for the 90th percentile year (TMDL 1995).
2. The existing, baseline condition (i.e., without any outlet retention BMP) was modeled for each analysis region, resulting in a mean baseline fecal coliform (FC) load for the 90th percentile year (baseline load).
3. The exceedance percentage of samples collected during days with precipitation greater than 0.1 inches was determined for each analysis region.
4. The allowable number of discharge days for each analysis region was calculated by dividing 17 TMDL allowable exceedance days by the exceedance percentage calculated in Step 3.
5. An instream diversion to a large virtual retention BMP at the outlet of each analysis region was iteratively sized so that it only bypasses during the number of allowable discharge days determined in Step 4.
6. Each diversion and virtual retention BMP was then modeled in SBPAT to produce a mean FC load for the 90th percentile year (allowed load).
7. For each analysis region , the difference between the baseline load (step 2) and the allowed load (step 6) resulted in a TLR for the 90th percentile year, which was the target load reduction required to meet the 17 allowable TMDL exceedance days for wet weather.

By implementing the steps described above, TLRs were developed for all analysis regions within the MS4, including both open beach and point zero CMLs. These TLRs are presented in **Table 2-7** for both the interim and final compliance deadlines. TLRs for the interim compliance deadlines are assumed to be 50% of the final TLR. TLRs for analysis regions located between two point zero CMLs, but not representing an open beach site, were assigned the TLR of the geographically smaller of the two adjacent CML analysis regions.

It should be noted that a zero percent TLR was calculated in the analysis region draining to CML SMB-6-03. This analysis region and CML had a lower average wet weather exceedance rate than the reference watershed based on a recent nine year period (2005-2013), produced relatively few modeled stormwater discharge days, and had few years with measured wet weather exceedance days greater than allowable exceedance days (i.e., only three of the recent nine years exceeded the allowed days, and each year by just one exceedance day).

Similarly, a zero percent TLR was also calculated in the analysis region draining to CML SMB-6-04. The frequency of exceedance at SMB-6-04 (27.6%) was lower than that of the surrounding anti-degradation sites SMB-6-02 (33.3%) and SMB-6-05 (31.0%) and also lower than the exceedance rate of SMB-6-03 (37.9%), which was calculated to have a TLR of zero. Further, SMB-6-04 is an open beach CML with no major MS4 outfall at the sampling location.

As stated earlier, nine CMLs with anti-degradation-based wet weather allowable exceedance days were assigned zero TLRs to reflect their historic good water quality. Although the SMBBB TMDL requires only that beach water quality at anti-degradation compliance locations be maintained, the Beach Cities EWMP will seek to implement nonstructural and Low Impact Development (LID)-based BMPs within the SMB portion of their EWMP area which will protect and potentially improve water quality at these beaches and is consistent with the J5&6 Implementation Plan (Geosyntec Consultants, 2011) for the SMBBB TMDL. These measures, though not required for RAA demonstration, are quantified in Section 2.6.3 below.

Table 2-7. Target Load Reductions for Fecal Coliform for each Modeled Analysis Region in Santa Monica Bay Watershed - TMDL Year 1995

Analysis Region	2003-2013 Historical Exceedance Frequency (Daily Rainfall >0.10-in)	Allowable Discharge Days (Daily Rainfall > 0.10-in)	Diversion Flowrate (cfs)	Baseline Condition for the Critical Year: Annual Runoff (ac-ft)	Baseline Condition for the Critical Year: Average Pollutant Concentration[5] (MPN/ 100mL)	Baseline Condition for the Critical Year: Annual Pollutant Load (10[12] MPN)	Allowed Condition for the Critical Year[6]: Annual Runoff (ac-ft)	Allowed Condition for the Critical Year[6]: Average Pollutant Concentration[5] (MPN/ 100mL)	Allowed Condition for the Critical Year[6]: Annual Pollutant Load (10[12] MPN)	Target Load Reduction for the Critical Year[6]: Interim Target Load Reduction: Absolute Load (10[12] MPN)	Target Load Reduction for the Critical Year[6]: Interim Target Load Reduction: % of Baseline Annual Load	Target Load Reduction for the Critical Year[6]: Final Target Load Reduction: Absolute Load (10[12] MPN)	Target Load Reduction for the Critical Year[6]: Final Target Load Reduction: % of Baseline Annual Load
SMB-5-01[1]	10.3%	4	0	39	15,400	7.4	39	15,400	7.4			0	0%
SMB-O-06	N/A	4	0	90	20,700	23.0	90	20,700	23.0			0	0%
SMB-5-02	67.9%	17	53	1516	28,600	534.8	1516	15,400	287.2			247.6	46.3%
SMB-5-02/ SMB-5-03[2]	N/A	12	0	123	23,000	34.9	123	23,000	34.9			0	0%
SMB-5-03[1]	17.2%	6	0	65	36,200	29.0	65	36,200	29.0			0	0%
SMB-5-03/ SMB-5-04[2]	N/A	9	0	251	28,800	89.3	251	28,800	89.3			0	0%
SMB-5-04[1]	31.0%	12	0	51	27,200	17.1	51	27,200	17.1			0	0%
SMB-5-04/ SMB-5-05[2]	N/A	10	0	37	17,800	8.2	37	17,800	8.2			0	0%
SMB-5-05[1]	31.0%	8	0	472	31,400	182.8	472	31,400	182.8	Interim target load reduction assessed on a watershed-wide basis		0	0%
SMB-5-05/ SMB-6-01[2]	N/A	13	0	36	15,100	6.7	36	15,100	6.7			0	0%
SMB-6-01[3]	63.9%	17	70	2118	27,100	706.6	2118	15,100	394.3			312.1	44.2%
BCSump[3]	63.9%	17	40	1191	25,800	379.4	1191	13,700	201.4			178	46.9%
SMB-6-01/ SMB-6-02[2]	N/A	16	0	621	21,200	162.5	621	21,200	162.5			0	0%
SMB-6-02[1,4]	33.3%	14	0	358	22,600	99.6	358	22,600	99.6			0	0%
SMB-6-03	37.9%	17	0	206	24,500	62.2	206	24,500	62.2			0	0%
SMB-6-04	27.6%	17	0	621	27,400	209.9	621	27,400	209.9			0	0%
SMB-6-05[1]	31.0%	11	0	230	32,000	90.9	230	32,000	90.9			0	0%
SMB-O-08	N/A	7	0	425	26,500	138.9	425	26,500	138.9			0	0%
SMB-6-06[1]	10.3%	3	0	19	28,000	6.7	19	28,000	6.7			0	0%
SMB Watershed-Wide	N/A	N/A	N/A	**8468**	**26,700**	**2789.9**	**8468**	**19,600**	**2052.1**	**368.9**	**13%**	**737.7**	**26%**

[1] Anti-degradation site.
[2] For the unmonitored tributary areas located in-between the CML tributary areas, TLRs were assigned from the geographically smaller of the two adjacent CML analysis regions.
[3] "BCSump" was defined as a separate analysis region for modeling purposes. The baseline load for "BCSump" analysis region was combined with the baseline load of the "SMB-6-01" analysis region to equal the total baseline load contributing to the SMB-6-01 CML ("SMB-6-01+BCSump").
[4] The drainage area to Outfall SMB-O-07 is encompassed by analysis region SMB-6-02; therefore SMB-O-07 was analyzed as part of analysis region SMB-6-02.
[5] Average pollutant concentrations are estimated as the total annual load divided by the total annual runoff volume.
[6] RAA demonstration is made based on the achievement of the TLR values in terms of absolute load removed by the proposed suite of BMPs in each analysis region. The target load reductions in terms of runoff volume and concentration are shown for informational purposes only.

2.6 Best Management Practices

2.6.1 *Methods to Select and Prioritize BMPs*

In order to demonstrate reasonable assurance, BMPs were identified in a prioritized manner. Prioritization was based on cost (low cost BMPs were prioritized first); BMP effectiveness for the pollutants of concern (BMPs that had greater treatment efficiency for the pollutant of concern in a particular analysis region were prioritized over other BMPs); and implementation feasibility as determined by the Beach Cities WMG. In general, nonstructural BMPs were prioritized over structural BMPs due to their lower relative cost, and then structural BMPs were identified that would likely result in the greatest load reduction per dollar.

The RAA was performed according to the following steps:

1. Calculate load reductions associated with existing structural BMPs;
2. Assume a load reduction for non-modeled non-structural BMPs (five percent of baseline pollutant load);
3. Calculate load reductions for public retrofit incentives (e.g., downspout disconnects) and redevelopment;
4. Calculate load reductions attributable to anticipated new permit compliance activities of non-MS4 entities (e.g., Industrial General Permit holders and Caltrans);
5. Calculate load reductions for proposed regional BMPs that were identified in existing plans; and
6. Meet the TLR by backfilling the remaining load reduction with new regional or distributed green streets BMPs, with green streets modeled by assuming treatment of runoff from a percentage of specific developed land uses.

The following schedule assumptions were made:

- Only BMPs implemented after the TMDL effective date (2003) were included;
- Redevelopment BMPs were assumed to use different sizing criteria before and after 2015 (EWMP submittal date), consistent with the Permit's post-construction requirements; and
- Modeled load reduction output are reported for both the interim (2018) and final (2021) TMDL compliance dates.

2.6.2 *Recommended MCMs and Nonstructural BMPs*

The Permit allows permittees developing an EWMP the opportunity to customize the MCMs specified in the Permit to focus resources on high priority issues within their watersheds. Modifications to the MCMs must be appropriately justified and still be consistent with 40 CFR § 122.26(d)(2)(iv)(A)-(D). A control measure may only be eliminated based on the justification that it is not applicable to a particular permittee (per Section IV.C.5.b.iv.1(c). Customized measures, once approved as part of the EWMP, will replace in part or in whole the prescribed MCMs in the Permit. The Planning & Land Development Program is not eligible for customization in that it may be no less stringent than the baseline requirements in the Permit. However, it can be enhanced over the baseline permit requirements if desired. The Permit-specified MCMs (baseline MCMs) build upon the MCMs in the previous MS4 Permit (Order 01-182). Although similar in many ways to the previously required MCMs, in most cases the baseline MCMs contain more prescriptive record-keeping and/or implementation requirements.

Summary assessments of each MCM contained in the Permit are provided in **Table 2-8**, as well as a determination as to whether the Beach Cities WMG will implement the MCM provisions as defined in the Permit, or whether modifications will be made. Additional modifications may also be made through the Adaptive Management Process, outlined in Section 5.

General Framework for MCM Customization

An approach for evaluating existing institutional MCMs was developed as part of the Beach Cities EWMP Work Plan and was used to evaluate existing MCMs and develop the customized MCMs. The following steps provide a general framework for MCM customization:

1. Identify MCMs for potential customization. This may include identifying:
    a. MCM requirements prescribed by the Permit which are not already being implemented by the permittee;
    b. Currently implemented MCMs which have been enhanced over the previous Permit as part of TMDL implementation, e.g., Clean Bay Restaurant Program;
    c. Programmatic solutions/non-structural controls identified in TMDL implementation plans which may not yet have been implemented; and
    d. MCMs which are currently being implemented but which may be excessive in scope. For example, commercial inspections being conducted of retail gasoline facilities which are already heavily regulated through other environmental programs in areas that have no receiving water impairments for the pollutants of concern may be carried out less frequently, or discontinued indefinitely.
2. Identify MCMs which are not applicable. A control measure may be eliminated based on the justification that it is not applicable to a particular permittee. For example if it is the policy of a permittee not to use pesticides in public agency activities, then there is no need for tracking of pesticide use and this MCM may be proposed for elimination.
3. Assess the effectiveness of the incremental baseline MCM requirements with respect to water quality priorities. The data necessary to quantify this will vary greatly by MCM, but may include information such as: receiving water quality, inspection and reporting records, number of qualifying projects (e.g., number of construction projects greater than 1 acre), number of pet station bags used, amount of material picked up by street sweeping activities, number of employees trained, and maintenance records. Additionally, the California Stormwater Quality Association (CASQA) provides a tool to estimate the effectiveness of stormwater management programs (CASQA, 2015). The tool recommends possible assessment metrics that can be used for various stormwater programs.

4. Quantify the additional resources required to implement the incremental baseline MCMs. This may include estimating additional staff resources in terms of full-time employees, consulting resources, and contracted services.
5. Assess the effectiveness and resources required to implement the customized MCM. The process to quantify these will be the same as the process used to quantify the baseline effectiveness of the existing MCM.
6. Compare the assessed effectiveness and resources required to implement the incremental baseline MCMs and the customized MCMs. Customization can be justified in several ways:
    a. If the customized MCM effectiveness is equal to or greater than the baseline MCM, customization can be justified.
    b. If an MCM requirement is not applicable, then elimination is justified.
    c. If the incremental MCM requires additional resources that are disproportionate to the increased effectiveness achieved, then retention of the existing MCM may be justified.
7. Document the customized MCM justification.

MCMs were evaluated based on their effectiveness in addressing the WBPCs specific to the Beach Cities EWMP Area and based on the Beach Cities WMGs knowledge and experience with existing MCMs. In many ways, the Group's practical experience with MCM implementation over time provides the best insight as to what MCM modifications/ enhancements will be most helpful to target the WBPCs of concern in the Beach Cities EWMP Area.

Table 2-8 summarizes the proposed MCM modifications common to the Beach Cities EWMP WMG, which include promotion of Ocean Friendly Landscaping Workshops as part of the residential outreach permit requirement, distribution of a Clean Bay Restaurant Program brochure to promote public education, establishment of a stormwater website for J5&6, implementation of the Clean Bay Restaurant Program as an assistance program for small businesses, and annual restaurant inspection as commercial pollutant sources. The LACFCD will implement the MCMs identified in VI.D.44 of the MS4 Permit with no additional modifications.

In addition to the MCM modifications being implemented by the WMG as a group, the Beach Cities WMG has identified additional individual city-specific MCM enhancements, which include organization of educational and cleanup-oriented events, installation of pet waste collection stations as a part of the residential outreach requirement, a ban on plastic bags in Manhattan Beach and polystyrene food containers in Hermosa Beach, and development of environmentally oriented city websites. City-specific MCMs enhanced beyond the 2012 Permit requirements are specified in **Table 2-8.** Details and descriptions of these enhancements are provided in **Appendix L**. The MCM enhancements shown in **Table 2-8** and **Appendix L** are examples and are not comprehensive. The Beach Cities WMG agencies' LID Ordinances and Green Street Policies are included as **Appendix M** and **Appendix N**, respectively.

Table 2-8. MCM Modifications and Agency-Specific Enhancements for Beach Cities EWMP Area

2012 Permit Requirement	Baseline Requirement Maintained by all Cities	General Beach Cities MCM Enhancement (all Cities)	City-Specific MCM Enhancement							
			City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
			MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?
D.2 Progressive Enforcement (Applies D.6, D.7, D.8, and D.10)										
Develop and maintain a Progressive Enforcement Policy	X								X	Milestone: 1/1/2016
Conduct follow-up inspection within 4 weeks of date of initial inspection	X									
Take progressive enforcement	X								X	Milestone: 1/1/2016
Retain records	X									
Refer violations to LARWQCB	X									
Investigate complaints from LARWQCB	X									
Assist LARWQCB with Enforcement Actions	X									
D.5 Public Information and Participation Program (PIPP)										
Participate in a Countywide PIPP, WMP PIPP, or individual PIPP that measurably increases knowledge and changes behavior, and involves a diversity of socio economic and ethnic communities	X								X	Implemented
Maintain reporting hotline	X								X	Implemented
Publish hotline info on web, telephone book	X									
ID staff/department that serve as the contact (publish this info)	X									
Organize events (e.g., clean ups)	X	X	X	Implemented	X	Implemented	X	Implemented	X	Implemented
Residential Outreach (Individually or with group):	X	X	X	Implemented	X	Implemented	X	Implemented	X	Implemented
Public Service Announcements	X	X	X	Implemented	X	Implemented	X	Implemented		
(Develop) Public education materials on: vehicle fluids; household waste; construction waste; pesticides, fertilizers, and integrated pest management (IPM); green wastes; and animal wastes	X		X	Implemented except for IPM materials (Milestone of June 2017 for IPM)			X	All except IPM are implemented (Milestone of June 2017 for IPM materials)	X	Implemented
Distribute public education materials at points of purchase	X	X			X	Implemented	X	Implemented	X	Implemented
Maintain stormwater website	X	X	X	Implemented			X	Implemented	X	Implemented
Provide schools with materials to educate children (K-12); can use state produced materials	X		X	Implemented			X	Implemented	X	Implemented
D.6 Industrial/ Commercial										
Track Critical Sources - maintain inventory (watershed based or lat/long recorded)	X									
Educate - notify critical sources of BMP requirements	X									
Implement a Business Assistance Program for select sectors or small businesses - technical assistance, and distribute materials to specific sectors	X	X	X	Implemented					X	Milestone: 1/1/2016
Inspect Commercial Sources	X	X							X	Implemented
Inspect Industrial Sources - Initial mandatory inspection	X		N/A				N/A		X	Implemented
Secondary mandatory inspection	X		N/A				N/A			

2012 Permit Requirement	Baseline Requirement Maintained by all Cities	General Beach Cities MCM Enhancement (all Cities)	City-Specific MCM Enhancement							
			City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
			MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?
No Exposure - evaluate and conduct 2nd inspection at 25% of facilities	X		N/A				N/A			
As needed, conduct Progressive Enforcement follow-up inspections (see Part VI.D.2)	X									
D.7 Planning and Land Development										
Update ordinance/design standards to conform with new requirements (LID)	X						X	Implemented LID ordinance enhanced beyond permit minimum	X	Implemented
Optional: Establish alternative compliance for technical infeasibility, e.g., allow onsite biofiltration or offsite infiltration or groundwater replenishment or retrofit	X									
Optional if allowing offsite mitigation: Develop a prioritized list of offsite mitigation projects	X									
Optional if allowing offsite mitigation: Develop a schedule for completion of offsite projects (must be with 4 yr of the Certificate of Occupancy of the first project that contributed funds)	X									
Optional if allowing offsite mitigation: Notice offsite projects to RB website	X									
Optional if allowing offsite mitigation: List of mitigation projects descriptions and estimated pollutant and flow reductions	X									
Optional if allowing offsite mitigation: Provide aggregated comparison of alternative compliance to results that would have been expected with on-site retention of the SWQDv	X									
Optional: Submit documentation that a previously adopted LID ordinance provides equivalent pollutant loading and flow reduction	X									
Plan Review process - check LID and BMP sizing, etc.,	X				X	Implemented	X	Implemented	X	Implemented
Establish internal agreements with structure for communication and authority for departments overseeing plan approval and project construction	X									
Require O&M plan for LID, treatment and hydromod BMPs	X									
Implement tracking and enforcement program for LID, treatment and hydromod BMPs	X									
Inspect all development sites upon completion and prior to occupancy certificates	X									
Verify O&M of BMPs operated by Permittee through inspection	X									
Develop maintenance inspection checklist	X									
Require private parties that operate BMPs to submit verification of O&M; enforce as needed	X									

2012 Permit Requirement	Baseline Requirement Maintained by all Cities	General Beach Cities MCM Enhancement (all Cities)	City-Specific MCM Enhancement							
			City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
			MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?
As needed, conduct Progressive Enforcement follow-up inspections (see Part VI.D.2)	X									
D.8 Development Construction Program										
Update erosion and sediment control ordinance/procedures to conform with new requirements	X						X	Implemented	X	Implemented
Sites < 1 acre; inspect based upon water quality threat	X						X	Implemented		
Establish priority inspection process	X								X	Implemented
Site < 1 acre; Require sites with soil disturbing activities to implement minimum BMPs	X									
Require construction sites to prepare erosion sediment control plan(ESCP); review and approve (≥ 1 acre)	X									
Verify construction sites coverage under the CGP and 401 cert	X									
Develop/implement ESCP review checklist	X									
Require construction sites to adhere to standards and make standards readily available	X									
Conduct inspections at public and private sites (at least 1x/2 weeks for high threat sites (more frequently when rain is predicted or occurs; at least monthly for lower threat; also must inspect during all phases of construction - at least 3 times)	X									
Develop/implement SOPs/inspection checklist	X									
Track number of inspections for inventoried sites and verify minimum inspections are completed	X									
As needed, conduct Progressive Enforcement follow-up inspections (see Part VI.D.2)	X									
Train plan review staff and inspectors	X						X	Implemented	X	Implemented
Staff must be knowledgeable in QSD/P key objectives, local BMPs standards	X									
D.9 Public Agency Activities										
Require public construction sites to implement Planning and Land Development requirements, implement Erosion and Sediment Control BMPs, and obtain Construction General Permit coverage	X								X	Implemented
Maintain inventory of Permittee owned facilities (including parks and recreation facilities,)	X									
Update inventory	X									
Develop retrofit opportunity inventory; evaluate and rank	X		X	Implemented					X	Milestone: 1/1/2016
Cooperate with private land owners to encourage site specific retrofitting; includes pilot projects and outreach	X									
Obtain IGP coverage for public facilities where appropriate	X									

2012 Permit Requirement	Baseline Requirement Maintained by all Cities	General Beach Cities MCM Enhancement (all Cities)	City-Specific MCM Enhancement							
			City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
			MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?
Develop procedures to assess impact of flood mgmt. projects on water quality of receiving waters; evaluate to determine if retrofitting is feasible	X									
Evaluate existing structural flood control facilities to determine if retrofitting facility to provide additional pollutant removal is feasible	X									
Implement source control BMPs at Permittee owned facilities/activities	X									
Require city-hired contractors to implement source control BMPs	X									
Prevent vehicle/equipment washing discharges to the MS4, including firefighting and emergency response vehicles	X								X	Implemented
Ensure new/redeveloped/replaced wash facilities are plumbed to the sanitary sewer or self-contained.	X									
Implement IPM program	X						X	Implemented		
Ordinances, policies, and procedures reflect IPM techniques and include commitments and schedules to reduce the use of pesticides that cause impairments	X								X	Implemented
Annually update in inventory of pesticides used by agency; quantify pesticides used by staff and contractors; demonstrate IPM alternatives to reduce pesticide use	X								X	Implemented
Use SOPs for pesticide application	X								X	Implemented
Ensure no application of pesticides or fertilizers when two or more days with a 50% chance of rain is predicted by NOAA; within 48 hr of 1/2 inch of rain; or when water is flowing off the site	X									
Ensure staff applying pesticides are certified or working under supervision of a certified applicator in the appropriate category	X									
Update catch basin map add GPS locations and update priority	X									
Inspect/Clean catch basin in areas not subject to Trash TMDL- Priority A: 3x during wet season, 1x during dry 1x; Priority B: 1x during wet 1x and 1x during dry; Priority C: 1x per yr. Maintain records.	X									
Required trash management at public events	X						X	Implemented	X	Implemented
Place and maintain trash receptacles/capture devices at newly identified high trash generating areas	X		X	Implemented	X	Implemented	X	Implemented	X	Implemented
Label storm drains	X								X	Implemented
Inspect labels prior to each wet season	X									
Record and relabel illegible labels within 180 days of inspection	X									
Post signs at access points to water bodies (open channels, creeks; lakes)	X									

2012 Permit Requirement	Baseline Requirement Maintained by all Cities	General Beach Cities MCM Enhancement (all Cities)	City-Specific MCM Enhancement							
			City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
			MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?	MCM	Milestone/ Already Implemented?
In areas not subject to the Trash TMDL, install trash excluders on catch basins or outfalls in areas defined as Priority A, or implement substantially equivalent BMPs	X		X	Implemented	X	Implemented	X	Implemented	X	Milestone: 1/1/2016
Inspect and Remove trash and debris from open channels and other drainage structures 1x/yr before rainy season.	X									
Eliminate discharge of contaminants during MS4 maintenance	X									
Implement controls to limit infiltration of seepage from sanitary sewers to the storm drains	X									
Implement routine preventative maintenance for both systems, survey sanitary sewer and MS4. May use SSO General Waste Discharge Requirement [WDR] to fulfill this requirement.	X									
Implement inspection and maintenance program for Permittee owned BMPs	X									
Manage residual water in treatment control BMPs removed during maintenance	X									
Street sweeping - Priority A: 2x/mo; B: 1x/mo; C: as needed, not less than 1x/yr	X		X	Implemented	X	Implemented	X	Implemented	X	Implemented
Implement road construction maintenance BMPs (e.g., restrict paving activity to exclude periods of rain)	X									
Inspect and/or clean Permittee owned parking lots 2x/mo	X								X	Implemented
Train employees and contractors on stormwater requirements	X								X	Implemented
Train employees and contractors on pesticide use	X									
D.10 Illicit Connections and Illicit Discharges Elimination										
Continue IC/ID program	X		X	Implemented	X	Implemented	X	Implemented	X	Implemented
Written procedures for conducting investigations and eliminations	X								X	Milestone: 1/1/2016
Initiate investigation within 72 hours from becoming aware of the discharge	X								X	Implemented
Implement solutions to eliminate discharge; conduct follow-up investigation to verify elimination; follow Progressive Enforcement Plan (see Part VI.D.2)	X		X	Implemented	X	Implemented	X	Implemented	X	Implemented
When discharge originates upstream of jurisdiction, notify the upstream jurisdiction and LARWQCB within 30 days	X									
Initiate investigation within 21 days for illicit connection	X									
Permit or document illicit connection that only discharge stormwater or allowed non-stormwater	X									
Eliminate illicit connection within 180 days of investigation	X									
Facilitate public reporting via hotline	X								X	Implemented

2012 Permit Requirement	**Baseline Requirement Maintained by all Cities**	**General Beach Cities MCM Enhancement (all Cities)**	**City-Specific MCM Enhancement**							
			City of Manhattan Beach		**City of Redondo Beach**		**City of Hermosa Beach**		**City of Torrance**	
			MCM	**Milestone/ Already Implemented?**	**MCM**	**Milestone/ Already Implemented?**	**MCM**	**Milestone/ Already Implemented?**	**MCM**	**Milestone/ Already Implemented?**
Signage adjacent to open channels provide info re: public reporting	X									
Document calls and actions associated with hotline	X								X	Implemented
Implement procedures on responding to complaints; evaluate and update procedures	X								X	Implemented
Implement a spill response plan	X								X	Implemented
Train staff and contractors on ID/IC	X								X	Implemented
Create a list of positions and contractors that require ID/IC training	X									

2.6.3 *Quantified Non-Structural BMPs*

Non-structural BMPs have been categorized as follows for purposes of RAA. Specific model inputs are summarized in tabular format below.

Non-Modeled Programmatic BMPs

These source controls include a combination of BMPs such as new or enhanced pet waste controls (ordinance, signage, education/outreach, mutt mitts, etc.), Clean Bay Restaurant Program, human waste source tracking and remediation (e.g., leaking sewer investigations including implementation of each agency's Sanitary Sewer Management Plan consistent with Statewide WDRs, etc.), enhanced street sweeping (e.g., 100% vacuum sweepers, increased frequency, posting of 'No Parking' signs for street sweeping, etc.), increased catch basin and storm drain cleaning, and other new or enhanced nonstructural BMPs that target the pollutants addressed in this EWMP. A combined credit of 2.5 – 7.5% load reduction (average of 5%) was applied for all pollutants to represent the cumulative benefit from these BMPs.

Modeled Redevelopment

Beginning in 2001, redevelopment projects were required by the Permit (via the Standard Urban Stormwater Management Program [SUSMP]) to incorporate stormwater treatment BMPs into their projects if their project size exceeded specified thresholds. The 2001 MS4 Permit SUSMP redevelopment requirements were applied between 2003 (the point at which the Bacteria TMDL was implemented) and 2015 for the SMB EWMP area. Redevelopment in this period was modeled as flow-through media filters at a 0.2 in/hr design event.

The 2012 MS4 Permit established new criteria for redevelopment projects, requiring certain sized projects to capture, retain, or infiltrate the 85th percentile design storm or the 0.75-inch design storm, whichever is greater, via the implementation of LID BMPs. To account for these redevelopment requirements, BMPs were modeled in SBPAT assuming land use-specific annual redevelopment rates for projects that triggered former SUSMP requirements or will trigger the Permit's LID BMP requirements (**Table 2-9**).

Table 2-9. Estimated Annual Redevelopment Rates

Land Use	Annual Redevelopment Rate (% of total land use area)		
	Cities of Redondo Beach and Torrance[1]	City of Hermosa Beach	City of Manhattan Beach
Residential	0.18	0.31	0.10
Commercial	0.15	0.79	0.38
Industrial	0.34	0.79	0.38
Education	0.16	0.16	0.16
Transportation	2.7	2.7	2.7

[1] Regionally developed redevelopment rates were applied to the City of Torrance and Redondo Beach (City of Los Angeles Bureau of Sanitation, 2012).

Redondo Beach and Torrance areas used regionally developed redevelopment rates. For Hermosa Beach, the recent 4-year rate for redevelopment of residential areas was used based on city-specific

LID implementation tracking data. The rate of redevelopment in all commercial land use categories tracked by SUSMP was combined to give an overall rate for both commercial and industrial (as that City has very few light industrial parcels), for historical as well as future redevelopment.

For Manhattan Beach, a City-specific redevelopment rate of 3.8 percent for commercial redevelopment was provided based on historical SUSMP data over the past ten years. This value was also assumed for historical industrial redevelopment as well as future commercial and limited industrial redevelopment. For the residential land use, because there are insufficient data to project LID rates, a nominal 0.10 percent was assumed.

BMPs were assumed to be implemented and to continue to be implemented in the future, at these rates across two distinct time periods:

- **2003 (SMBBB TMDL Effective Date) - 2015:** The SUSMP requirements, based on the 2001 MS4 Permit, were assumed to be implemented over this period as flow-through media filters at a 0.2 in/hr design intensity (Los Angeles County Department of Public Works, 2002).
- **2015 – 2021 (SMBBB TMDL Final Compliance Deadline):** The 2012 MS4 Permit post-construction requirements were assumed to be implemented over this period as 50% biofiltration and 50% bioretention. Biofiltration (bioretention with underdrains) were modeled using bioswale BMP types with effluent EMCs set to bioretention and sized to retain 150 percent of the 1-year, 1-hour design storm (approximately 0.3 in/hr)[16] because they do not retain all the design storm volume on site (they are flow-through systems), while bioretention units were sized to retain 100 percent of the 85th percentile, 24-hour design storm depth, calculated as the mean for each analysis region.

2015 is used as a transition date since the LID post-construction requirements from the 2012 MS4 Permit are required to be in full effect via local LID ordinances by this time.

In order to estimate load reductions associated with these redevelopment BMPs, the land use percentages shown in **Table 2-1** were multiplied by the respective land use areas in each analysis region, resulting in an assumed area treated by LID BMPs each year. This area was multiplied by the applicable number of years, since new BMPs are assumed to be implemented each year. The total land use area assumed to be redeveloped for each analysis region was then modeled as being treated by the BMPs described below (**Table 2-10**) and the total load reduction was quantified. The default design parameter assumptions for the biofiltration redevelopment projects were that the longitudinal slopes were 0.03 ft/ft, Manning's n was 0.25, hydraulic residence time was 10 min, and water quality flow depth was 4 inches.

[16] 150% of the 1-year, 1-hour design storm was used per Section VI.D.7.c.iii of the Permit.

Modeled Public Retrofit Incentives

These BMPs include programs directed at incentivizing the public to decrease the amount of stormwater runoff from their property, specifically via downspout disconnects. Public incentives for retrofitting existing development were modeled in SBPAT between 2015, when the EWMP will begin to be implemented, and the respective TMDL final compliance date. Public retrofit incentives were assumed to be a downspout disconnection program, modeled as bioswales sized to a design storm intensity of 0.2 in/hr (**Table 2-10**). The default design parameter assumptions for the biofiltration redevelopment projects were that longitudinal slopes were 0.03 ft/ft, Manning's n was 0.25, hydraulic residence time was 10 min, and water quality flow depth was 4 in.

It was assumed that 10 percent of single family residential areas would be converted to disconnected downspout systems over 2015 to 2021, and that, based on GIS analysis, 38 percent of the single family residential area consists of rooftops that can be effectively disconnected. Therefore, 3.8 percent of single family residential neighborhoods were modeled as treated by bioswales in order to account for public retrofit incentives.

Table 2-10. Redevelopment and Public Retrofit Incentives Model Assumptions

Implementation Level	BMP Type	Design Storm	Longitudinal Slope (ft/ft)	Manning n	Hydraulic Residence Time (min)	Water Quality Flow Depth (in)	Effective Retention Depth (in)	Infiltration Rate (in/hr)
Redevelopment (2003-2015)	Media Filter	0.2 in/hr	-	-	-	-	-	-
Redevelopment (2015-2021)	Biofilters[1]	0.3 in/hr	0.03	0.25	10	4	2	Based on analysis region-specific soil type
	Bioretention	0.75 in	-	-	-	-	12	0.15
Public Retrofit Incentives (2015-2021)	Bioswales representing downspout disconnects	0.2 in/hr	0.03	0.25	10	4	2	Based on analysis region-specific soil type

[1] Modeled as bioswales using bioretention effluent EMCs

Modeled Non-MS4 Permitted Parcels or Areas

SBPAT was used to quantify the load reduction assuming that regulated parcels/areas would be in compliance with the NPDES Statewide Storm Water Permit Waste Discharge Requirements (WDRs) from State of California Department of Transportation (Order No. 2012-0011-DWQ, NPDES No. CAS000003) and the California NPDES General Permit for Storm Water Discharges Associated with Industrial Activities (Industrial General Permit [IGP], Order 2014-0057-DWQ) (**Figure 2-12**).

A load reduction was obtained from these areas by simulating treatment plants sized to treat the IGP's design storm requirement, the 85th percentile, 24-hour storm event (0.2 in/hr), with an effluent concentration set equal to the water quality standard (**Table 2-11**). For fecal coliform, 400 MPN/100mL was used.

Table 2-11. Non-MS4 Parcels – Modeled as Treated by Treatment Plants (i.e., BMPs that will treat stormwater to the Water Quality Objectives)

Implemen-tation Level	BMP Type	Treatment Flowrate (cfs)	Design Storm (in/hr)	Average Basin Depth (ft)	Equal-ization Volume (cu-ft)	Diversion Flowrate (cfs)	Infiltration Rate (in/hr)
Non-MS4 Parcels	Treatment Plant	10,000	0.20	100.00	1,000	10,000	0.00001

2.6.4 *Structural BMPs*

Existing (constructed between 2003 and 2014) and proposed structural BMPs (regional and distributed) were modeled in SBPAT based on best available design information. The following sections outline the structural BMPs that were modeled as well as their drainage areas, design details in SBPAT, and any relevant assumptions. Modeled regional BMPs are depicted in **Figure 2-13**. Modeled distributed BMPs are depicted in **Figure 2-14**.

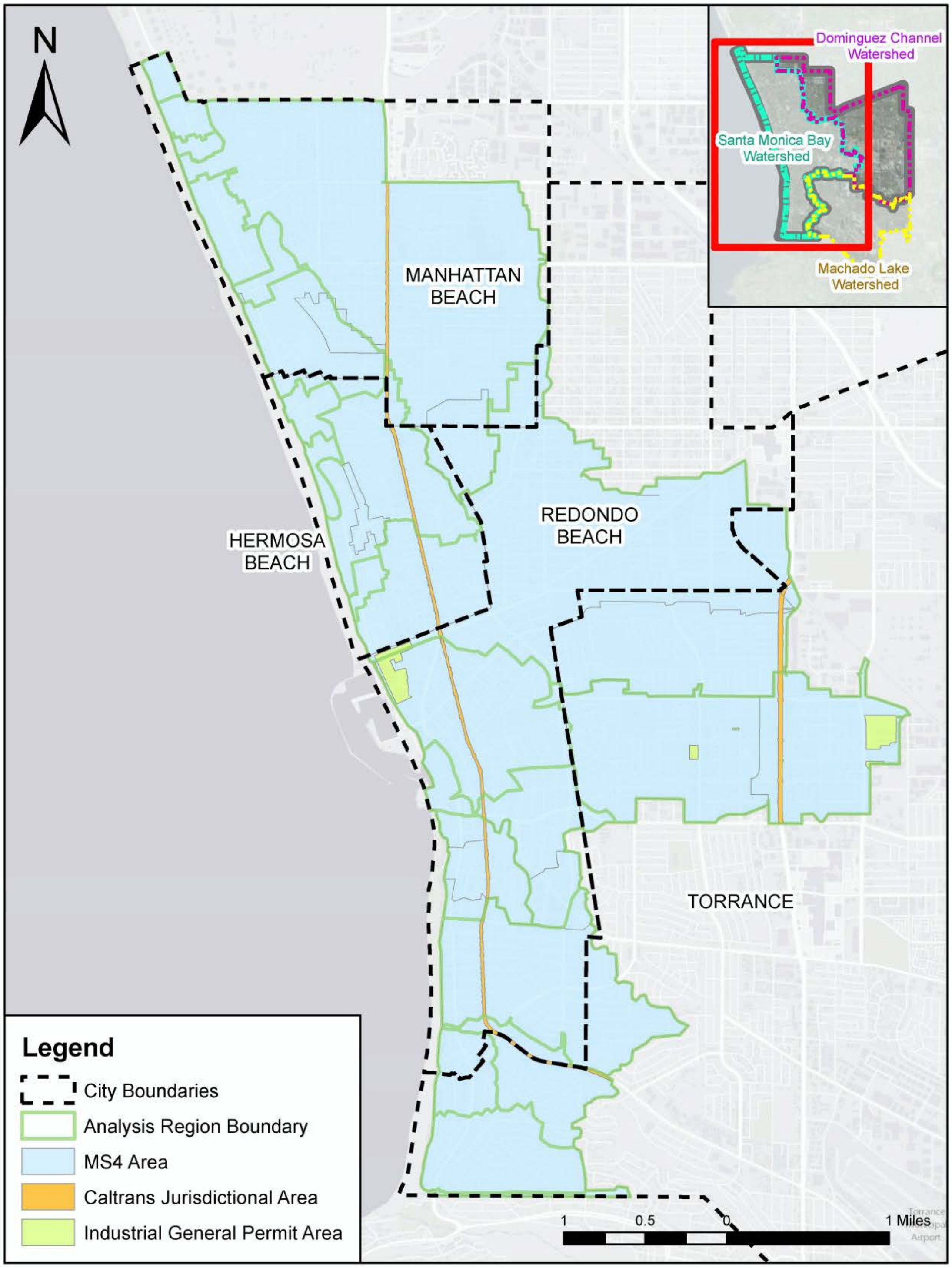


Figure 2-12. IGP and Caltrans Area within the Santa Monica Bay portion of the Beach Cities EWMP Area

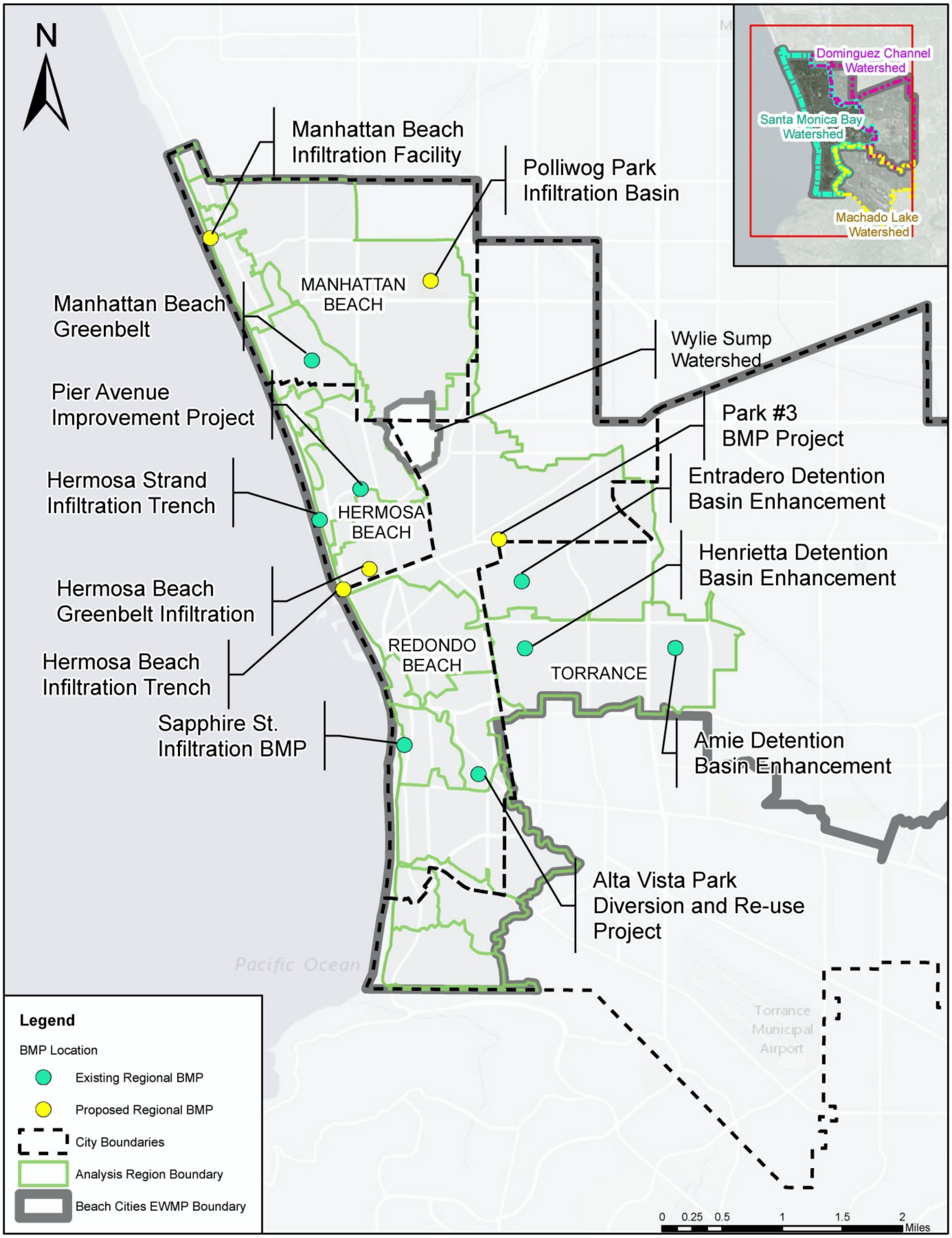


Figure 2-13. Existing and Proposed Regional BMPs within EWMP Area

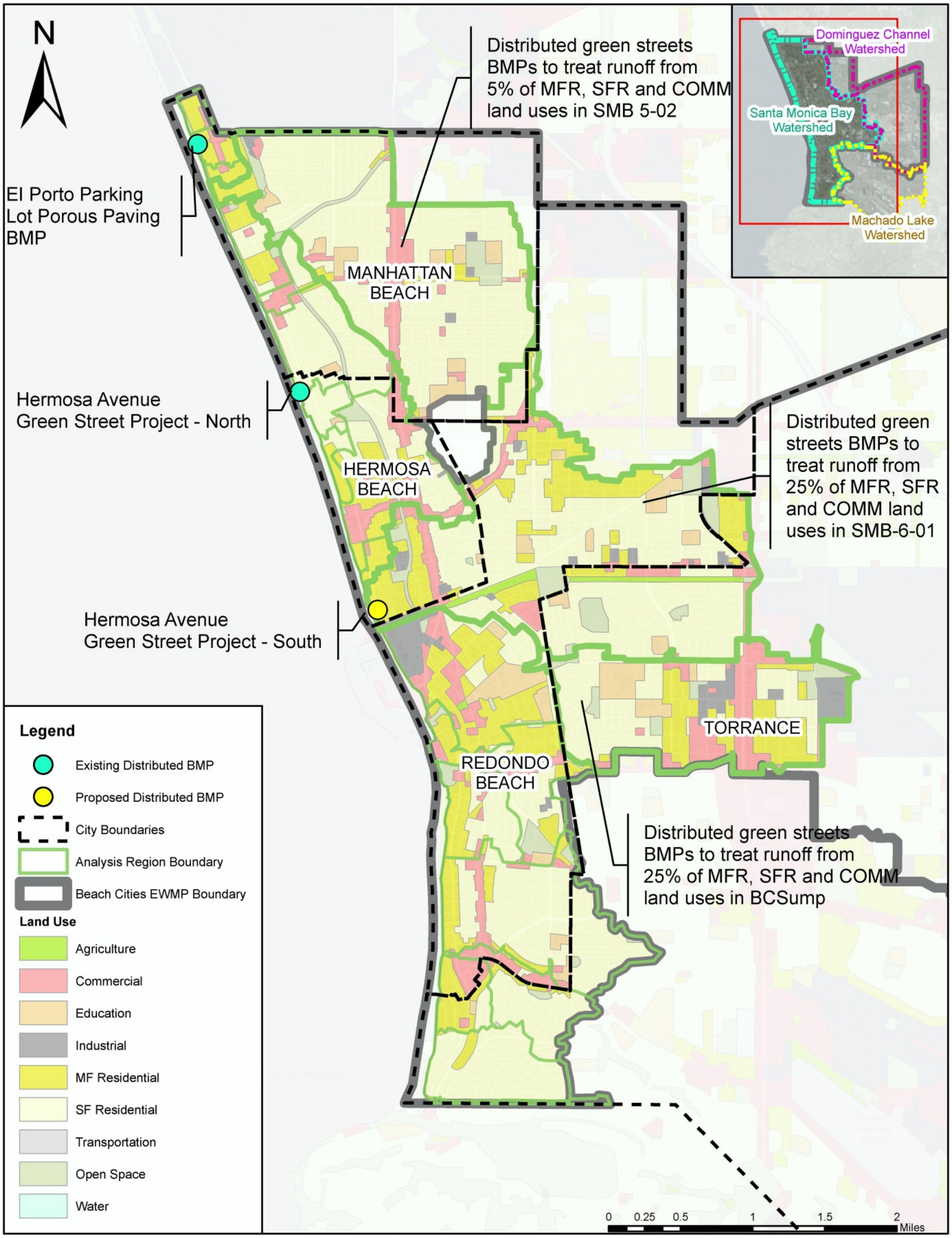
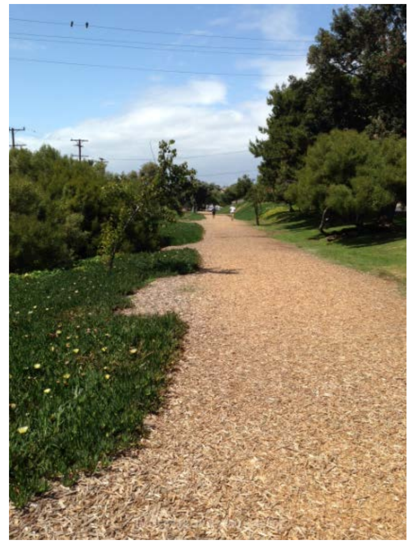


Figure 2-14. Existing and Proposed Distributed BMP Locations within the EWMP Area

Existing Regional BMPs

Analysis Regions SMB-5-02 and SMB-5-03/SMB-5-04



The Manhattan Beach Green Belt Infiltration Project tributary area spans analysis regions SMB-5-02 and SMB-5-03/SMB-5-04. The Project, completed in February 2013, utilizes the linear greenbelt parkland that runs through the City to intercept and infiltrate dry weather and wet weather low flows from existing storm drains that intersect the parkway. The Project was designed to reduce the downstream peak flow and runoff volume from the 55.2 acres of contributing developed residential land use while also increasing groundwater recharge and subsequently increasing the effective permeability of the developed area. The 55.2 acre drainage area is part of the 161 acre tributary area that drains to the 1st Street outfall and Santa Monica Bay , which is part of the approximately 205 acres of drainage influencing the SMB-5-04 open beach monitoring site under the CSMP (2004).

Analysis Region SMB-5-05

The Pier Avenue Improvement Project captures and treats stormwater/urban runoff from residential areas on surrounding streets and commercial development in the downtown corridor along Pier Avenue (36-acre drainage area). The Project includes drainage improvements for treatment and infiltration of dry and wet-weather flows up to the design storm to reduce pollutant loading at the beach and to reduce flooding.

The Hermosa Strand Infiltration Trench project receives runoff from a 76.2-acre, intensely developed mixed commercial and residential coastal subdrainage area conveyed via the Pier Avenue storm drain. The Pier Avenue storm drain was retrofit with a diversion structure and tide gate to direct dry-weather flows and wet weather low flows from the storm drain into a pump well, through a baffle-box pretreatment unit, then into the subsurface infiltration trench 1,000 feet long constructed on the beach adjacent to the Strand. The diversion pump was designed to divert up to 250 gallons per minute (GPM), which is significantly greater than would be required solely to divert dry weather runoff from the drainage area, thereby allowing for diversion of some wet weather flows.

Analysis Region SMB-6-01

Three existing regional BMPs were modeled within analysis region SMB-6-01. These include Amie Basin, Entradero Basin, and Henrietta Basin in their post-enhancement state. Since the basins were in existence prior to the 2003 TMDL effective date, pollutant removal credit was not assigned to the basins for their pre-2003 function, rather only the basin improvement design parameters that 1) improved water quality and 2) were implemented post-2003 were modeled. Infiltration rate, depth, volume, and discharge rate of the basins and their extended storage were extracted from analysis of the stage-discharge curves provided in the Stormwater Basin Enhancement Project Design Memorandum (CWE Corp., 2012).

Amie Basin, post-enhancements. Amie Detention Basin is an existing BMP that captures runoff from 409 acres of upstream land in analysis region BCSump, which drains to SMB-6-01. Based on boring test results, the average on-site infiltration rate is reported as 0.0082 in/hr. Due to its limited infiltration capacity, Amie Detention Basin is not designed for the purpose of on-site infiltration. Instead, its primary purpose is to discharge runoff slowly to the downstream Henrietta Detention Basin. The basin enhancements, completed in August 2015 (City of Torrance, 2014), increased the extended retention volume by reducing the permanent pool volume by 25% by creating additional flow paths within the basin. Due to the nature of the basin enhancements, Amie Detention Basin was modeled as a wet pond with extended detention capacity.

Entradero Basin, post-enhancements. Entradero Detention Basin is an existing BMP that treats runoff from 436 acres of upstream land in analysis region SMB-6-01 and is sized to capture the 0.75 inch storm. Based on boring test results, the average on-site infiltration rate is 1.28 in/hr. To increase the infiltration capacity, the post-enhancement design project, which was completed in August 2015 (City of Torrance, 2014), significantly increased the infiltration surface area from 0.03 acres to 1.44 acres. Entradero Detention Basin was modeled as an infiltration basin. The basin includes a small permanent pool (1500 cubic feet), the volume of which was excluded from the calculation of total storage capacity.

Henrietta Basin, post-enhancements. Henrietta Detention Basin is an existing BMP that treats runoff from Amie Detention Basin as well as an additional 153 acres of upstream land in analysis region BCSump for up to 0.75 inches storm. Based on boring test results, the average on-site infiltration rate is 2.1 in/hr. To further increase the infiltration capacity, recent design enhancements (completed in August 2015 (City of Torrance, 2014)) increased the maximum basin depth from 23 feet to 30 feet, and created additional flow path within the basin. In SBPAT, the Henrietta basin is modeled as an infiltration basin. The basin included a small permanent pool (6900 cubic feet), the volume of which was excluded from the total storage capacity.

Analysis Region SMB-6-02

The Alta Vista Park Diversion and Re-Use Project is located in Redondo Beach and is designed to divert wet weather flows up to a rainfall event of 0.3 inches in 24 hours, collected from its 101-acre watershed. HDPE pipes comprise the approximately 100,000 gallons of underground storage. Excess overflows from the tank go into a 4,200 square feet infiltration bed located under the tank. The Project diversion facilities include structures that divert up to 4.5 cfs of the storm flow through a gross pollutant removal device.

Analysis Region SMB-6-03

The Sapphire Street Infiltration BMP consists of a low flow diversion and infiltration bed. The low flow diversion is intended to divert all dry weather flow and wet weather runoff from a storm up to 0.1 inches in 24 hours. The diversion facilities include a structure that will divert up to 11 cfs of the storm flow through a CDS unit. A smaller amount, up to 160 gpm, are diverted to a pump station that pumps the water to two stormwater bioretention filtration units, where it is then conveyed to the infiltration bed.

Summary of Existing Regional BMPs

The existing regional BMPs, including their location, analysis region, model inputs, and expected performance, are summarized in **Table 2-12** and **Table 2-13**. Wylie Sump and its tributary area were excluded from the RAA analysis because it is an 85th percentile capture project and also does not produce outflow and would therefore have no impact on the TLR or contribute any loads. The Wylie Sump receives runoff from 38 acres of the City of Manhattan Beach, 20 acres of Hermosa Beach, and 73 acres of Redondo Beach. There are no other 85th percentile capture projects in the Santa Monica Bay Watershed portion of the Beach Cities EWMP Area.

Table 2-12. Parameters and Performance for Existing Regional BMPs Modeled as Infiltration Basins

Location of BMP	Analysis Region	Project Name	Model Inputs					Expected Performance (load reduction as a % of analysis region baseline load)
			Design Storage Volume (cu-ft)	Design Storm (in)	Average Depth (ft)	Diversion Rate (cfs)	Infiltration Rate (in/hr)	
Manhattan Beach	SMB-5-03/ SMB-5-04	Manhattan Beach Green Belt Infiltration	-	0.45	2.6	6.7	2.1	4.7%
	SMB5-02							1.1%
Hermosa Beach	SMB-5-05	Pier Avenue Improvement Project infiltration systems	-	0.21	2.6	11	0.77	2.3%
Hermosa Beach	SMB-5-03/ SMB-5-04	Hermosa Strand Infiltration Trench	1,400	-	-	2.9	0.56	0.5%
	SMB-5-04/ SMB-5-05							1.9%
	SMB-5-05/ SMB-6-01							2.0%
	SMB5-04							1.4%
	SMB5-05							0.9%
	SMB6-01							0.2%
Torrance	SMB-6-01	Entradero Detention Basin Enhancement	88,860	-	2.0	16	1.3	2.6%
		Henrietta Detention Basin Enhancement	383,000	-	12.0	54	2.1	4.6%
Redondo Beach	SMB-6-02	Alta Vista Park Diversion and Re-Use Project	-	0.30	3.0	4.5	0.18	3.8%
Redondo Beach	SMB-6-03	Sapphire St Infiltration BMP	-	0.10	1.5	11	0.74	9.5%

Table 2-13. Parameters and Performance for Existing Regional BMPs Modeled as Wet Ponds with Extended Detention

Location of BMP	Analysis Region	Project Name	Model Assumptions						Expected Performance (load reduction as a % of analysis region baseline load)
			Volume (cu-ft)	Surcharge Depth (ft)	Surcharge Drawdown Time (hr)	Permanent Pool Volume (cu-ft)	Permanent Pool Depth (ft)	Diversion Flowrate (cfs)	
Torrance	SMB-6-01	Amie Detention Basin Post Enhancement	5,600,000	45	160	99,750	5	46	8.8%

Proposed Regional BMPs

Analysis Region SMB-5-02 Regional BMP Parameters and Criteria

One regional BMP (Alternative 1) is being proposed and was modeled within analysis region SMB-5-02 (**Figure 2-15**) — Manhattan Beach Infiltration Trench Project (see **Table 2-13**). The Manhattan Beach Infiltration Trench site is proposed along a public beach adjacent to a walking/bike path and consists of recreational open space. The project has an approximate infiltration footprint of 2.2 acres and drainage area of 1,600 acres. The storage volume of the project was estimated as 4.6 acre-feet, with an estimated drawdown time of 72 hours. Additional benefits achieved by this project include infiltration to help prevent intrusion of shallow saline groundwater associated with sea level rise in order to protect subsurface infrastructure from corrosion, as well as potential dune habitat restoration. This BMP can also increase public awareness through educational signage.

An alternative design (Alternative 2) is for a beach infiltration trench at 80% of Alternative 1 in combination with an infiltration-based BMP at Polliwog Park, which would achieve approximately 10% of the target load reduction needed for analysis region SMB-5-02 and could potentially offset 20% of the required storage capacity of the Manhattan Beach Infiltration Project (**Figure 2-15**). In other words, the load reduction of Polliwog Park infiltration is equivalent to that of Manhattan Beach Infiltration Trench at 20% of its full Alternative 1 treatment volume. The addition of the Polliwog Park BMP would result in the additional benefits of neighborhood greening, mitigating issues such as the urban heat island effect, and also raising public education/awareness. The construction of a wetland would provide the additional benefit of expanding riparian habitat, and also help mitigate downstream flood control issues.

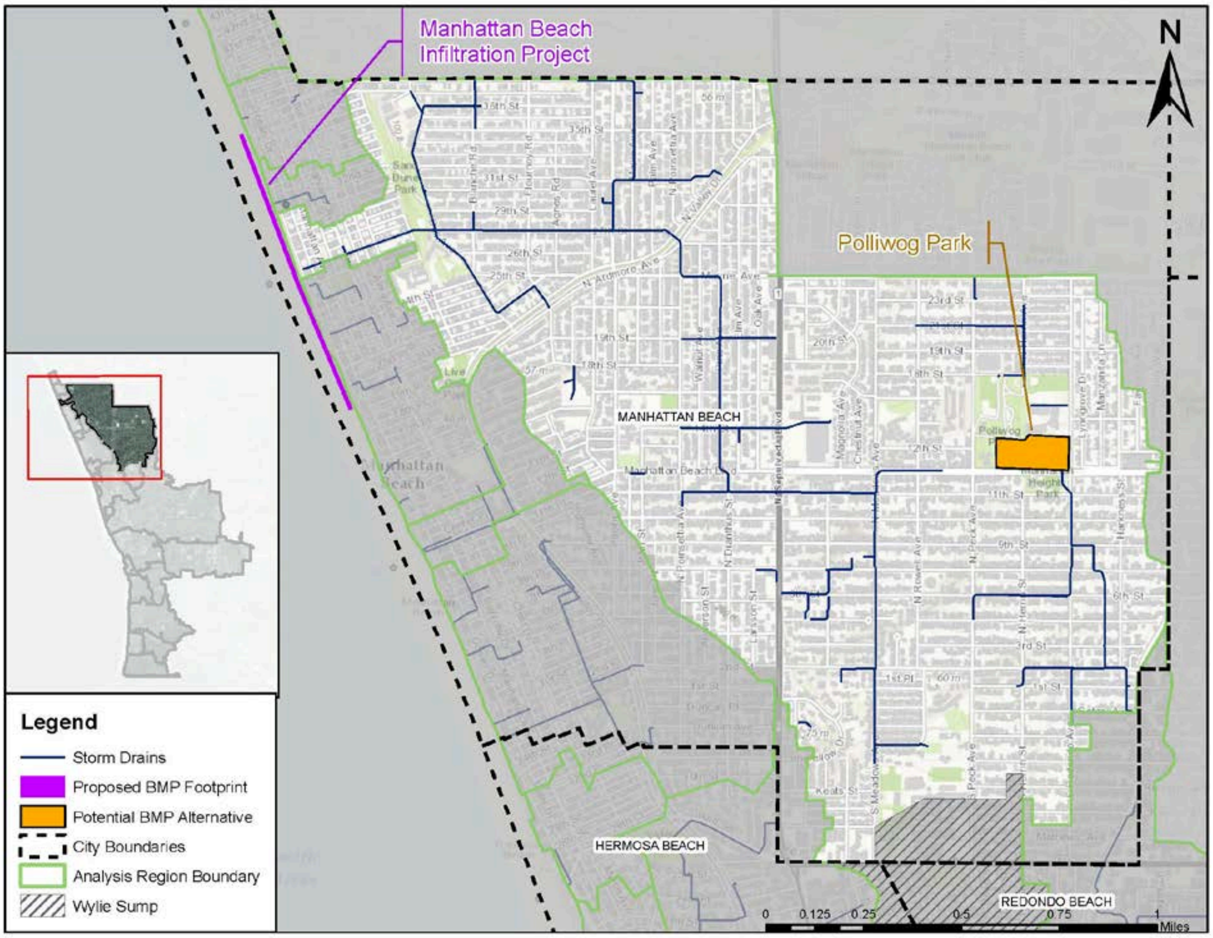


Figure 2-15. Proposed Regional Projects, Analysis Region SMB-5-02

Analysis Region SMB-6-01 Regional BMP Parameters and Criteria

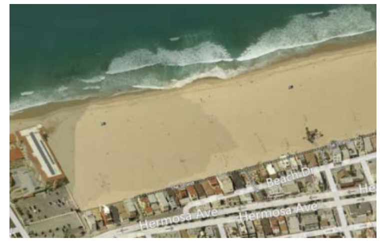
Three regional BMPs (and one potential alternative) are proposed within Analysis Region SMB-6-01, as described below, and depicted in **Figure 2-16**.

Park #3. The Park #3 Project was identified as a potentially suitable site for several different BMP types, including infiltration, wetlands, or a detention basin. Park #3 is located northwest of Blossom Ln. and 190th St, and has an approximately footprint of 0.4 acres and drainage area of 1,430 acres. The storage volume of the project was estimated as 87,100 cubic feet. Diversion flowrate was assumed to be 0.015% of the volume for preliminary planning purposes. This BMP would provide the additional benefits of neighborhood greening, mitigating issues such as the urban heat island effect and also raising public education/awareness. The construction of a wetland would provide the additional benefit of expanding riparian habitat, and also help mitigate downstream flood control issues.

Hermosa Beach Greenbelt Project. The Greenbelt site in Hermosa Beach was identified as a potentially suitable site for several different BMP types, including infiltration, wetlands, or a detention basin. The Greenbelt is situated between Valley Dr. and Ardmore Ave. and has a potential footprint of 1.5 ac and an approximate tributary area of 1,800 acres. The project storage volume is a function of its footprint. The diversion flowrate was assumed to be 0.015% of the volume for preliminary planning purposes.

Powerline Easement. A potential alternative location to the Hermosa Beach Greenbelt Project facility is located south of Herondo Street between N. Francisca Ave. and N. Catalina Ave., within a powerline easement.[17] Both potential locations for the greenbelt project would provide the additional benefits of neighborhood greening, mitigating issues such as the urban heat island effect and also raising public education/awareness. The construction of a wetland would provide the additional benefit of expanding riparian habitat, and also help mitigate downstream flood control issues.

[17] If this proposed design is to be developed within the powerline easements, certain considerations should be made. To alleviate concerns of saturating soils around powerline footings, and to allow for powerline maintenance activities to occur, stormwater facilities should be installed at least 100 feet from any tower and 10 feet from any pole. Special consideration and increased distances may be necessary when working around "dead-end" towers, or towers where transmission lines change direction. Access road clearance should also be maintained and basin depth must be considered for safety and illegal dumping purposes.



Hermosa Beach Infiltration Trench. The Hermosa Beach Infiltration Trench project has a tributary area of 2000 acres. The project may be designed to reduce downstream water volumes and facilitate compliance with the dry-and wet-weather WLAs allotted in the SMBBB TMDL at the SMB-6-01 CML. If upstream projects (e.g., LID projects) and other City activities are implemented, TMDL compliance may be able to be achieved under reduced design requirements. Additional benefits achieved by this project include infiltration to help prevent intrusion of shallow saline groundwater associated with sea level rise in order to protect subsurface infrastructure from corrosion, as well as potential dune habitat restoration. This BMP can also increase public awareness through educational signage.

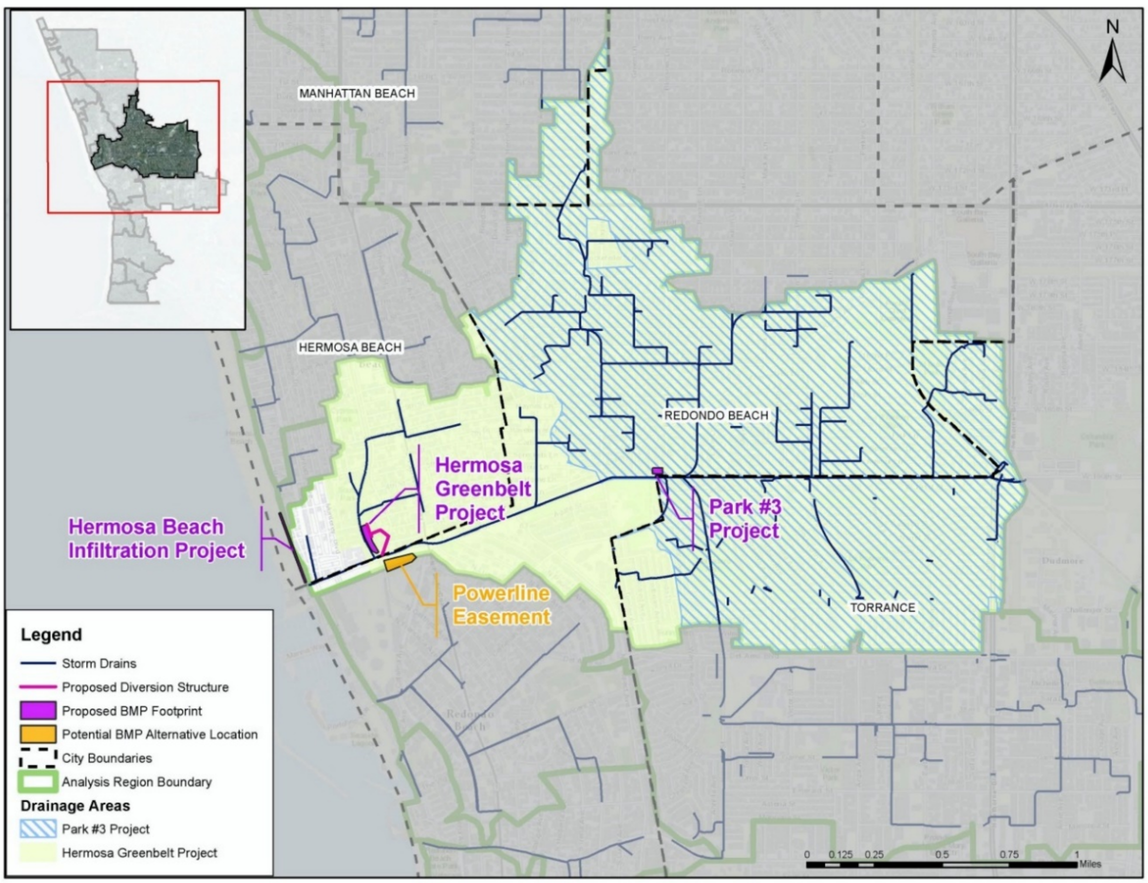


Figure 2-16. Proposed Regional Projects, Analysis Region SMB-6-01

Summary of Proposed Regional BMPs

Four regional BMPs are proposed in the Santa Monica Bay Watershed portion of the Beach Cities EWMP Area. None of these projects could be feasibly sized to meet the 85th percentile design criteria. However, the BMPs were sized to collectively meet the target load reductions necessary to achieve compliance with the WQBELs and RWLs, in combination with other existing and proposed structural and non-structural BMPs. Proposed regional BMPs, including their location, analysis region, project name, model inputs, and expected performance, are summarized in **Table 2-14.**

Table 2-14. Parameters and Performance for Proposed Regional BMPs Modeled as Infiltration Basins

Analysis Region	Location of BMP	Project Name	Model Assumptions: Design Storage Volume (cu-ft)	Design Storm (in)	Average Depth (ft)	Diversion Rate (cfs)	Infiltration Rate (in/hr)	Expected Performance (load reduction as a % of analysis region baseline load)
SMB-5-02	Manhattan Beach	Manhattan Beach Infiltration Trench, Alt 1	198,000	-	2.1	160	13	36.5%
		Manhattan Beach Infiltration Trench, Alt 2	158,400*	-	2.1	160	13	32.1%[1]
		Polliwog Park Infiltration, Alt 2	148,000	-	4.0	11	0.7	4.4%
SMB-6-01	Hermosa Beach	Hermosa Beach Greenbelt Infiltration	319,000	-	5.0	48	12	15.1%
		Hermosa Beach Infiltration Trench	13,300	-	1.70	25	13	0.4%
	Redondo Beach	Park #3 BMP Project	87,100	-	5.00	410	1.0	1.3%

[1] The treatment volume of Manhattan Beach Infiltration Trench in Alternative 2 is set at 80% of the Alternative 1 volume so that load reductions achieved by BMP configurations in Alternative 1 and Alternative 2 are identical.

Existing Distributed BMPs

In 2008-09, the City of Hermosa Beach retrofitted the east side of Hermosa Avenue between 27th and 35th Streets with a series of seven filter/infiltration boxes to intercept, filter, and infiltrate low flows conveyed down side streets from the areas east of Hermosa Avenue prior to entry into catch basin inlets on Hermosa Avenue. The infiltration boxes were modeled in the RAA analysis as two bioretention systems due to their infiltration capabilities and combined into two systems (System A and System B) — one system per analysis region SMB-5-04 and SMB-5-03/SMB-5-04, respectively. The City of Manhattan Beach also replaced several downtown asphalt parking lots with pervious concrete. See **Table 2-15** and **Figure 2-14** for design assumptions and BMP locations.

Proposed Distributed BMPs

Proposed distributed BMPs, including green streets, were modeled by assuming that stormwater runoff from high priority land use areas can be treated in the right-of-way, and 50%-50% use of biofilters and bioretention. Biofilters (also known as bioretention with underdrains) were sized to 150% of the 85th percentile, 24-hour design storm (0.3 in/hr) because they do not retain on site (they are flow-through systems), while bioretention units were sized to 100% of the 85th percentile, 24-hour design storm depth, calculated as the mean for each analysis region. Biofilters were modeled using bioswale volume reduction and bioretention effluent EMCs. Default modeling assumptions included longitudinal slopes of 0.03 ft/ft, Manning's n of 0.25, hydraulic residence time of 10 min, and water quality flow depth of 4 in.

Distributed green streets were implemented at similar rates (as a percentage of land use area) in residential and commercial land uses. Distributed BMPs were applied at levels unique to each analysis region, iteratively determined based on compliance with TLRs, after accounting for load reductions attributable to nonstructural and regional BMPs. They were applied by assuming treatment of stormwater from analysis region-specified percentages of single family, multi-family, and commercial land use areas, until TLRs are met. These land use and BMP type combinations were chosen based on their ability to result in maximum bacteria load reduction.

In order to minimize redundancy of BMP coverage and avoid double-counting BMP benefits, distributed BMPs were not applied in the drainage area footprints of existing regional BMPs. However, they were modeled in the drainage area of proposed BMPs, as long as both were included in the same model run to avoid double counting. Performance of existing and proposed distributed BMPs are shown in **Table 2-16**.

Table 2-15. Existing and Proposed Distributed BMPs

Implementation Level	Analysis Region(s)	BMP Type	Design Storm	Longitudinal Slope (ft/ft)	Manning n	Hydraulic Residence Time (min)	Water Quality Flow Depth (in)	Effective Retention Depth (in)	Infiltration Rate (in/hr)
Existing Manhattan Beach Porous Paving Project – El Porto Lot	SMB-5-01	Porous Pavement	Removal of existing asphalt and replacement with 10 inches of porous concrete						
Existing Distributed Green Streets BMPs (2003-2015)[1]	SMB-5-04 (System A)	Bioretention	0.038	-	-	-	-	35	10
	SMB-5-03/SMB-5-04 (System B)	Bioretention	0.026	-	-	-	-	35	10
Proposed Distributed Green Street BMPs (2015-2021)	MFR and COM/SFR land uses in BCSump, SMB-5-02, and SMB-6-01	Biofilters[2]	0.3 in/hr	0.03	0.25	10	4	2	Based on analysis region-specific soil type
		Bioretention	Varies by analysis region (0.77 to 0.82 in)	-	-	-	-	12	0.15

[1] In 2008-09 the City of Hermosa Beach retrofit the east side of Hermosa Avenue with a series of seven (7) filter/infiltration boxes to intercept, filter, and infiltrate low flows conveyed down side streets from the areas east of Hermosa Avenue prior to entry into catch basin inlets on Hermosa Avenue. The infiltration boxes were modeled as two bioretention systems due to their infiltration capabilities and combined into two systems (System A and System B) — one system per defined subcatchment.

[2] Modeled as a bioswale using bioretention EMCs.

Table 2-16. Existing and Proposed Distributed BMP Performance

Analysis Region	Implementation Level	Status	Estimated load reduction (as % of analysis region baseline load)
SMB-5-04	N/A - Existing	Existing	1%
SMB-5-03/ SMB-5-04	N/A - Existing	Existing	0.1%
SMB-5-02	5% on MFR/COM/SFR land uses	Proposed	3%
SMB-6-01+BCSump[1]	25% on MFR/COM/SFR land uses	Proposed	2%

[1] "BCSump" was defined as a separate analysis region for modeling purposes. The baseline load for "BCSump" analysis region was combined with the baseline load of the "SMB-6-01" analysis region to equal the total baseline load contributing to the SMB-6-01 CML ("SMB-6-01+BCSump").

2.7 Reasonable Assurance Analysis Results

2.7.1 Wet Weather

Quantitative analyses were conducted for each analysis region separately and are summarized below. Average BMP load reduction results for each analysis region are presented in **Table 2-17** below. Detailed results for all BMPs in terms of volume, concentration, and load for each WBPC and analysis region can be found in the electronic data files submitted along with the Beach Cities EWMP. An example illustrating the modeling results of applicable pollutant concentrations at the downstream outlet of the watershed system is included in Appendix K. The values provided correspond to the fecal coliform load reductions attributable to the BMP types at both the interim (2018) and final (2021) TMDL compliance deadlines. As shown, the TLRs were met in all analysis regions as a result of varying levels of implementation of non-structural and regional BMPs as described previously. The interim 50% TLR is met through a combination of nonstructural and existing regional BMPs. It should be noted that if at any time specific distributed green streets or regional/centralized BMPs are found to be infeasible for implementation, alternative BMPs or operational changes will be planned within the same subwatershed and within the same timeline, to meet an equivalent subwatershed load reduction, unless the TLRs or compliance schedules are modified.

Because USEPA's Santa Monica Bay DDT and PCBs TMDL effectively implements an anti-degradation approach to set MS4 WLAs to maintain and protect the receiving waters and meet water quality standards, the existing MS4 PCB and DDT loads from the Beach Cities EWMP Area are reasonably assumed to be in compliance with the applicable WLAs. Therefore, a target load reduction of zero has been set for PCBs and DDT. In spite of the zero required load reduction for PCBs and DDT in Santa Monica Bay for the Beach Cities EWMP Group, the BMPs proposed in this EWMP are expected to reduce sediment and sediment-associated pollutants such as DDTs and PCBs, so the non-quantified but greater-than-zero anticipated BMP load reductions for DDTs and PCBs will exceed the TMDL WLA. Therefore, compliance with the TMDL-based permit limits for DDTs and PCBs has been demonstrated through this narrative RAA evaluation.

Table 2-17. Santa Monica Bay Watershed – Fecal Coliform RAA Results – Interim and Final Compliance

Analysis Region	Implementation Benefits (average load reduction as % of baseline load for critical year)							TLR	Compliance (TLR Met)?
	Non-Structural BMPs (Non-Modeled)	Public Retrofit Incentives + Redevelopment	Non-MS4	Regional BMPs	Distributed BMPs	Distributed BMP Implementation Level	Estimated Load Reduction		
SMB-5-01	5%	2%	0%	0%	0%	N/A	**7%**	**0%**	Yes
SMB-O-06	5%	2%	0%	0%	0%	N/A	**7%**	**0%**	Yes
SMB-5-02	5%	4%	2%	36%	3%	5% MFR/COM/SFR	**50%**	**46%**	Yes
SMB-5-02/5-03	5%	3%	0%	0%	0%	N/A	**8%**	**0%**	Yes
SMB-5-03	5%	3%	0%	0%	0%	N/A	**8%**	**0%**	Yes
SMB-5-03/5-04	5%	4%	0%	5%	0%	N/A	**15%**	**0%**	Yes
SMB-5-04	5%	5%	0%	1%	1%[2]	N/A	**12%**	**0%**	Yes
SMB-5-04/5-05	5%	4%	0%	2%	0%	N/A	**11%**	**0%**	Yes
SMB-5-05	5%	4%	5%	3%	0%	N/A	**18%**	**0%**	Yes
SMB-5-05/6-01	5%	3%	0%	2%	0%	N/A	**10%**	**0%**	Yes
SMB-6-01+ BCSump[1]	5%	3%	3%	33%	2%	25% MFR/COM/SFR	**46%**	**45%**	Yes
SMB-6-01/6-02	5%	2%	4%	0%	0%	N/A	**11%**	**0%**	Yes
SMB-6-02	5%	3%	1%	4%	0%	N/A	**13%**	**0%**	Yes
SMB-6-03	5%	3%	5%	10%	0%	N/A	**23%**	**0%**	Yes
SMB-6-04	5%	4%	3%	0%	0%	N/A	**12%**	**0%**	Yes
SMB-6-05	5%	3%	6%	0%	0%	N/A	**15%**	**0%**	Yes
SMB-O-08	5%	2%	0%	0%	0%	N/A	**7%**	**0%**	Yes
SMB-6-06	5%	5%	0%	0%	0%	N/A	**10%**	**0%**	Yes
Final Compliance Deadline (2021)	**5%**	**3%**	**3%**	**21%**	**1%**	**N/A**	**33%**	**26%**	**Yes**
Interim Compliance Deadline (2018)[3]	**2.5%**	**0.8%**	**1.5%**	**9.6%**	**0%**	**N/A**	**14.4%**	**13%**	**Yes**

[1] "BCSump" was defined as a separate analysis region for modeling purposes. The baseline load for "BCSump" analysis region was combined with the baseline load of the "SMB-6-01" analysis region to equal the total baseline load contributing to the SMB-6-01 CML ("SMB-6-01+BCSump").

[2] Distributed green street BMP load reduction in SMB-5-04 is a result of the existing filter/infiltration boxes retrofitted on the east side of Hermosa Avenue in the City of Hermosa Beach.

[3] The total interim load reduction is the sum of the load reductions calculated for each analysis region by 2018. The TLR is met through a combination of nonstructural and existing regional BMPs.

Time Series Output

Electronic input and output SWMM files and Excel summary spreadsheets will be provided to the LARWQCB upon submittal of this Draft EWMP

Consistency with LARWQCB Guidance

The approaches described above, including model selection, data inputs, critical condition selection (90th percentile year), calibration performance criteria, and output types were selected for consistency with the LARWQCB RAA Guidance Document (LARWQCB, 2014).

2.7.2 DRY WEATHER

For dry weather bacteria compliance, a qualitative analysis was conducted to show compliance at each of the CMLs. **Table 2-18** outlines the results of this analysis. Many CMLs have an effective diversion[18] such that they are consistently operational, well maintained, and sized to effectively eliminate discharges to the surf zone during year-round dry weather days. For the remaining smaller outfalls a systematic screening conducted in 2002 demonstrated that there was no discharge to the wave wash during summer dry weather from these storm drains. Rescreening of outfalls will be conducted as part of the Non-Stormwater Screening and Monitoring in the Coordinated Integrated Monitoring Program and will include both summer dry weather and winter dry weather screening. For the CMLs in the SMB Watershed that have anti-degradation based allowed exceedance days for both winter-dry and summer-dry weather, reasonable assurance is assumed to be demonstrated through the basis that the TMDL established their allowed exceedance days based on historic conditions (i.e., no water quality improvements were necessary).

If following dry weather outfall re-screening, dry weather reasonable assurance has not been demonstrated by the evaluation criteria shown in **Table 2-18**, the Beach Cities EWMP Group's compliance approach is consistent with the Permit requirement to eliminate 100 percent of non-exempt dry weather MS4 discharges. The Group's implementation approach for achieving this is to use a suite of non-structural source controls (e.g., water conservation incentives, enhanced illicit discharge detection and elimination [IDDE] efforts, and enhanced education/outreach and inspection/enforcement to prevent non-exempt sources of stormwater flow) and source investigations. By eliminating flows, this is equivalent to 100 percent load reduction for all pollutants, thereby demonstrating reasonable assurance of meeting all applicable TMDL limits and water quality objectives in the Permit during dry weather. Elimination of discharges is a pathway for compliance with RWLs and WQBELs in the MS4 Permit (per Section VI.E.2.e.i.(3)); without discharges there can be no "cause or contribute" to receiving water issues.

Since the dry weather compliance deadlines for the SMBBB TMDL have passed, this analysis is provided for informational purposes only, and is not intended to support or justify a new

[18] The seven existing low flow diversions include Polliwog Park, SMB 5-2 (28th Street), SMB 5-3 (Manhattan Beach Boulevard), SMB 5-5 (south of Pier Avenue), SMB 6-1 (Herondo Street), SMB 6-3 (Sapphire Street), and SMB 6-5 (Avenue I).

compliance schedule, additional non-structural or structural BMPs, or an evaluation of whether any newly proposed BMPs will provide a dry weather benefit.

Table 2-18. Dry Weather RAA Evaluation of Santa Monica Bay Watershed CMLs

CML	Effective Diversion/Disinfection at Analysis Region Outlet?	WMG MS4 Outfall Absent?	NSW MS4 Discharges Absent?	Reasonable Assurance Demonstrated?
SMB-5-01	No	Yes	To be determined pending results of non-stormwater screening	**Yes**
SMB-5-02	Yes	No		**Yes**
SMB-5-03	Yes	Yes		**Yes**
SMB-5-04	No	No		**TBD**
SMB-5-05	Yes	No		**Yes**
SMB-6-01	Yes	No		**Yes**
BCSump	Yes	No		**Yes**
SMB-6-02	Yes	No		**Yes**
SMB-6-03	Yes	No		**Yes**
SMB-6-04	No	No		**TBD**
SMB-6-05	Yes	No		**Yes**
SMB-6-06	No	No		**TBD**

2.8 Multiple Benefits

Not only is reasonable assurance demonstrated for the water quality objectives, but some of the proposed projects also provide multiple benefits beyond pollutant load reduction. Such benefits are described per individual project in Section 2.6.4 and described in general below.

2.8.1 Neighborhood Greening

Increased green space can positively impact the aesthetics, and even the property value, of highly urbanized areas. Property value tends to increase when an urban neighborhood has green space or trees in sight (Center for Neighborhood Technology [CNT], 2010).

Green infrastructure and green space can also alleviate urban heat-island effects by reducing temperatures by about 5^{o}F through shade and evaporation (CNT, 2010). Urban heat-island effects describe the process by which urbanized regions become warmer than their rural surroundings due to an increase in black top and hardscape surfaces, an increase in vehicular and industrial emissions, and a reduction in shade and green space. Reduced temperatures will in turn reduce both energy consumption needs and the heat and pollution-related risks to human health (CNT, 2010).

2.8.2 Water Conservation/Supply

Stormwater retained in the regional structural BMPs can be reused for irrigation and other on-site, non-potable uses, thus promoting water conservation and offsetting reliance on the potable water supply.

2.8.3 Groundwater Recharge

Stormwater capture may increase groundwater supplies in cases where BMPs are designed for water supply augmentation and captured stormwater is recharged to groundwater basins that are used as drinking water sources. Green infrastructure allows captured runoff to infiltrate to useable groundwater basin storage. Due to the proximity to coastal aquifers, there may be limited groundwater recharge benefit in the proposed BMPs. However, this design option and potential benefit can be further explored as more site information is collected during the feasibility assessment and design phase for each BMP.

2.8.4 Public Education/Awareness

Public education and outreach engages the public's interest in preventing stormwater pollution and is achieved most effectively through an understanding of the varying levels of public background knowledge about stormwater management and pollution prevention (USEPA, 2014).

Public outreach is a major facet of the public retrofit incentives element of the RAA approach, which is directed at incentivizing the public to decrease the amount of stormwater runoff from their property, specifically via downspout disconnects. Outreach for this incentive may occur in the form of direct conversations, a variety of media, and/or short training courses, for example. Structural BMPs proposed in the EWMP will also serve as public education opportunities in the form of on-site educational materials, such as signage posted at construction and completed sites.

2.8.5 Flood control

Flood control benefits can exist in the context of:

- **Localized flooding,** caused by runoff before it enters a drain, causing property damage or traffic hazards. Regional BMPs can have significant impact on mitigating risk to localized flooding issues.
- **Riverine flooding,** occurring when flow exceeds the carrying capacity of the river, resulting in risk of overbank flow. Large regional BMPs will reduce pressure on the flood control capacity of streams.
- **Coastal Flooding**, occurring when local drainage infrastructure is overwhelmed during coast storm surges. Regional BMPs can significantly reduce pressure on local drainage, reducing risk of flooding to low lying coastal neighborhoods during coastal storm surges.

Depending on the type, size and location of the BMP, multiple benefits for one or more of the flood control scenarios may be provided. Cities and towns are beginning to recognize that green infrastructure practices provide a feasible and cost-effective alternative that manages precipitation on-site and reduces loads in local storm sewers and waterways. These solutions can not only reduce localized flooding, but can also significantly reduce negative downstream impacts in a way that traditional grey infrastructure solutions are less able to do (American Rivers, et al., 2012).

2.9 Parallel Compliance Efforts

During the remaining compliance period, the Beach Cities WMG may also elect to perform special studies to evaluate the SMBBB dry and wet weather WLAs. Various pathways are available to reopen the TMDL and modify the WLAs, including use of microbial source tracking to support a natural source exclusion, and quantitative microbial risk assessment to develop site specific objectives as allowed by the recent USEPA recreational criteria update. Furthermore, TMDL WLA changes are anticipated if the pending statewide bacteria objectives are adopted. The proposed changes for marine water include removal of the total coliform, fecal coliform, and fecal-to-total coliform ratio objectives, changing the enterococcus single sample maximum of 104 MPN/100ML to a statistical threshold value (10% allowed exceedances in a 30 day period) of 110 MPN/100mL, and other clarification and implementation guidance. Through the adaptive management process, the RAA may be reevaluated after any changes to the statewide objectives, TMDL WLAs, and/or Permit limits.

3 Dominguez Channel Watershed

3.1 Background

3.1.1 Geographical Context

The northeastern portion of the Beach Cities EWMP Area is tributary to Dominguez Channel[19] (including Torrance Carson Channel) and is comprised of approximately 7,380 acres of land (**Figure 3-1**), the majority of which is comprised of residential land uses (**Figure 3-2**). This watershed accounts for 48% of the total Beach Cities EWMP Area, and includes portions of the Cities of Manhattan Beach, Redondo Beach, and Torrance. Storm drains from the Cities of Manhattan Beach and Redondo Beach drain through the City of Lawndale before discharging to Dominguez Channel. The City of Torrance's MS4 discharges directly to Dominguez Channel and Torrance Carson Channel (Torrance Lateral). Collectively, this portion of the study area is hereinafter referred to as the Dominguez Channel Watershed.

LACFCD is not responsible for land within the Beach Cities EWMP Area, but does own and maintain infrastructure within all three watersheds. Background information on the LACFCD is provided in **Appendix G. Table 3-1** provides a breakdown of the Beach Cities EWMP Area by city and tributary watershed. This section of the EWMP focuses on the Dominguez Channel Watershed only.

Table 3-1. Beach Cities WMG Area Distribution by Participating Agency

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

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

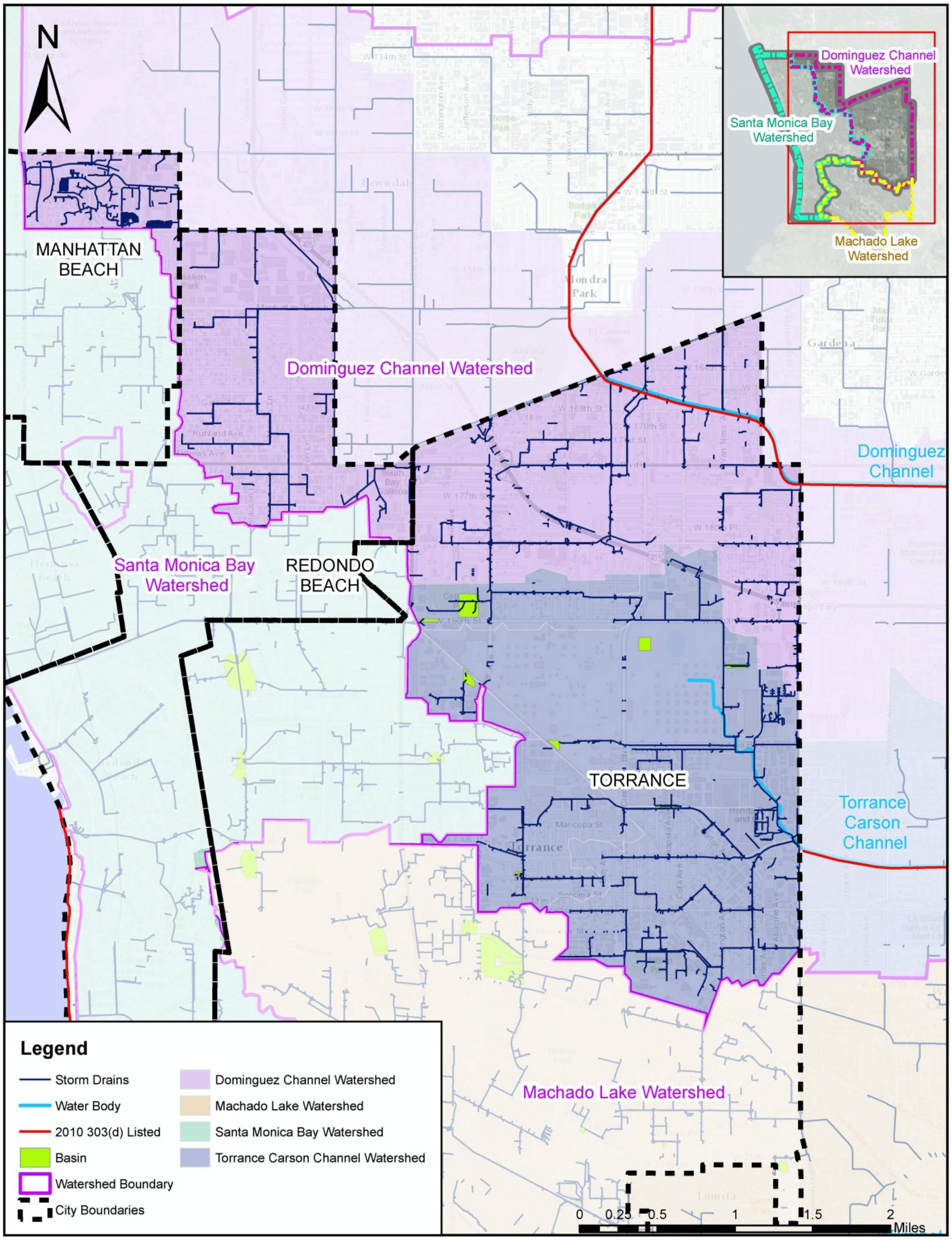


Figure 3-1. Beach Cities WMG MS4 Infrastructure within the Dominguez Channel Watershed

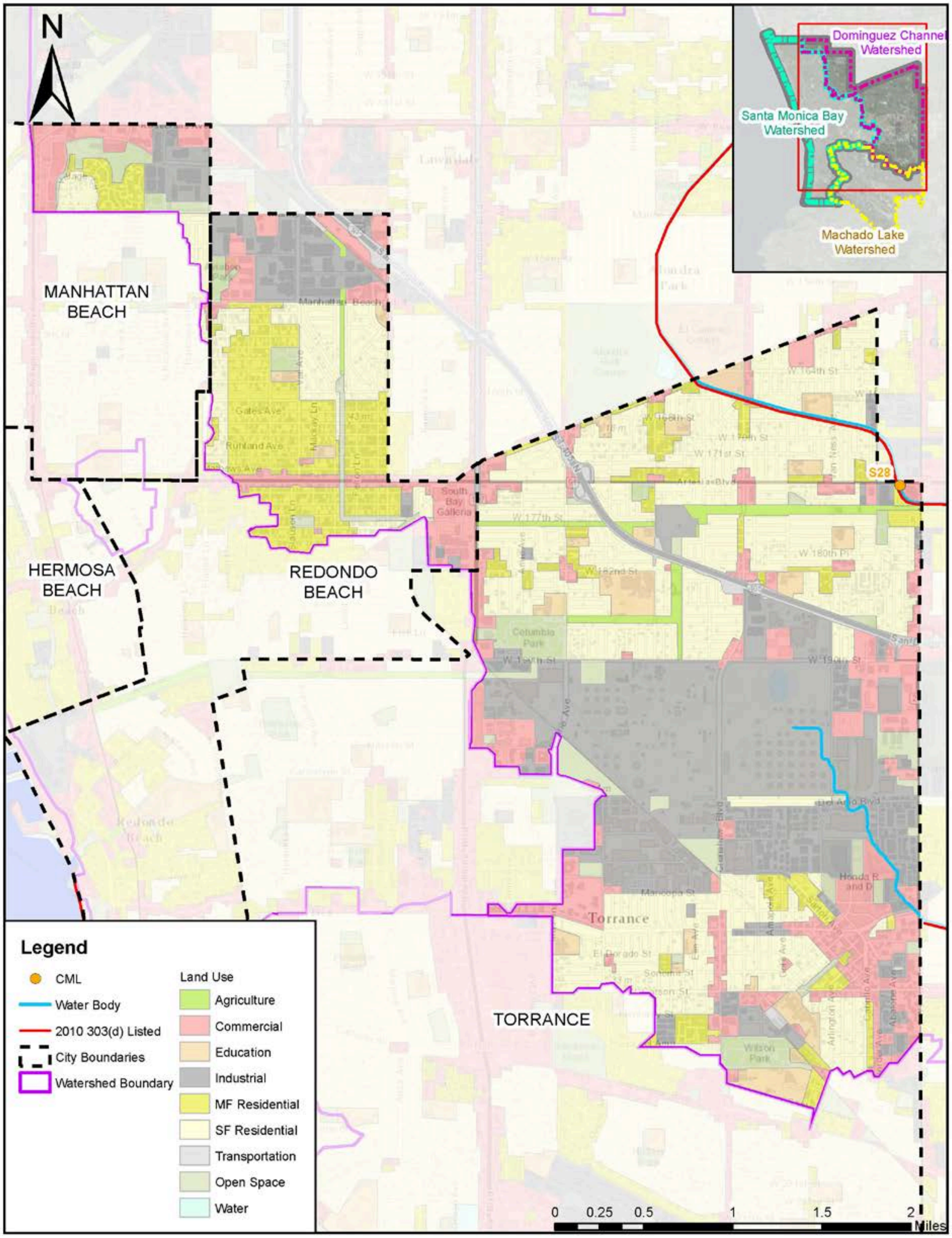


Figure 3-2. Beach Cities WMG Land Uses within the Dominguez Channel Watershed

3.2 Identification of Water Quality Priorities

As part of the EWMP, the Permit requires the Beach Cities WMG to identify water quality priorities within their EWMP AREA. To accomplish this per Permit Section VI.C.5.a, the Beach Cities WMG conducted the following for the Dominguez Channel Watershed portion of the Beach Cities EWMP Area:

1. Characterize the water quality of stormwater and non-stormwater discharges from the MS4 as well as receiving water bodies;
2. Prioritize WBPCs; and
3. Assess sources for high priority water body.

A summary of results is provided below.

3.2.1 Water Quality Characterization

Beneficial Uses

As discussed in Section 2.2.1, the Basin Plan (LARWQCB, 1995, updated 2011) identifies receiving waters within the Los Angeles region and sets regulatory objectives for these receiving waters. The Basin Plan regulates waste discharges to protect the quality of surface waters for use and enjoyment by the general public. Regulations set forth in the Basin Plan are based on assigned beneficial uses for each receiving water body. Beneficial use designations for receiving waters within the Beach Cities WMG Area are defined in Section 2.2.1 and summarized in **Table 3-2** below.

Table 3-2. Beach Cities EWMP Area – Dominguez Channel Watershed Water Bodies and Beneficial Uses

Water Body	MUN	IND	NAV	REC1	REC2	HFS	COMM	WARM	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET[3]
Dominguez Channel	P[1]			P	E	E		P		P	E				
Torrance Lateral[2]	P[1]			P	E	E		P		P	E				

E = Existing beneficial use

P = Potential beneficial use

[1] Designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date.

[2] Listed in Basin Plan Table 1 as a "major surface water," tributary to Dominguez Channel Estuary.

[3] Water bodies designated as WET may have wetlands habitat associated with only a portion of the water body. Any regulatory action would require a detailed analysis of the area.

The high flow suspension beneficial use, which was approved by the USEPA as a Basin Plan Amendment in 2004, applies to Dominguez Channel and its tributaries. During days on which this beneficial use suspension is in effect, bacteriological objectives applicable to Dominguez Channel and its tributaries are suspended. The high flow suspension applies on days with rainfall greater than or equal to ½ inch and the 24 hours following the end of such an event.

Dominguez Channel Watershed Data Analysis

An evaluation of existing water quality conditions, including characterization of stormwater and non-stormwater discharges from the MS4 as well as water quality of the receiving water bodies within the Beach Cities WMG Area, was carried out as part of this EWMP to support identification and prioritization/sequencing of management actions, to the extent possible based on available data. Analyzed raw monitoring data were limited to data collected as part of the Mass Emission Station monitoring program established by the Los Angeles County Department of Public Works (LACDPW). No other data within Dominguez Channel were known to exist. Data were analyzed from two relevant monitoring stations: the Dominguez Channel Mass Emission Station (Station S28), located in Dominguez Channel at Artesia Blvd on the Torrance city boundary; and Tributary Station "Project No. 1232" (Station TS19), located in Torrance Carson Channel (Torrance Lateral) within the City of Carson. The ten most recent years of data (2003 to 2013) from Mass Emission Station S28 were used; all available data (2008 to 2011) from Station TS19 were used.

3.2.2 Water Body-Pollutant Classification

Receiving waters for stormwater runoff from the Dominguez Channel Watershed portion of the Beach Cities EWMP area were screened for water quality priorities by reviewing TMDLs, the State's 303(d) list, and recent available water quality data. Each identified water quality priority for a given receiving water body was categorized as a WBPC. WBPCs were classified into one of three categories, in accordance with Section VI.C.5(a).ii of the Permit, and further detailed in Section 2.2.2 herein.

Figure 2-3 in Section 2.2.2 provides a conceptual overview of the process used to identify and categorize the WBPCs within the Beach Cities EWMP Area. In order to categorize and prioritize the WBPCs within the Dominguez Channel Watershed portion of the Beach Cities EWMP Area, relevant TMDLs, 303(d) listings, recent available monitoring data, and water quality objectives from the Basin Plan were considered.

Category 1 – Highest Priority

WBPCs under Category 1 (highest priority) are defined in the Permit as "water body-pollutant combinations for which WQBELs and/or RWLs are established in Part VI.E and Attachments L through R of [the Permit]." These WBPCs include:

- <u>Dominguez Channel for copper, lead, and zinc in wet weather</u>: These WBPCs are considered Category 1 due to the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxics and Metals TMDL (Dominguez Channel Toxics TMDL) (LARWQCB, 2011).
- <u>Dominguez Channel for toxicity</u>: This is considered Category 1 due to the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxics and Metals TMDL. Toxicity was not modeled for Dominguez Channel and Torrance Lateral as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of toxicity. Toxicity will continue to be monitored under the Beach Cities' CIMP.
- <u>Dominguez Channel Estuary for copper, lead, zinc, cadmium, DDT, PAHs, and PCBs</u>: These WBPCs are considered Category 1 due to the Dominguez Channel Toxics TMDL (LARWQCB,

2011). According to the Dominguez Channel WMA EWMP (DC WMG, 2015), relationships between TSS and historical organics were evaluated to determine if TSS could be used as a surrogate for historical organics. As there were significant non-detects in the available water quality data, a relationship between historic organics and TSS could not be established in the available Dominguez Channel monitoring data. Other studies have shown that relationship between TSS and historical organics can exist; however, the water quality depends on the storm event, soil disturbance, and other factors. It was assumed that if water column pollutant targets were met in Dominguez Channel, the targets would also be met downstream in the Dominguez Channel Estuary, which is the receiving water to Dominguez Channel. Sediment-borne pollutants would also be reduced by the same BMPs that are being used to address the water column pollutants. For these reasons, it was not necessary to perform a separate Reasonable Assurance Analysis for the Dominguez Channel Estuary. If monitoring data show that Dominguez Channel discharges are not meeting sediment objectives, a Reasonable Assurance Analysis will be conducted for sediment and the EWMP will be revised accordingly.

Category 2 – High Priority

Category 2 (high priority) WBPCs are defined as "pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) (SWRCB, 2004) and for which MS4 discharges may be causing or contributing to the impairment." Aside from those WBPCs already identified as Category 1, the remaining WBPC list can be condensed by excluding pollutants which are not stormwater related (i.e., MS4 discharges are unlikely to cause or contribute to the impairment) as well as pollutants which are already being addressed (directly or indirectly) by one of the TMDLs. Therefore, the Category 2 WBPCs are limited to the following:

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

- Dominguez Channel (including Torrance Lateral) for diazinon. Dominguez Channel is also 303(d)-listed for diazinon, although data are not available on the SWRCB's website since this listing was made prior to 2006. However, as the Dominguez Channel Toxics TMDL staff report states, the USEPA banned diazinon on December 31, 2005. The Dominguez Channel Toxics TMDL staff report (Section 2.6.1) states, "Whereas elevated diazinon levels had been observed concurrently with toxicity in 2002-2005 wet weather samples and therefore diazinon was presumed to be contributing to adverse toxicity results; post-2005 results show no diazinon concentrations above the freshwater guideline. Therefore, it is appropriate to develop freshwater metals and toxicity TMDLs for wet weather; however, the more recent toxicity results are not attributable to diazinon and therefore no diazinon TMDLs have been developed for Dominguez Channel." Dominguez Channel and Torrance Lateral data from 2006-2013, which includes 85 total samples between the two monitoring sites, show no exceedances of the chronic diazinon criteria established by the California Department of Fish and Game (0.10 ug/L). Due to the fact that monitoring data since 2006 show that all samples at S28 and TS19 meet the applicable water quality criteria for diazinon, diazinon could reasonably be removed from the State's 303(d) list for Dominguez Channel and therefore is not included as a Category 2 pollutant for Dominguez Channel (including Torrance Lateral).

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

Category 3 – Medium Priority

Category 3 (Medium Priority) designations are applied to WBPCs which are not 303(d)-listed but which exceed applicable RWLs contained in the Permit and for which MS4 discharges may be causing or contributing to the exceedance.

The annual monitoring reports published by LACDPW list exceedances of each sampled constituent relative to various water quality criteria, including Basin Plan Objectives (BPOs) and California Toxics Rule (CTR) criteria.[20] Raw data from S28 and TS19 have been reevaluated. Aside from the constituents described previously, measured exceedances at S28 and TS19 are summarized in **Table 3-3.** A single exceedance of the Department of Fish and Game's chronic criterion for chlorpyrifos (0.05 mg/L) occurred in October 2005 at S28. This exceedance occurred prior to EPA's December 31, 2005 chlorpyrifos ban. Since this time, 85 total samples from S28 and TS19 have been analyzed for chlorpyrifos and no exceedances have been recorded.

[20] Because of some additional water quality criteria used to evaluate exceedances in the County's annual monitoring reports (e.g., applying Ocean Plan Objectives to freshwater bodies; applying MUN-specific BPOs to potential-MUN-designated water bodies), exceedances were over-reported. As a result, pollutants evaluated as part of this appendix were limited to those pollutants which had at least one reported exceedance since 2003. For pollutants with a reported exceedance since 2003, all historic water quality data from that time forward was evaluated against appropriate water quality criteria. For pollutants with no reported exceedances, it was assumed that LACDPW's exceedance analyses were accurate.

Table 3-3. LACDPW Monitoring Results Summary

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

In addition, based on water quality data analyses conducted by Dominguez Channel EWMP Group in the Dominguez Channel Estuary, arsenic, chromium, silver, nickel, mercury, and thallium are also considered Category 3 pollutants in the Dominguez Channel Estuary. Details are found in the Dominguez Channel EWMP (DC WMG, 2015).

Although data are not currently available to evaluate a linkage between Beach Cities WMG MS4 discharges and these receiving water exceedances, the following WBPCs are considered Category 3 based on the receiving water exceedances described above:

- Dominguez Channel (including Torrance Lateral) for cyanide, due to exceedances of the CTR continuous concentration criterion for cyanide summarized in **Table 3-3**. Cyanide was not modeled for Dominguez Channel and Torrance Lateral due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of cyanide. Cyanide will continue to be monitored under the Beach Cities' CIMP.
- Dominguez Channel (including Torrance Lateral) for pH, due to exceedances of the Basin Plan Objective for pH summarized in **Table 3-3**. However, due to the fact that there is currently no evidence supporting a linkage between MS4 discharges and exceedances of the pH criteria, pH was not modeled as part of the Beach Cities' RAA. Monitoring for pH will occur under the CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to pH exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel (including Torrance Lateral) for selenium, due to exceedances of the CTR continuous concentration criterion for selenium summarized in **Table 3-3**. However, due to the

fact that there is currently no evidence supporting a linkage between MS4 discharges and exceedances of selenium[21], selenium was not addressed in the Beach Cities' RAA. Monitoring for selenium will occur under the CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to selenium exceedances in the receiving water, the EWMP will be revised accordingly.

- Dominguez Channel (including Torrance Lateral) for mercury, due to exceedances of the CTR human health criterion for mercury summarized in **Table 3-3**. Mercury was not modeled for Dominguez Channel and Torrance Lateral as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of mercury. Mercury will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to mercury exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel (including Torrance Lateral) for cadmium, due to exceedances of the CTR continuous concentration criterion for cadmium summarized in **Table 3-3**. Cadmium was not modeled for Dominguez Channel and Torrance Lateral as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of cadmium. Cadmium will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to cadmium exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel Estuary for arsenic, due to exceedances of the proposed Effect Range Low (ERL) sediment quality guideline for arsenic. Arsenic was not modeled for Dominguez Channel Estuary as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of arsenic. Arsenic will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to arsenic exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel Estuary for chromium, due to exceedances of the proposed ERL sediment quality guideline for chromium. Chromium was not modeled for Dominguez Channel Estuary as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of chromium. Chromium will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to chromium exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel Estuary for silver, due to exceedances of the CTR continuous saltwater concentration criterion for silver. Silver was not modeled for Dominguez Channel Estuary as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of silver. Silver will continue to be monitored under

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

the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to silver exceedances in the receiving water, the EWMP will be revised accordingly.

- Dominguez Channel Estuary for nickel, due to exceedances of the CTR continuous and maximum saltwater concentration criteria for nickel. Nickel was not modeled for Dominguez Channel Estuary as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of nickel. Nickel will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to nickel exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel Estuary for mercury, due to exceedances of the proposed ERL sediment quality guideline and the CTR human health criterion for mercury. Mercury was not modeled for Dominguez Channel Estuary as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of mercury. Mercury will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to mercury exceedances in the receiving water, the EWMP will be revised accordingly.
- Dominguez Channel Estuary for thallium, due to exceedances of the CTR human health criterion for thallium. Thallium was not modeled for Dominguez Channel Estuary as part of the RAA due to the fact that there is currently a lack of evidence supporting a linkage between MS4 discharges and exceedances of thallium. Thallium will continue to be monitored under the Beach Cities' CIMP. If future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to thallium exceedances in the receiving water, the EWMP will be revised accordingly.

Table 3-4 summarizes the prioritized WBPCs within the Dominguez Channel Watershed portion of the Beach Cities EWMP Area.

Table 3-4. Water Body-Pollutant Combination Prioritization and Pollutant Interim and Final Compliance Targets for Dominguez Channel Watershed

Category	Water Body	Pollutant	Reason for Categorization	WQBEL/RWL/ Objective Basis	Interim WQBEL/ RWL	Final WQBEL/RWL/ Objective
1: Highest Priority	Dominguez Channel (including Torrance Lateral) [1]	Toxicity	Dominguez Channel Toxics TMDL	Monthly Average	2 TUc [2]	1 TUc
		Total Copper	Dominguez Channel Toxics TMDL	Wet Weather Single Event	207.51 ug/L[2]	9.7 ug/L
		Total Lead	Dominguez Channel Toxics TMDL	Wet Weather Single Event	122.88 ug/L[2]	42.7 ug/L
		Total Zinc	Dominguez Channel Toxics TMDL	Wet Weather Single Event	898.87 ug/L[2]	69.7 ug/L
	Dominguez Channel Estuary	Total Copper	Dominguez Channel Toxics TMDL	Annual Average	220 mg/kg sediment[2]	22.4 kg/yr
		Total Lead	Dominguez Channel Toxics TMDL	Annual Average	510.0 mg/kg sediment[2]	54.2 kg/yr
		Total Zinc	Dominguez Channel Toxics TMDL	Annual Average	789.0 mg/kg sediment[2]	271.8 kg/yr
		Cadmium	Dominguez Channel Toxics TMDL	Daily Maximum	n/a	1.2 mg/kg sediment
		DDT	Dominguez Channel Toxics TMDL	Annual Average	1.727 mg/kg sediment[2]	0.25 g/yr
		Total PAHs	Dominguez Channel Toxics TMDL	Annual Average	31.60 mg/kg sediment[2]	0.134 kg/yr
		PCBs	Dominguez Channel Toxics TMDL	Annual Average	1.490 mg/kg sediment[2]	0.207 g/yr

Category	Water Body	Pollutant	Reason for Categorization	WQBEL/RWL/ Objective Basis	Interim WQBEL/ RWL	Final WQBEL/RWL/ Objective
2: High Priority	Dominguez Channel (including Torrance Lateral)	Indicator Bacteria	303(d) List	Exceedance Rate over 30-day Period	n/a	*See Footnote 3*
		Ammonia	303(d) List	1-hour Average	n/a	$Effluent\ Limit\left(\frac{mg\ N}{L}\right) = \frac{0.411}{1+10^{7.204-pH}}+\frac{58.4}{1+10^{pH-7.204}}$ (Equation 1)
	Dominguez Channel Estuary	Indicator Bacteria	303(d) List	Single Event and Geometric Mean	n/a	*See Footnote 3*
		Ammonia	303(d) List	1-hour Average	n/a	0.233mg N/L or limit calculated using Equation 1, whichever is greater
3: Medium Priority	Dominguez Channel (including Torrance Lateral)	Cyanide	Historic exceedances of the California Toxics Rule (CTR) continuous concentration water quality objective (5.2 ug/L)	Continuous Monitoring	n/a	5.2 ug/L
		pH	Historic exceedance of the Basin Plan Objective (6.5 – 8.5)	Continuous Monitoring	n/a	6.5 - 8.5

Category	Water Body	Pollutant	Reason for Categorization	WQBEL/RWL/ Objective Basis	Interim WQBEL/ RWL	Final WQBEL/RWL/ Objective
		Selenium	Historic exceedances of the CTR continuous concentration water quality objective (5.0 ug/L)	Continuous Monitoring	n/a	5.0 ug/L
		Mercury	Historic exceedances of the CTR human health criterion for organisms only (0.051 ug/L)	Continuous Monitoring	n/a	0.051 ug/L
		Cadmium	Historic exceedances of the CTR continuous concentration water quality objective (2.2 ug/L)	Continuous Monitoring	n/a	2.2 ug/L
	Dominguez Channel Estuary	Arsenic	Historic exceedances of the Effects Range-Low (ERL) proposed sediment quality guidelines from the National Status and Trends database (8.2 mg/kg sediment)	Continuous Monitoring	n/a	8.2 mg/kg sediment

Category	Water Body	Pollutant	Reason for Categorization	WQBEL/RWL/ Objective Basis	Interim WQBEL/ RWL	Final WQBEL/RWL/ Objective
		Chromium	Historic exceedances of the ERL proposed sediment quality guidelines from the National Status and Trends database (81 mg/kg sediment)	Continuous Monitoring	n/a	81 mg/kg sediment
		Silver	Historic exceedances of the CTR continuous saltwater objective (1.9 ug/L)	Continuous Monitoring	n/a	1.9 ug/L
		Nickel	Historic exceedances of the CTR maximum saltwater objective (74 ug/L) and the CTR continuous saltwater objective (8.2 ug/L)	Continuous Monitoring	n/a	8.2 ug/L (continuous) 74 ug/L (maximum)
		Mercury	Historic exceedances of the ERL proposed sediment quality guidelines from the National Status and Trends database (0.15 mg/kg sediment) and the CTR human health	Continuous Monitoring	n/a	0.15 mg/kg sediment 0.051 ug/L

Category	Water Body	Pollutant	Reason for Categorization	WQBEL/RWL/ Objective Basis	Interim WQBEL/ RWL	Final WQBEL/RWL/ Objective
			criterion for organisms only (0.051 ug/L)			
		Thallium	Historic exceedances of the CTR human health criterion for organisms only (6.3 ug/L)	Continuous Monitoring	n/a	6.3 ug/L

[1] Wet weather only, based on the Dominguez Channel Toxics TMDL

[2] The interim deadline for Dominguez Channel Toxic TMDL is 3/23/2012. Hence the interim target is no longer applicable

[3] Per the Basin Plan Objective REC1 Water Bodies Limit for Indicator Bacteria.

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

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

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

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

For WBPCs already addressed by a TMDL, adherence to all requirements and compliance dates as set forth in the approved EWMP will constitute compliance with applicable interim TMDL-based water quality based effluent limits and interim receiving water limits. 303(d)-listed WBPCs are equivalent to the identified Category 2 combinations. For any Category 2 and 3 WBPCs that are identified in the future through the adaptive management process, adherence to all implementation actions, milestones, and compliance schedules identified in the updated EWMP will constitute compliance with applicable receiving water limits. This approach is outlined in **Appendix H**. Category 2 and 3 parameters will also be monitored under the Beach Cities' CIMP and if future monitoring data suggest that the Beach Cities' MS4s may cause or contribute to exceedances of these pollutants in the receiving water, the EWMP will be revised to address these pollutants.

3.2.3 Source Assessment

The following data sources have been reviewed as part of the source assessment for the WBPCs listed previously:

- Findings from the Permittees' IC/ID Programs;
- Findings from the Permittees' Industrial/Commercial Facilities Programs;
- Findings from the Permittees' Development Construction Programs;
- Findings from the Permittees' Public Agency Activities Programs;
- TMDL source investigations;
- Watershed model results;
- Findings from the Permittees' monitoring programs, including but not limited to TMDL compliance monitoring and receiving water monitoring; and

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

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

Copper, Lead, and Zinc

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

SCCWRP conducted a detailed study of various wet weather pollutants throughout the Los Angeles region, including Dominguez Channel (Stein et al., 2007). They found that industrial land use sites contributed a substantially higher flux of copper and zinc compared to other land uses evaluated, followed by agriculture, recreational, transportation (for copper), and high density residential (for zinc). Wet weather EMCs for copper and zinc, based on the Los Angeles County land use EMC dataset (Geosyntec Consultants, 2012) were similar to SCCWRP's findings, showing that the highest runoff concentrations are expected from industrial, transportation, and commercial land uses, excluding agriculture. With respect to copper, research has shown that brake pads are a significant source of copper in urban stormwater (TDC Environmental, 2013). Copper and other pollutants are deposited on roads and other impervious surfaces and then transported to aquatic habitats via stormwater runoff.

Pollutant loads of copper from urban land uses is expected to decrease due to Senate Bill (SB) 346 which was signed into law on September 25, 2010. This legislation phases out copper in vehicle brake pads over a period of years; milestones include the following dates:

- January 1, 2021: Limits the use of copper in motor vehicle brake pads to no more than five percent by weight; and
- January 1, 2025: Limits the use of copper in motor vehicle brake pads to no more than 0.5 percent by weight.

A separate study focusing on zinc showed that the major sources of zinc in urban runoff are outdoor zinc surfaces (including galvanized surfaces) and tire wear debris (TDC Environmental, 2013).

For lead, SCCWRP found that the greatest land use contributors were agricultural (minimal in Dominguez Channel Watershed), high density residential, and recreational (horse) land uses (Stein et al., 2007). Based on the Los Angeles County land use EMC dataset (Geosyntec Consultants, 2012), the highest lead contributing land uses are agriculture, industrial, commercial, and single family residential. Lead was also formerly used as an additive in gasoline and is still used in general aviation gasoline (Avgas) for small piston-engine aircraft. According to Federal Aviation

Administration (FAA), Avgas emissions are the largest contribution to relatively low levels of lead emission in the U.S. (FAA, 2015). This has contributed to the contamination of some soils near highways and streets and in drainage ways in urban areas. Exhaust particulates, fluid losses, drips, spills, and mechanical wear products continue to contribute lead to street dust.

For both copper and lead, the SCCWRP and Los Angeles County datasets indicate that average EMCs exceed applicable CTR continuous concentration criteria for each land use sampled. For zinc, some land uses (single family residential, education, and vacant) have average EMCs below the CTR continuous concentration criterion, while others (commercial, industrial, transportation, multi-family residential, and agriculture) exceed this criterion.

These land use EMC datasets were used to support BMP placement as part of the RAA.

Toxicity

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

Pesticides are used in urban settings for structural pest control, landscape maintenance (parks, golf courses, cemeteries, and right-of-ways), vector control, and public health pest control. Two specific pesticides, diazinon and chlorpyrifos, were banned by the USEPA on December 31, 2005. As a result, mass emission monitoring at S28 has resulted in no measured exceedance of the 1 toxicity unit criteria for chlorpyrifos or diazinon in Dominguez Channel since 2006. Similarly, both DDT and PCBs were banned from general production and use in the 1970s, resulting in the elimination of direct discharges of these chemicals to Dominguez Channel, SMB, and other local surface water bodies, except from legacy sources.

Additional sources of toxicity within the Dominguez Channel Watershed are unknown at this time. Therefore, toxicity monitoring will be conducted under the Beach Cities CIMP to help assess if MS4 discharges are causing or contributing toxicity exceedances in Dominguez Channel. In addition, a toxicity identification evaluation (TIE) will be performed as necessary to identify the compound(s) responsible for any observed toxicity.

Indicator Bacteria

Although the Dominguez Channel is 303(d) listed for indicator bacteria, a bacteria TMDL has not yet been developed for the watershed. The source assessment for indicator bacteria within the Santa Monica Bay watershed portion of the Beach Cities EWMP area is provided in Section 2.2.3, and many of these urban anthropogenic and non-anthropogenic sources apply to the Dominguez Channel portion of the Beach Cities EWMP Area as well.

Additional local monitoring data will be needed to quantify the contribution of MS4 discharges – particularly relative to the many other identified non-anthropogenic sources that have been documented. Additional data are also needed to identify the sources of bacteria within MS4 discharges as well as their potential to contribute to recreational illness risks; such source tracking data have the potential to affect the TMDL WLAs through a future reopener. For example, if human fecal sources are found to be undetected in MS4 discharges to Dominguez Channel using a rigorous sampling design, the latest analytical markers, and a credible laboratory, then TMDL revisions may be proposed. And the combination of MS4 outfall monitoring (through the CIMP) and source identification (through special studies) will be essential to support future BMP planning and EWMP updates.

Ammonia

Monitoring data since 2003 show that all water quality samples at S28 and TS19 meet the freshwater Basin Plan Objective for ammonia. Because ammonia does not exceed water quality standards, a source assessment has not been completed at this time.

Generally, ammonia enters urban creeks via anthropogenic sources or discharges such as municipal effluent discharges, agricultural runoff, and natural sources such as nitrogen fixation, the excretion of nitrogenous wastes from animals, and runoff from agricultural lands (USEPA, 2013a).

Diazinon

Dominguez Channel and Torrance Lateral data from 2006-2013, which includes 85 total samples between the two monitoring sites, show no exceedances of the chronic diazinon criteria established by the California Department of Fish and Game (0.10 ug/L). No diazinon TMDLs have been developed at this time. Due to the fact that monitoring data since 2006 show that all samples at S28 and TS19 meet the applicable water quality criteria for diazinon, a source assessment has not been completed at this time.

Generally, diazinon in urban creeks may be attributed to urban runoff that contains pesticides as a result of such activities as application by businesses and individuals who apply them for structural pest control, landscape maintenance, agricultural, and other pest management purposes (Werner, et al., 2002).

3.2.4 Prioritization

Based on the water quality characterization above, the WBPCs have been classified into one of three categories, in accordance with Section IV.C.5(a)ii of the Permit: highest priority, high priority, and medium priority (**Table 3-4**). This categorization is intended to prioritize WBPCs in order to guide the implementation of structural and institutional BMPs. An RAA was performed on the WBPCs in Categories 1 and 2. WBPCs will be further prioritized based on the applicable compliance schedules, as discussed in Section 4.

3.3 Selection of Appropriate Best Management Practices

3.3.1 Objectives

The Permit requires the Beach Cities WMG to identify strategies, control measures, and BMPs to implement within their EWMP area. Specifically, the Permit specifies that BMPs are expected to be implemented so that MS4 discharges meet effluent limits as established in the Permit and to reduce impacts to receiving waters from stormwater and non-stormwater runoff. This expectation assumes the implementation of both types of BMPs – non-structural and structural – by the Beach Cities WMG.

The objectives of selecting and incorporating BMPs into the Beach Cities EWMP include:

1. Preventing and/or eliminating non-stormwater discharges to the MS4 that are a source of pollutants from the MS4 to receiving waters;
2. Achieving all applicable interim and final WQBELs and/or RWLs pursuant to corresponding compliance schedules; and
3. Ensuring that discharges form the MS4 do not cause or contribute to exceedances of RWLs.

3.3.2 Definition of Best Management Practices

See Section 2.3.2.

3.3.3 Incorporated Provisions

Minimum Control Measures

See Section 2.3.3.

Non-Stormwater Discharge Measures

The Permit requires Permittees to identify non-stormwater discharges that cause or contribute to exceedances of RWLs, and to then identify and implement BMPs to effectively eliminate the source of pollutants. These BMPs may include measures to prohibit non-stormwater discharge to the MS4, additional structural BMPs to reduce pollutants in the non-stormwater discharge, diversion to a sanitary sewer for treatment, or strategies to require the non-stormwater discharge to be separately regulated under a general NPDES permit. In contrast to Santa Monica Bay, Dominguez Channel Watershed does not have low flow diversions; however, within the Cities of Redondo Beach and Manhattan Beach, the implementation of two regional BMPs at both outlets from the EWMP area (see Section 3.6.4) will control dry weather flows by capturing the small flows in the pre-treatment volume and either retaining them or treating them in the media filter. In addition, the cities each have water conservation ordinances which include elimination of irrigation overspray.

The non-stormwater screening process consists of the steps shown in **Figure 2-4**. Further details on the Beach Cities WMGs' approach to meet this requirement are provided in the CIMP for the Beach Cities Watershed Management Group (Beach Cities Watershed Management Group, 2014). The watershed control measures proposed within Dominguez Channel that are expected to eliminate non-stormwater discharges meet the requirements as set forth in Parts III.A and VI.D.4.d and VI.D.10 of the LA County MS4 Permit.

The following schedule is proposed to eliminate unauthorized non-stormwater discharges that are either causing or contributing to receiving water exceedances in Dominguez Channel Watershed:

- December 2023: 50% volume reduction of significant non-stormwater discharges.
- December 2025: 100% elimination of all significant non-stormwater contributions.

Since there is no bacteria TMDL for Dominguez Channel, the final compliance date for dry weather bacteria was selected to be consistent with the draft TMDL for indicator bacteria in the San Gabriel River, Estuary and Tributaries, adopted by the LARWQCB in 2015, which requires that compliance is achieved with applicable MS4 WLAs 10 years after the effective date of the TMDL (Water Quality Control Plan, Attachment A to Resolution No. R15-0xx, adopted by the RWQCB in 2015).

TMDL-Specific Control Measures

See Section 2.3.3.

Additional BMPs

See Section 2.3.3.

Demonstration of BMP Performance – Introduction to the Reasonable Assurance Analysis

See Section 2.3.3.

Legal Authority

The Permit-required legal authority that the Beach Cities WMG has to implement the BMPs identified in the EWMP is discussed in Section 8.

3.4 Reasonable Assurance Analysis Approach

The general approach used for Dominguez Channel is described below with references to relevant portions of Section 2 where the approaches or data used in the Santa Monica Bay Watershed are similar (e.g., for calculating bacteria TLRs).

3.4.1 *Description of RAA Tools and Approach*

The approaches for performing the RAA in both dry and wet weather are described below.

Dry Weather

For the purposes of the dry weather RAA, the EWMP area draining to Dominguez Channel was combined into a single analysis region, for which bacteria was the only applicable dry weather WBPC specific to both Dominguez Channel and Dominguez Channel Estuary and total lead, copper, and zinc were dry weather WBPCs specific to Dominguez Channel Estuary.

The Beach Cities WMG dry weather compliance approach for Dominguez Channel and subsequently Dominguez Channel Estuary is to eliminate non-exempt dry weather MS4 discharges using a suite of non-structural source controls (e.g., water conservation incentives, enhanced IDDE efforts, and enhanced education/outreach and inspection/enforcement to prevent sources of non-stormwater flow), source investigations following dry weather outfall screening, and structural BMPs that are primarily designed to support wet weather reasonable assurance demonstration. If monitoring shows that this combination of nonstructural and structural BMPs does not eliminate non-exempt dry weather flows, additional measures such as low flow diversion to sanitary sewers will be constructed as necessary so that dry weather flows are eliminated. By eliminating dry weather flows, this is equivalent to 100% load reduction for all pollutants, thereby demonstrating reasonable assurance of meeting all applicable Permit limitations during dry weather. Elimination of discharges is a pathway for compliance with RWLs and WQBELs in the MS4 permit (per section VI.E.2.e.i.(3)); without discharges there can be no "cause or contribute" to receiving water issues.

Wet Weather

The modeled wet-weather RAA applied in the Dominguez Channel watershed consists generally of the following steps:

- Identify WBPCs for which the RAA will be performed;
- Identify the MS4 service area (exclude lands of agencies not party to this EWMP such as Federal land, State land, etc.);
- For each analysis region, develop TLRs for the critical condition;
- Identify structural and non-structural BMPs that were either implemented after applicable TMDL effective dates or are planned for implementation in the future;
- Evaluate the performance of these BMPs in terms of annual pollutant load reductions;
- Compare these estimates with the TLRs; and
- Revise the BMP implementation scenario until TLRs are met.

For the purposes of the wet weather RAA, the EWMP area draining to Dominguez Channel was combined into a single analysis region to establish TLRs and into two analysis regions, one including the portion of the Cities of Redondo Beach and Manhattan Beach (Dominguez Channel – Redondo Beach/Manhattan Beach [DC-RB/MB]) and one including the portion of the City of Torrance (DC – Torrance), to evaluate the performance of BMPs. The Dominguez Channel Watershed analysis regions are shown in **Figure 3-3.**

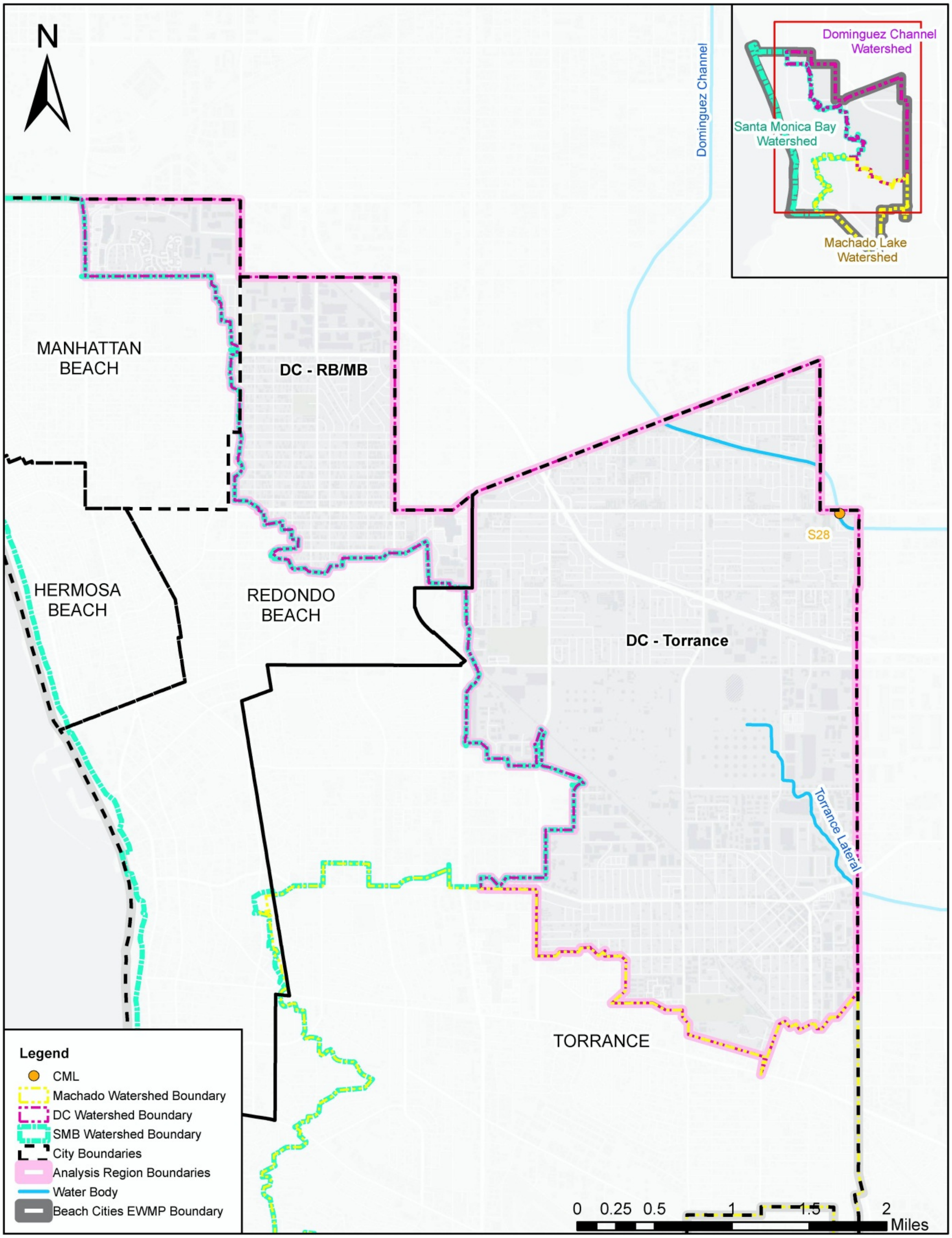


Figure 3-3. Analysis Regions within the Dominguez Channel Watershed portion of the Beach Cities EWMP Area

In general, the approach, including model selection, data inputs, critical condition selection (90th percentile year for bacteria and 90th percentile load day for metals), calibration performance criteria, and output types have been selected for consistency with the LARWQCB RAA Guidance Document (LARWQCB, 2014) and to leverage previous efforts where relevant models have already been developed. Previous efforts include the development of a Loading Simulation Program C++ (LSPC) model for the LACFCD in connection with Watershed Management Modeling System (WMMS). LSPC is a publically available watershed model that was developed for the LACFCD in connection with WMMS. This model uses Hydrologic Simulation Program Fortran (HSPF) algorithms to simulate hydrology, sediment transport, water quality on land, and fate and transport within streams. GIS is used for the spatial component of the analysis in addition to visualization. The LSPC model used for the RAA was recently calibrated by CWE to stream gauge S28 which receives runoff from almost all of the Dominguez Channel Watershed.

To leverage these previous calibration efforts, the portion of the LSPC model within the Dominguez Channel Watershed EWMP Area was used to calibrate SBPAT's hydrology. SBPAT was used to establish all TLRs in the Dominguez Channel Watershed. SBPAT was also used to perform the RAA for the portion of the Cities of Redondo Beach and Manhattan Beach within the Dominguez Channel Watershed. The RAA for the portion of the City of Torrance within the Dominguez Channel Watershed was performed using SWMM to determine baseline loading and static spreadsheet-based calculations based on a literature review to estimate load reductions from the proposed BMPs. The SWMM model used for baseline loading was calibrated using the recently calibrated LSPC model. **Table 3-5** below summarizes the TLR and RAA models used across the Dominguez Channel Watershed for this EWMP. These models are discussed in more detail below.

Table 3-5. RAA Models Used in the Dominguez Channel Watershed

City	Model Selection		
	Set Target Load Reduction	**Perform RAA**	**Calibration Data Source**
Manhattan Beach	SBPAT	SBPAT	Recently calibrated LSPC model
Redondo Beach	SBPAT	SBPAT	Recently calibrated LSPC model
Torrance	SBPAT	SWMM for baseline/static spreadsheet-based calculations for load reductions	Recently calibrated LSPC model

As in the Santa Monica Bay watershed, the Beach Cities RAA was conducted within the Dominguez Channel Watershed to demonstrate reasonable assurance of compliance with Permit specified TMDL RWLs and WQBELs, as well as other RWLs and water quality objectives for non-TMDL WBPCs. In instances where critical conditions were not explicitly defined in the Permit (e.g., a critical condition of "wet weather" without an associated rainfall or flow-based criterion), steps were taken to establish a link between the expressed Permit limit and the modeled pollutant concentrations and loads (i.e., rainfall, runoff, and pollutant concentrations in the runoff). **Table 3-6** summarizes these steps for the modeled WBPC in the Dominguez Channel Watershed with a Permit-established limit. According to the Dominguez Channel WMA EWMP (DC WMG, 2015), relationships between TSS and historical organics were evaluated to determine if TSS could be used as a surrogate for historical organics. As there were significant non-detects in the available water quality data, a relationship between historic organics and TSS could not be established in the available Dominguez Channel monitoring data. Other studies have shown that relationship between TSS and historical organics can exist; however, the water quality depends on the storm event, soil disturbance, and other factors. It was assumed that if water column pollutant targets were met in Dominguez Channel, the targets would also be met downstream in the Dominguez Channel Estuary, which is the receiving water to Dominguez Channel. Sediment-borne pollutants would also be reduced by the same BMPs that are being used to address the water column pollutants. For these reasons, it was not necessary to perform a separate Reasonable Assurance Analysis for the Dominguez Channel Estuary. If monitoring data show that Dominguez Channel discharges are not meeting sediment objectives, a Reasonable Assurance Analysis will be conducted for sediment and the EWMP will be revised accordingly. Because no evidence currently exists to support a linkage between ongoing MS4 discharges and exceedances of toxicity, mercury, cadmium, cyanide, selenium, or pH in Dominguez Channel, these pollutants were not modeled as part of this analysis.

Table 3-6. Wet Weather Permit Limits (Final Compliance Limits for Modeled Pollutants)

Pollutant	RWL/WQBEL from the Permit or Assumed Based on Other Similar Los Angeles Region TMDLs	Approach for Applying the Critical Period
Fecal Coliform	19% allowed exceedance of the REC-1 water quality objective, (400 MPN/100mL) on non-high flow suspension days[2].	90^{th} percentile year (based on wet days[1]) was used as the critical condition. Allowable number of wet weather exceedance days for the critical year was set to % of non-high flow suspension wet days, rounding down.
Total Copper	WQBEL= 9.7 ug/L *Daily Volume[3]	90^{th} percentile daily load during wet weather was used as the critical condition. This calendar day was identified for each metal by ranking daily metal loads for wet days[1] between 2003 and 2012.
Total Lead	WQBEL= 42.7 ug/L *Daily Volume[3]	
Total Zinc	WQBEL= 69.7 ug/L *Daily Volume[3]	

[1] For bacteria, wet days were defined as days with 0.1" or greater of rainfall plus the next three days. For metals, the TMDL defines wet weather as days in which the maximum daily flow at the S-28 gauge on Dominguez Channel is 63 cfs or greater; for the purpose of this RAA, this was assumed to equate to days in which the SBPAT model (which responds to rainfall events greater than 0.1", had a non-zero flow).

[2] High Flow Suspension days are defined based on the criteria used in bacteria TMDLs in the region in which days in which 0.5" or greater of rainfall occurs, and the day following such an event, are both high flow suspension days.

[3] The MS4 permit provides both the concentration-based effluent limitations above as well as load based limitations on page N-6 which come from the Dominguez Channel Toxics TMDL. The load-based limitations are based on multiplying the metal concentration-based limitations by the runoff volume on the 90^{th} percentile day. However, the TMDL does not provide quantitative load-based effluent limitations, but instead states that the WLAs are the water quality effluent target multiplied by the daily flow volume. The MS4 permit states that the load-based limitations can be recalculated based on the flow volume at the time of sampling. Therefore, the load-based effluent limitations will change based on the daily flow volume, so the WQBEL is written to account for flow variability.

Cities of Redondo Beach and Manhattan Beach (DC-RB/MB Analysis Region). SBPAT was used for the portion of the Dominguez Channel Watershed within the Cities of Redondo Beach and Manhattan Beach to evaluate BMP scenarios and demonstrate reasonable assurance of achieving applicable Permit limits. SBPAT was used in the same capacity for the Santa Monica Bay watershed and is described in detail in Section 2.4.1 above.

City of Torrance (DC-Torrance Analysis Region). In general, the RAA approach used within the City of Torrance portion of the Dominguez Channel Watershed was conducted using static spreadsheet calculations coupled with a literature review on the performance of catch basin inlet filters to determine reasonable removal percentages for metals and bacteria.

3.4.2 Modeling Data

The critical condition definition and a summary of data associated with the models used in the RAA are described below.

Critical Condition Definition

Bacteria. Consistent with all existing Los Angeles region bacteria TMDLs for freshwater bodies, as well as the LARWQCB RAA Guidance (LARWQCB, 2014), the RAA for bacteria was performed on the 90th percentile critical wet year in the Dominguez Channel Watershed. This was determined in the same manner as the Santa Monica Bay portion of the EWMP area as described in Section 2.4.2 using the same rain gauge and the same period of record. The 90th percentile TMDL year (Nov 1-Oct 31), based on the number of wet days based on gage D1070 was determined to be 1995 (see **Appendix Q**).

Metals. The critical condition for metals is based on the 90th percentile metal load day on wet days (see **Appendix Q**). Wet days in the Dominguez Channel Toxics TMDL are defined as days where the maximum daily flow at the S-28 stream gauge in lower Dominguez Channel is 62.7 cfs or greater. Consistent with RAA Guidelines, the most recent 10 year period with available rainfall data was selected; this period was 2003 to 2012 (Nov 1, 2002-Oct 31, 2012). The stream gauge data at this S-28 prior to October 2011 are segmented and do not cover the entire period. This could result in actual wet days that do not get classified as wet days if stream gage data are missing from that day, and could bias the TLR calculations and RAA analysis. Therefore, wet days for this analysis were based on days where the calibrated SBPAT model (which models only wet weather, i.e., no dry weather runoff or baseflows are modeled) predicted non-zero flow. This was compared to the bacteria wet day definition in which days with 0.1" or greater rainfall plus the next three days were counted as wet days. Storms that were greater than 0.1" produced runoff in SBPAT throughout the modeled period, thereby confirming that predicted flow in SBPAT was a reasonable representation of wet days. The calibrated SBPAT model (discussed below) was used to determine the daily metal load on wet days. These days were ranked by their daily metals load for each metal to determine the 90th percentile load day for TLR calculation. The 90th percentile load days were found to be Nov 30, 2007, February 5, 2010, and February 26, 2006 for copper, lead, and zinc, respectively. Other data related to the SBPAT model are discussed in detail in Section 2.4.2.

3.4.3 Calibration

Hydrology

No stream gauge exists that measures flow from only the Dominguez Channel portion of the EWMP area. However, a stream gauge does exist on lower Dominguez Channel above the Torrance Lateral. This gauge captures flow from 24,275 acres. Approximately 3,687 acres of the EWMP area drain to this gauge. The rest of the EWMP area drains to the Torrance Lateral and is therefore downstream of this gauge. The EWMP area upstream of this gauge constitutes only 15% of the total area draining to the gauge. Therefore, in lieu of local measured stream flow data from within the EWMP area, a Los Angeles County LSPC model of the Dominguez Channel Watershed which had previously been calibrated to the S28 stream gauge on Dominguez Channel was used as a stream flow calibration comparison dataset for SBPAT. As future monitoring data become available, this calibration may be reassessed as part of the EWMP adaptive management process.

The Los Angeles County LSPC model was previously calibrated by CWE to gauge S28 for the Dominguez Channel watershed using the calibration parameters in Table 3.0 of the RAA Guidelines. A ten-year calibration period was used (2003-2012). The percent difference for both daily and monthly runoff volumes between the LSPC model and the stream gauge was less than 10%, which is in the 'very good' category in the RAA guidelines (CWE, 2015). The mean annual runoff volume in the LSPC model (7,210 acre-ft) was within 12% of the stream gauge volume (8,210 acre-ft) which is in the 'good' range in the RAA Guidelines.

For modeling the portion of the Beach Cities EWMP area which drains to Dominguez Channel, the calibrated LSPC model was clipped to the Dominguez Channel analysis region (including Torrance, see Figure 1), while keeping all other model parameters unchanged. Because SBPAT only includes storm generated runoff and LSPC includes dry weather flows (irrigation was turned off for the purposes of this analysis), any dry weather flows were first removed from the LSPC annual volumes using the Web-based Hydrograph Analysis Tool (WHAT) for porous aquifers with ephemeral streams; this tool was developed by Purdue University to separate base flows and runoff. Because dry weather flows are minimal in Dominguez Channel Watershed in the LSPC model, this resulted in a decrease in volume of only 6%.

The SBPAT calibration of the Dominguez Channel analysis region focused on accurate prediction of annual discharge volumes predicted by the LSPC model for TMDL years 1989-2011. The dominant rain gauge used by LSPC (Manhattan Beach Station ID 1070) was also used by SBPAT. This gage had less than 2% difference in total rainfall volume than the aggregate of the surrounding rain gauges making it a good representative gauge for the EWMP area. The calibration parameters were the soil saturated hydraulic conductivities and the land use imperviousness, which were changed by a uniform multiplier for all soil and land use types in all subcatchments to match the LSPC predictions. **Table 3-7** shows the mean annual volume predicted by the calibrated SBPAT model versus the mean annual volume predicted by the calibrated LSPC model for the Dominguez Channel portion of the Beach Cities EWMP area. **Figure 3-4** compares the annual volumes predicted by SBPAT to the annual volumes predicted by LSPC for all years between 1989 and 2011. **Figure 3-5** presents these same results in a flow duration curve format. The difference in mean annual volume between LSPC and the calibrated SBPAT model was 2%, and the difference for the 90th percentile year was 1%, both of which are in the "very good" category for calibration in the RAA Guidelines.

Table 3-7. Mean Annual Volume Predicted by SBPAT and LSPC and Measured at the S28 Stream Gauge

Model/Source	Average Annual Volume (acre-ft)
SBPAT	2,943
LSPC	2,890
Stream Gauge	-
Difference (%)	2%

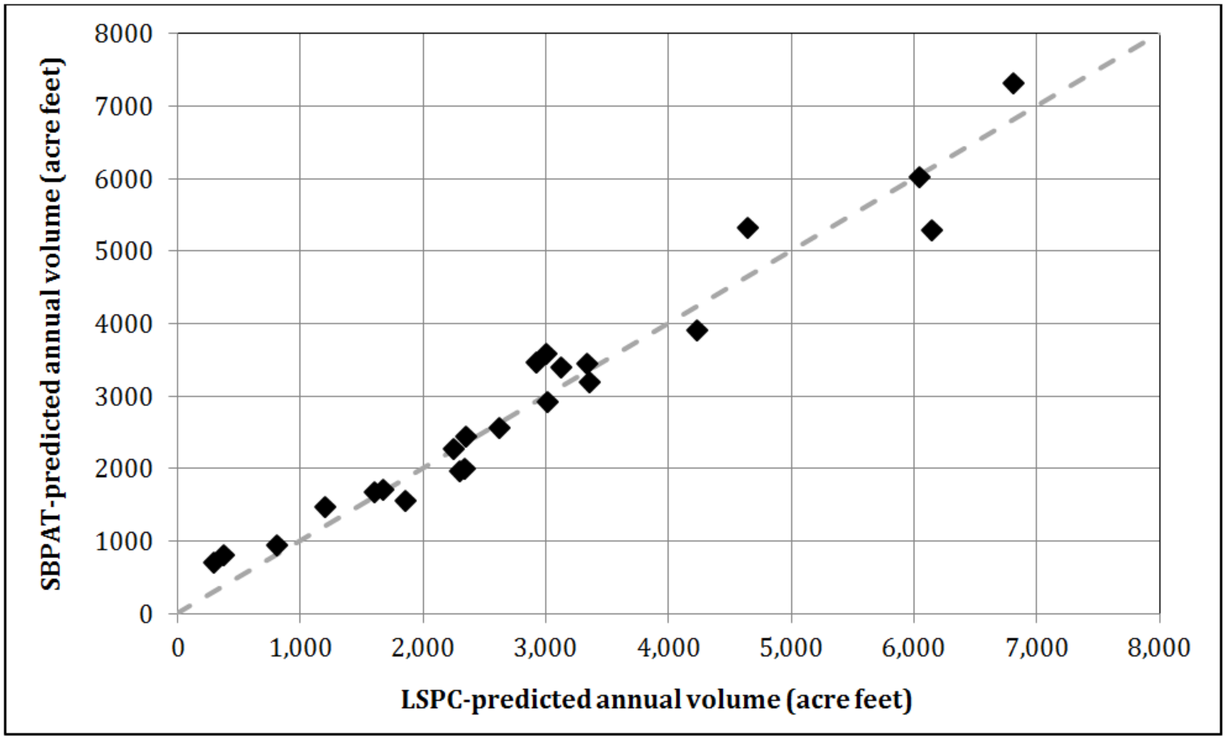


Figure 3-4. Annual Runoff Volumes Predicted by LSPC and SBPAT

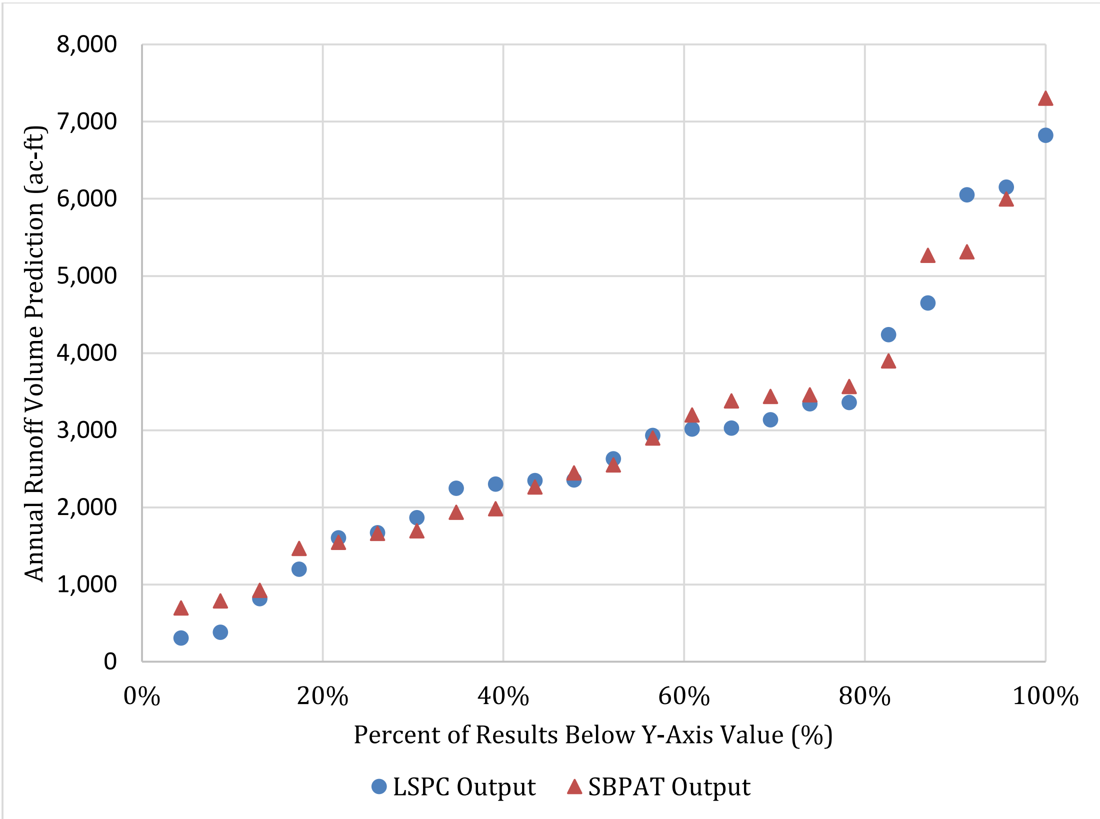


Figure 3-5. Annual Runoff Volumes Predicted by LSPC and SBPAT

Water Quality

The RAA Guidelines require water quality calibration based on available monitoring data from the most recent 10 years. However, in the portion of the Beach Cities EWMP draining to Dominguez Channel, recent water quality monitoring data are not available for the applicable pollutants for a nearby receiving water monitoring station (the Dominguez Channel mass emission station S28 (**Figure 3-2**) is located downstream of a portion of the Beach Cities EWMP area, but upstream of the rest and includes large areas outside the EWMP area), so a conventional water quality calibration was not feasible. In the future as new local monitoring data become available, SBPAT's water quality input parameters may be calibrated as part of the EWMP adaptive management process. In the meantime, to meet current model verification needs for the RAA, SBPAT's log-normal land use EMC statistics were compared with the original land use monitoring datasets upon which were based. This land use based comparison is consistent with the calibration method applied for the original county-wide LSPC model (Los Angeles County Department of Public Works, 2010).

The land use EMCs used in SBPAT were calculated from data collected by Los Angeles County between 1996 to 2000 (County of Los Angeles, 2000) for metals, and land use-specific data collected by SCCWRP (SCCWRP, 2007) between 2000 to 2005 for fecal coliform. An example of the fecal coliform distribution for high density residential land use from the SCCWRP results and the distributions used in SBPAT for multi-family land use are shown in **Figure 3-6** for fecal coliform bacteria. An additional example of the zinc distribution for high density residential land use from Los Angeles County results and the distributions used in SBPAT is shown in **Figure 3-7**. As shown by the percentiles, the pollutant EMC distribution is well representative of measured data. The example is provided for high density residential land use since this is the dominant developed land use in the Dominguez portion of the Beach Cities WMG area. Modeled EMC values are consistent with the recommended values for land use-specific loading in Table 3.3 of the RAA Guidelines.

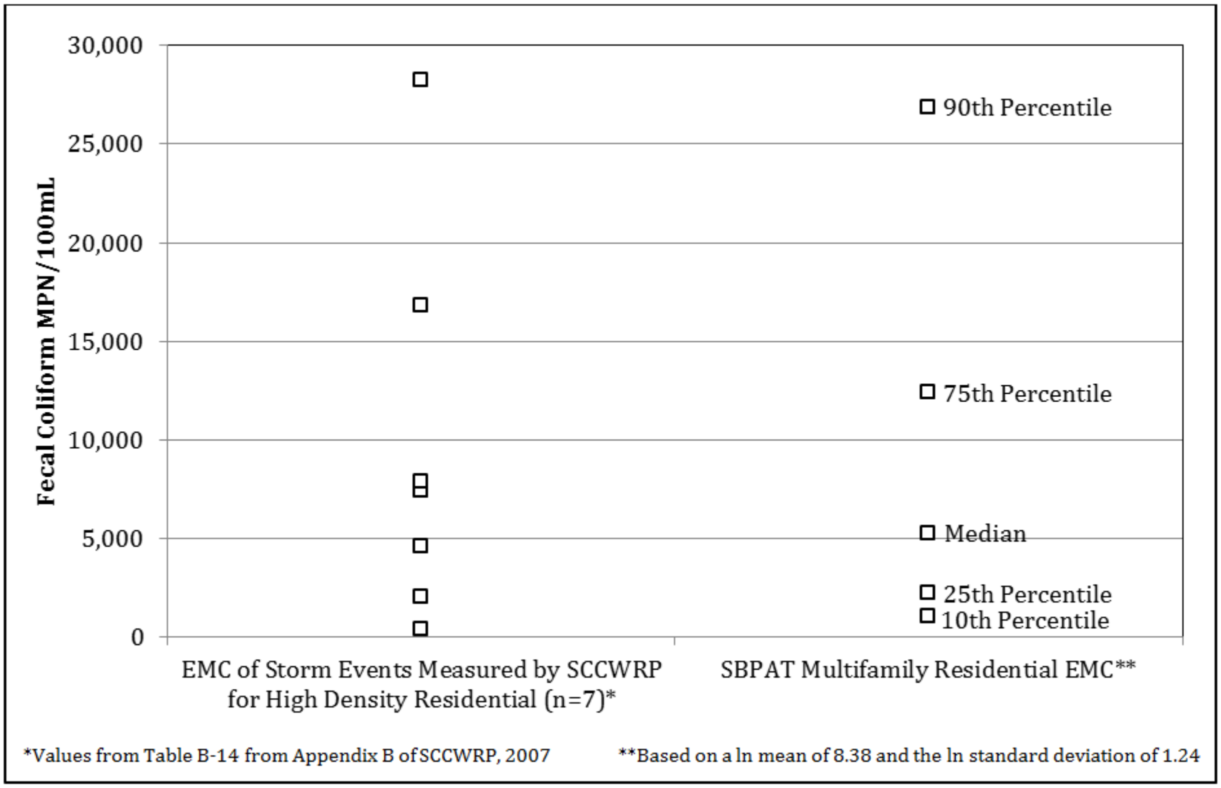


Figure 3-6. Comparison of Fecal Coliform High Density Residential EMC Values between SCCWRP Measurements (n=7) and Multi-Family Residential EMC distribution in SBPAT[22]

[22] A full log distribution is used by the model, but non-parametric summary statistics are shown for comparison.

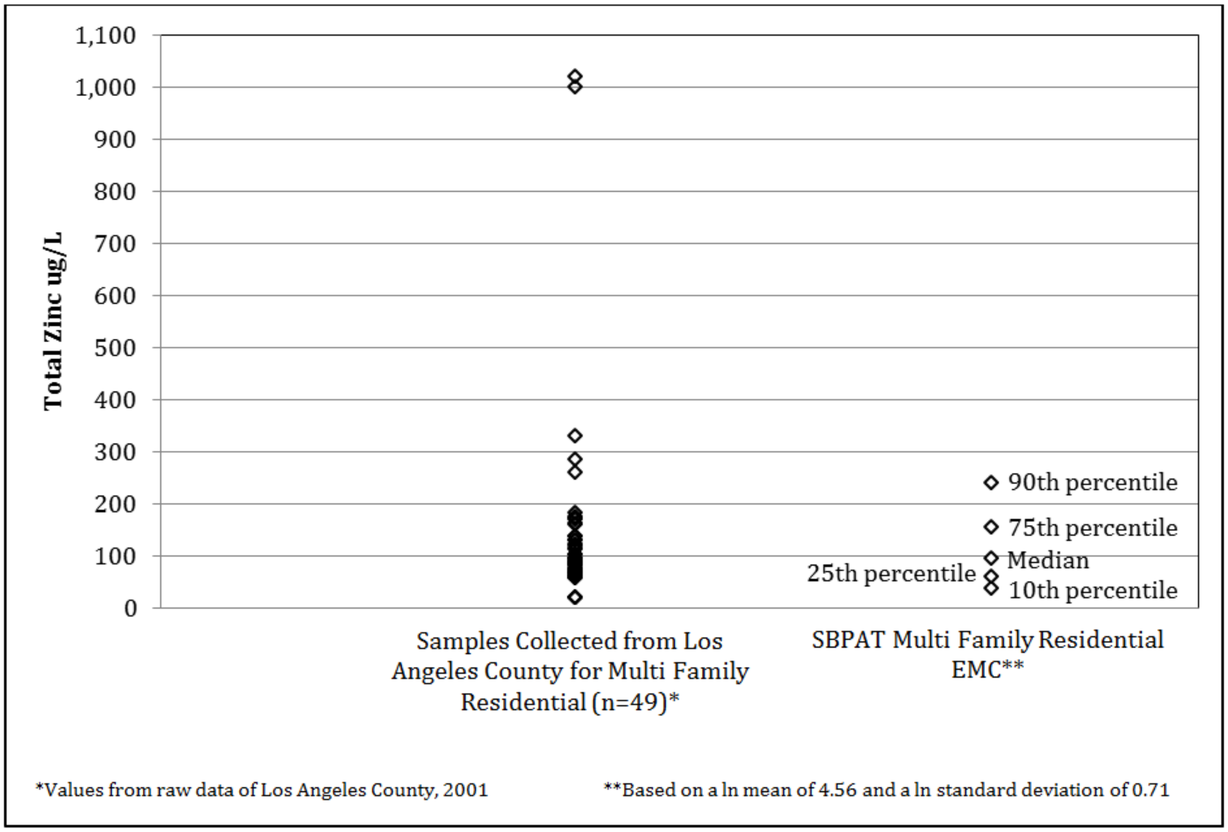


Figure 3-7. Comparison of Total Zinc Multi Family Residential EMC Values between Los Angeles County Measurements (n=4) and Multi-Family Residential EMC distribution in SBPAT[23]

3.4.4 VALIDATION

A validation step was performed to demonstrate that modeled annual fecal coliform loads are indeed predictive of the compliance metric, or annual exceedance days for fecal indicator bacteria. For bacteria modeling, verifying the linkage between modeled *fecal coliform loads* (i.e., discharged from the watershed outlets) and total observed wet weather *exceedance days* (in the receiving water, based on REC1 daily maximum water quality objectives) was critical to establish reasonable assurance that CMLs would be in compliance with the Permit limits. To establish this linkage, an analysis was conducted using shoreline monitoring data at Topanga Canyon[24] (SMB-1-18) between 2005 and 2013. As presented in Section 2.4.4, **Figure 2-11** in Section 2.4.4 illustrates that decreasing fecal coliform loads should result in measurable reductions in exceedance days, and that there is a reasonable correlation between total annual modeled fecal coliform loads and total annual observed wet weather exceedance days. Each point shown represents one TMDL year.

[23] A full log distribution is used by the model, but non-parametric summary statistics are shown for comparison.

[24] Fecal coliform data and objectives were used to represent all fecal indicator bacteria because fecal coliform has the most robust land use and BMP effluent EMC datasets.

3.5 Baseline Loads and Target Load Reductions

Baseline loads for the critical period for bacteria and metals from the entire EWMP area draining to Dominguez Channel were computed using SBPAT. For bacteria, the critical period was the 90th percentile wet TMDL year, which was computed to be 1995 as discussed in Section 3.4.2. For metals, the critical condition is the 90th percentile metal load day between 2003 and 2012. These dates were found to be November 30, 2007, February 5, 2010, and February 26, 2006 for copper, lead, and zinc, respectively, as discussed in Section 3.4.2. The computed baseline conditions for runoff volume, pollutant concentration, and pollutant loading based on 90th percentile critical condition are shown in **Table 3-8** below.

Table 3-8. Baseline Runoff, Concentration, and Load for Pollutants in the Dominguez Channel Watershed for the Critical Condition

Pollutant	90th Percentile Critical Condition	Baseline Runoff	Average Baseline Concentration [1]	Baseline Load
Copper	11/30/2007	301 ac-ft/day	25.8 µg/L	21 lb/day
Lead	2/5/2010	275 ac-ft/day	11.6 µg /L	8.7 lb/day
Zinc	2/26/2006	291 ac-ft/day	290.2 µg /L	230 lb/day
Bacteria	11/1/1994-10/31/1995	6,048 ac-ft/yr	20,080 MPN/100 mL	$1{,}498 \times 10^{12}$ MPN/yr

[1] Average pollutant concentrations are estimated as the total annual load divided by the total annual runoff volume.

The process for establishing TLRs for the modeled WBPCs (copper, lead, zinc, and bacteria in Dominguez Channel) is described in the following section. TLRs were set for the entire Dominguez Channel analysis region, including the cities of Manhattan Beach, Redondo Beach, and Torrance. Because no evidence currently exists to support a linkage between MS4 discharges and exceedances of toxicity, mercury, cadmium, cyanide, selenium, or pH in Dominguez Channel, these pollutants were not modeled as part of this analysis. This potential linkage will be re-evaluated based on results of future monitoring efforts.

3.5.1 Metals

For the Dominguez Channel and Greater LA Harbor Toxics and Metals TMDL, the final WQBELs in the Permit are expressed as allowed daily loading of total copper, total lead, and total zinc during wet weather. The WQBEL loads were calculated as the CTR freshwater chronic criteria-based numeric target concentrations (9.7, 42.7, 62.7 ug/L for total copper, total lead, and total zinc, respectively) multiplied by the daily flow volume at the time of sampling.

The following approach was implemented to calculate a wet weather TLR for each metal in the Dominguez Channel portion of the Beach Cities EWMP area:

1. The analysis region was modeled in SBPAT for TMDL years 2003 to 2012.
2. Including only wet[25] days, the day with the 90th percentile metal load (the critical daily load) was determined (see **Appendix Q**).
3. The target load was calculated by multiplying the allowed concentration by the runoff volume on that day which is the WQBEL expressed in the permit.
4. The difference between the baseline load (step 2) and the target load (step 3) resulted in a TLR for the 90th percentile load day, which was the load reduction required to meet the allowable TMDL concentration.

Appendix K provides an example calculation for this TLR process.

Zinc was found to require the greatest TLR and was also found to be the controlling pollutant for BMP implementation, meaning that meeting the zinc requirement required the most stringent BMP implementation, which will likely produce load reductions for the other pollutants greater than the TLR. The TLR for lead was found to be zero because the baseline concentration on the 90th percentile critical day was found to be less than the allowed concentration. TLRs for each of the metals are shown in **Table 3-9**.

3.5.2 FECAL COLIFORM BACTERIA

Since no TMDL exists for this WBPC, an approach was developed to compute a wet weather bacteria TLR consistent with freshwater bacteria TMDLs in the region, which use allowable exceedance days (per year) and the 90th percentile critical year as the basis for their WLAs. The TLR calculation for bacteria for Dominguez Channel EWMP area was similar to the method used in the SMB portion. The method relates the annual number of modeled calendar days with rainfall-generated runoff (or "discharge days") to the expected annual bacteria exceedance days. The validation of this methodology on the Arroyo Sequit reference watershed is described in Section 2.5.1.

The TLR-development methodology was applied to the EWMP area to predict the number of baseline exceedance days for the 90th percentile year, or TMDL year 1995. Once the number of baseline discharge days were estimated, the number of allowed discharge days was established. Consistent with other Los Angeles region freshwater bacteria TMDLs, it was assumed that 19% of non-high flow suspension days were allowed to exceed the REC1 single sample limit, or 400 MPN/100mL for fecal coliforms[26].The D1070 rain gauge, which was used to determine the 90th percentile year and used to model both the Dominguez Channel and Santa Monica Bay portions of the EWMP area, was used to determine the number of wet days and high flow suspension days in TMDL year 1995. Wet day definition and high flow suspension day definition were based on other

[25] Wet days defined as days in which gauge S28 has flows equal than or greater than 62.7 cfs. Due to insufficient continuous flow data at this gauge, wet days were estimated as days in which flows in SBPAT were non-zero excluding days with less than 0.1 inch of rainfall. This is discussed in more detail in Section 3.4.2.

[26] Fecal coliform, and its previous freshwater Basin Plan objective value (400 mpn/100mL), is used as the modeled surrogate for *E. coli* due to its more robust available modeling datasets.

bacteria TMDLs in the region, where wet days are days in which 0.1" or greater of rainfall occur, plus the following 3 days, and high flow suspension days are days in which 0.5" or greater of rainfall occur plus the following day. In TMDL year, 1995, a total of 73 wet days (19 of which were high flow suspension days) occurred using this methodology. Because the REC1 single sample limits are suspended on high flow suspension days, the total number of applicable wet days is 54. Using the 19% allowable exceedance rate, the number of allowable exceedance days was set to 10 (19% x 54 wet days). Thus, 10 wet days (that are not high flow suspension days) were allowed to exceed 400 MPN/100mL. Any remaining exceedance days must be removed using BMPs.

To determine the TLR necessary to meet the allowed discharge days, a virtual retention BMP was modeled in SBPAT at the outlet of the EWMP area. This approach was presented to LARWQCB staff on June 6, 2014 and verbal feedback received during the meeting was supportive.

For the outlet virtual retention BMP included a diversion with a virtual hydraulic capacity that results in a model-derived bypass frequency (or number of discharge days), during TMDL year 1995 that meets the allowable exceedance day criteria. The diversion is modeled as a full capture system. High flow suspension days were not included in the number of exceedance days, and the concentration on each discharge day was confirmed to be greater than 400 MPN/100mL to ensure it was actually an exceedance day. The diversion is modeled as a full capture system. The load reduction resulting from this BMP scenario (i.e., baseline analysis region load minus analysis region load with the diversion system and retention BMP in place) became the TLR. "Reasonable assurance" of compliance with the allowed discharge days was then considered to have been met when actual and proposed BMPs combined to achieve the TLR for each analysis region. The calculated TLR for bacteria is shown in **Table 3-9**.

In summary, the following approach was implemented to calculate a wet weather bacteria TLR in the Dominguez Channel analysis region:

1. The analysis region is modeled in SBPAT for the 90th percentile year (TMDL year 1995) (see **Appendix Q**).
2. The existing, baseline condition (i.e., without any outlet retention BMP) is modeled for the analysis region, resulting in a mean baseline fecal coliform (FC) load for the 90th percentile year (baseline load).
3. The allowable number of non-high flow suspension discharge days is calculated to be 10 (19% of 54 non-high flow suspension wet weather days in TMDL year 1995).
4. An in-stream diversion to a large, virtual retention BMP at the outlet of the analysis region is iteratively sized so that the number of non-high flow suspension discharges meets the criteria established in Step 3.
5. The diversion and retention BMP is then modeled in SBPAT to produce a mean FC load for the 90th percentile year (allowed load).
6. The difference between the baseline load (step 2) and the allowed load (step 5) results in a TLR for the 90th percentile year, which is the load reduction required to meet the 10 allowable exceedance days for wet weather.

7. In order to meet the allowable exceedance days of 10, the TLR (as a percentage of the baseline 90th percentile year load) is 33%.

Table 3-9. Target Load Reductions and Baseline Conditions for Pollutants in the Dominguez Channel Watershed for the Critical Condition

	Baseline Data for Critical Condition			Allowable Discharge for Critical Condition			Target Load Reduction[2]	
Pollutant	**Runoff Volume**	**Pollutant Conc.[1]**	**Pollutant Load**	**Runoff Volume**	**Pollutant Conc.[1]**	**Pollutant Load**	**Absolute Load**	**% of Baseline Load**
Copper	301 ac-ft/day	25.8 µg/L	21 lb/day	301 ac-ft/day	9.7 µg /L	8 lb/day	13 lb/day	62%
Lead	275 ac-ft/day	11.6 µg /L	8.7 lb/day	275 ac-ft/day	42.7 µg /L	32 lb/day	0 lb/day	0%
Zinc	291 ac-ft/day	290.2 µg /L	230 lb/day	291 ac-ft/day	69.7 µg /L	55 lb/day	175 lb/day	76%
Bacteria	6,048 ac-ft/yr	20,080 MPN/100 mL	$1{,}498 \times 10^{12}$ MPN/yr	6,048 ac-ft/yr	13,454 MPN/100 mL	$1{,}004 \times 10^{12}$ MPN/yr	493×10^{12} MPN/yr	33%

[1] Bacteria concentration is estimated as the total annual load divided by the total annual runoff volume. The pollutant concentrations presented for the Dominguez Channel Toxics TMDL are a direct output from the LSPC model used for the RAA.

[2] RAA demonstration is made based on the achievement of the TLR values in terms of absolute load removed by the proposed suite of BMPs in each analysis region. The allowed conditions in terms of runoff volume and concentration are shown for informational purposes only.

3.6 Best Management Practices

3.6.1 Methods to Select and Prioritize BMPs

In order to demonstrate reasonable assurance, BMPs were identified in a prioritized manner. Prioritization was based on cost (low cost BMPs were prioritized); BMP effectiveness for the pollutants of concern (BMPs that had greater treatment efficiency for the pollutant of concern in a particular analysis region were prioritized over other BMPs); and implementation feasibility as determined by the Beach Cities agencies. In general, nonstructural BMPs were prioritized over structural BMPs due to their lower relative cost, and then structural BMPs were identified that would likely result in the greatest load reduction per dollar.

The RAA was performed according to the following steps:

1. Calculate load reductions associated with existing structural BMPs;
2. Assume a load reduction for non-modeled non-structural BMPs(five percent of baseline pollutant load);

3. Calculate load reductions for public retrofit incentives (e.g., downspout disconnects) and redevelopment;
4. Calculate load reductions attributable to anticipated new permit compliance activities of non-MS4 entities (e.g., Industrial General Permit holders and Caltrans);
5. Calculate load reductions for proposed regional BMPs that were identified in existing plans; and
6. Meet the TLR by backfilling the remaining load reduction with new regional or distributed green streets BMPs, with green streets modeled by assuming treatment of runoff from a percentage of specific developed land uses.

The following schedule assumptions were made:

- Only BMPs implemented after the TMDL effective date (2012) were included;
- Redevelopment BMPs were assumed to use different sizing criteria before and after 2015 (EWMP submittal date), consistent with the Permit's post-construction requirements; and
- Modeled load reduction outputs are reported for the proposed interim bacteria (2018, 2023, and 2027) and final proposed bacteria/toxics TMDL (2032) compliance dates.

3.6.2 Recommended MCMs and Nonstructural BMPs

See Section 2.6.2. All information provided in **Table 2-8**, excluding the City of Hermosa Beach (which is not in the Dominguez Channel Watershed), also pertains to the Dominguez Channel Watershed.

3.6.3 Quantified Non-Structural BMPs

Non-structural BMPs have been categorized as follows. Specific model inputs are summarized below. No modeling of non-structural BMPs was conducted in the City of Torrance, as all load reductions were quantified based on literature references.

Non-Modeled Programmatic BMPs

These source controls include a combination of BMPs such as new or enhanced pet waste controls (ordinance, signage, education/outreach, mutt mitts, etc.), Clean Bay Restaurant Program, human waste source tracking and remediation (e.g., leaking sewer investigations, etc.), enhanced street sweeping (e.g., 100% vacuum sweepers, increased frequency, posting of 'No Parking' signs for street sweeping, etc.), increased catch basin and storm drain cleaning, and other new or enhanced nonstructural BMPs that target the pollutants addressed in this EWMP. The City of Torrance, for instance, has committed to such BMPs as smart gardening program enhancements, TMDL-specific stormwater training, enhancement of commercial and industrial facility inspections, enhancement escalation procedures, improved street sweeping technology, and reduction of irrigation return flow. A combined credit of 5% load reduction was applied for all pollutants to represent the cumulative benefit from non-modeled programmatic BMPs.

In addition, a separate load reduction is assumed for copper due to the elimination of copper in brake pads. In 2010, California Senate Bill 346 (SB 346) was enacted to eliminate nearly all use of copper in brake pad manufacturing. In 2013, TDC Environmental prepared a draft detailed study for the California Stormwater Quality Association (CASQA) describing the expected percent reduction for copper as a result of the passage of SB 346 (TDC Environmental, 2013). The TDC study identifies three possible implementation scenarios, the least aggressive of which estimates that a 55% load reduction in copper will be achieved by 2032 due to the brake pad phase out. Therefore, a 55% load reduction was assumed for copper in the Greater LA Harbor analysis region; however, to avoid double counting load reductions, this reduction was applied to the copper load *after* accounting for all future nonstructural and structural BMP load reductions.

Modeled Redevelopment

Beginning in 2001, redevelopment projects were required by the Permit (via the SUSMP) to incorporate stormwater treatment BMPs into their projects if their project size exceeded specified thresholds. The 2001 MS4 Permit SUSMP redevelopment requirements were applied between 2012 (the point at which the Metals TMDL was implemented) and 2015 for the Dominguez Channel EWMP area. Redevelopment in this period was modeled as flow-through media filters at a 0.2 in/hr design event**.**

The 2012 MS4 Permit established new criteria for redevelopment projects, requiring certain sized projects to capture, retain, or infiltrate the 85th percentile design storm or the 0.75-inch design storm, whichever is greater, via the implementation of LID BMPs. To account for these redevelopment requirements in the Cities of Redondo Beach and Manhattan Beach, BMPs were modeled in SBPAT assuming land use-specific annual redevelopment rates for projects that triggered former SUSMP requirements or will trigger the Permit's LID BMP requirements (**Table 3-10).** No load reduction from this non-structural BMP was quantified for the City of Torrance.

Table 3-10. Estimated Annual Redevelopment Rates

Land Use	Annual Redevelopment Rate (% of total land use area)	
	Cities of Redondo Beach and Torrance[1]	**City of Manhattan Beach**
Residential	0.18	0.10
Commercial	0.15	0.38
Industrial	0.34	0.38
Education	0.16	0.16
Transportation	2.7	2.7

[1]Regionally developed redevelopment rates were applied to the City of Torrance and Redondo Beach (City of Los Angeles Bureau of Sanitation, 2012).

A City-specific redevelopment rate of 3.8 percent for commercial redevelopment in Manhattan Beach was provided based on historical SUSMP data over the past ten years. This value was also assumed for historical industrial redevelopment and both commercial and industrial redevelopment moving forward. For residential land use, because there are insufficient data to project LID rates, a nominal 0.10 percent was assumed and is subject to change based on the model outcomes and discussions with City staff as the LID ordinance is finalized.

BMPs were assumed to be implemented and to continue be implemented in the future, at these rates across five distinct time periods in the Dominguez Channel watershed:

- **2012 (Dominguez Channel Toxics TMDL Effective Date) – 2015:** The SUSMP requirements, based on the 2001 MS4 Permit, were assumed to be implemented over this period as flow-through media filters at a 0.2 in/hr design intensity (Los Angeles County Department of Public Works, 2002).
- **2015 - 2032 (Final Dominguez Channel Toxics TMDL Compliance Deadline and Proposed Final Bacteria Compliance Deadline):** The 2012 MS4 Permit post-construction requirements were assumed to be implemented over this period as 50% biofiltration and 50% bioretention. Biofiltration (bioretention with underdrains) were modeled using bioswale BMP types with effluent EMCs set to bioretention and sized to retain 150 percent of the 1-year, 1-hour design storm (approximately 0.3 in/hr) because they do not retain all the design storm volume on site (they are flow-through systems), while bioretention units were sized to retain 100 percent of the 85th percentile, 24-hour design storm depth, calculated as the mean for each analysis region.

2015 is used as a transition date since the LID post-construction requirements from the 2012 MS4 Permit are required to be in full effect via local LID ordinances by this time.

In order to estimate load reductions associated with these redevelopment BMPs, the land use percentages shown in **Table 3-10** were multiplied by the respective land use areas in each analysis region, resulting in an assumed area treated by LID BMPs each year. This area was multiplied by the applicable number of years, since new BMPs are assumed to be implemented each year. The total land use area assumed to be redeveloped for each analysis region was then modeled as being treated and the total load reduction was quantified. The default design parameter assumptions for the biofiltration redevelopment projects were that the longitudinal slopes were 0.03 ft/ft, Manning's n was 0.25, hydraulic residence time was 10 min, and water quality flow depth was 4 in.

Modeled Public Retrofit Incentives

These BMPs include programs directed at incentivizing the public to decrease the amount of stormwater runoff from their property, specifically via downspout disconnects. Public incentives for retrofitting existing development were modeled in SBPAT between 2015, when the EWMP will begin to be implemented, and the respective TMDL final compliance date. No quantification of these load reductions was done for the City of Torrance, although they may be taken into account in future iterations. Public retrofit incentives were assumed to be a downspout disconnection program, modeled as bioswales sized to a design storm intensity of 0.2 in/hr (see **Table 2-10**). The default design parameter assumptions for the biofiltration redevelopment projects were that longitudinal slopes were 0.03 ft/ft, Manning's n was 0.25, hydraulic residence time was 10 min, and water quality flow depth was 4 in.

Assumptions included that 10 percent of single family residential areas would be converted to disconnected downspout systems over 2015 to 2021, and that, based on GIS analysis, 38 percent of the single family residential area consists of rooftops that can be effectively disconnected. Therefore, 3.8 percent of single family residential neighborhoods were modeled as treated by bioswales in order to account for public retrofit incentives.

Modeled Non-MS4 Permitted Parcels or Areas

SBPAT was used to quantify the load reduction assuming that regulated parcels/areas would be in compliance with the NPDES Statewide Storm Water Permit Waste Discharge Requirements (WDRs) from State of California Department of Transportation (Order No. 2012-0011-DWQ, NPDES No. CAS000003) and the California NPDES General Permit for Storm Water Discharges Associated with Industrial Activities (Industrial General Permit [IGP], Order 2014-0057-DWQ) (**Figure 3-8**). The load reduction from these areas was quantified in analysis region DC-RB/MB. This load reduction was obtained from these areas by simulating treatment plants sized to treat the IGP's design storm requirement, the 85th percentile, 24-hour storm event, with an effluent concentration set equal to the water quality standard (see Section 2.6.3). For fecal coliform, 400 MPN/100mL was used. In the Dominguez portion of the Beach Cities EWMP, these constituted only a small fraction of the total area.

3.6.4 Structural BMPs

Structural BMPs have been categorized as follows. Proposed distributed BMPs in the Dominguez Channel Watershed area of the Beach Cities EWMP are shown in **Figure 3-9**, and existing and proposed regional BMPs are shown in **Figure 3-10**.

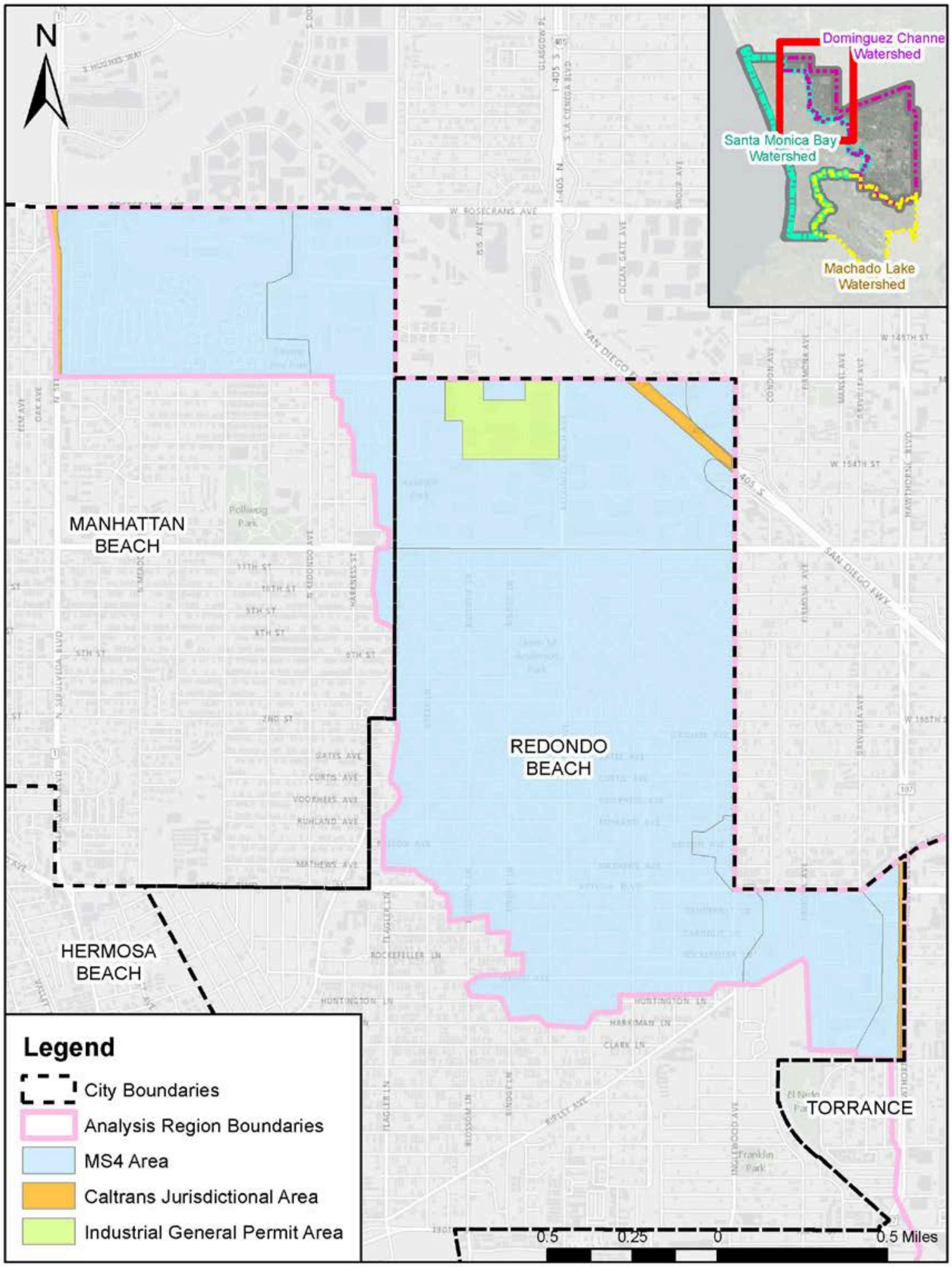


Figure 3-8. IGP and Caltrans Area within the Dominguez Channel portion of the Beach Cities EWMP Area

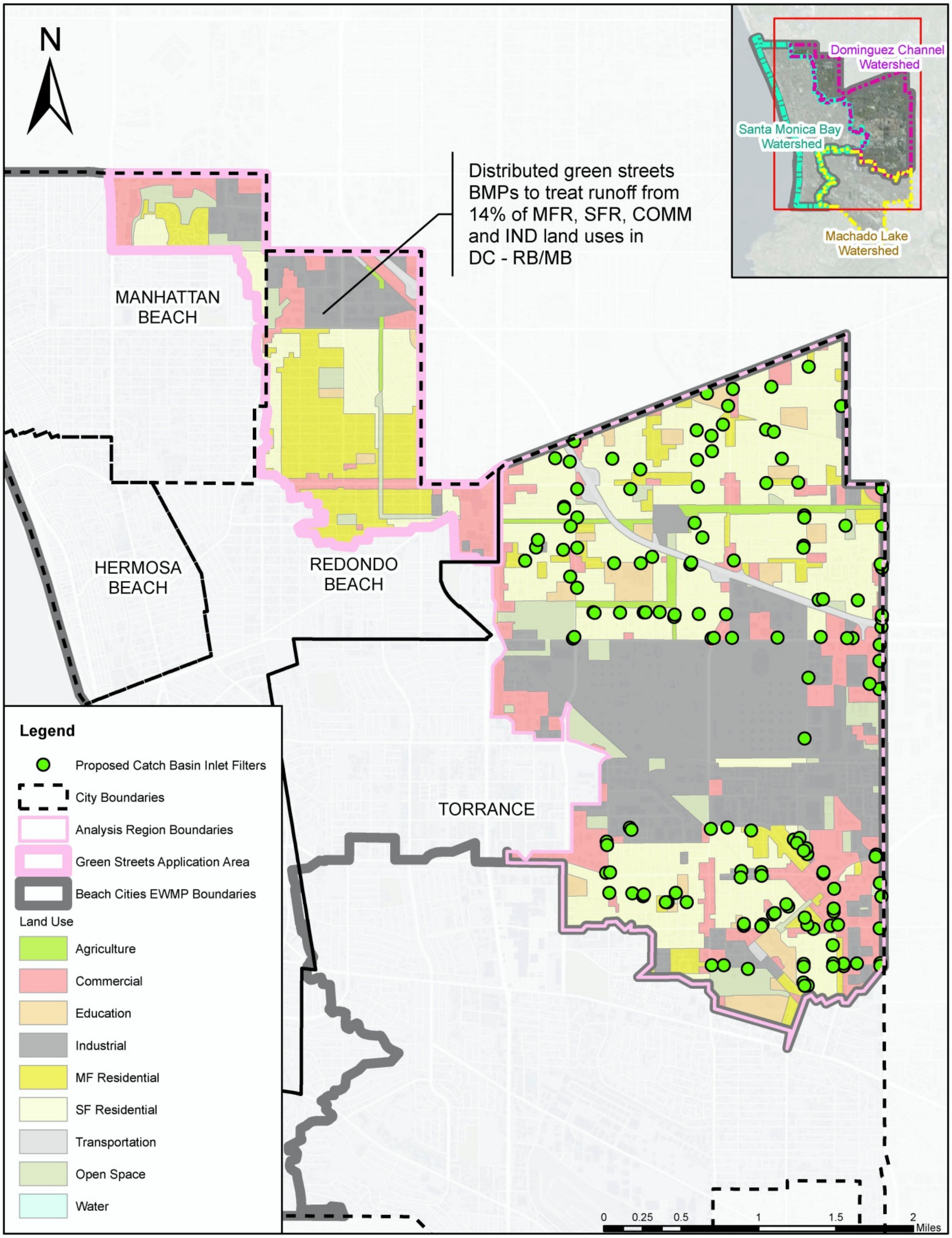


Figure 3-9. Proposed Distributed BMPs within the Dominguez Channel Watershed

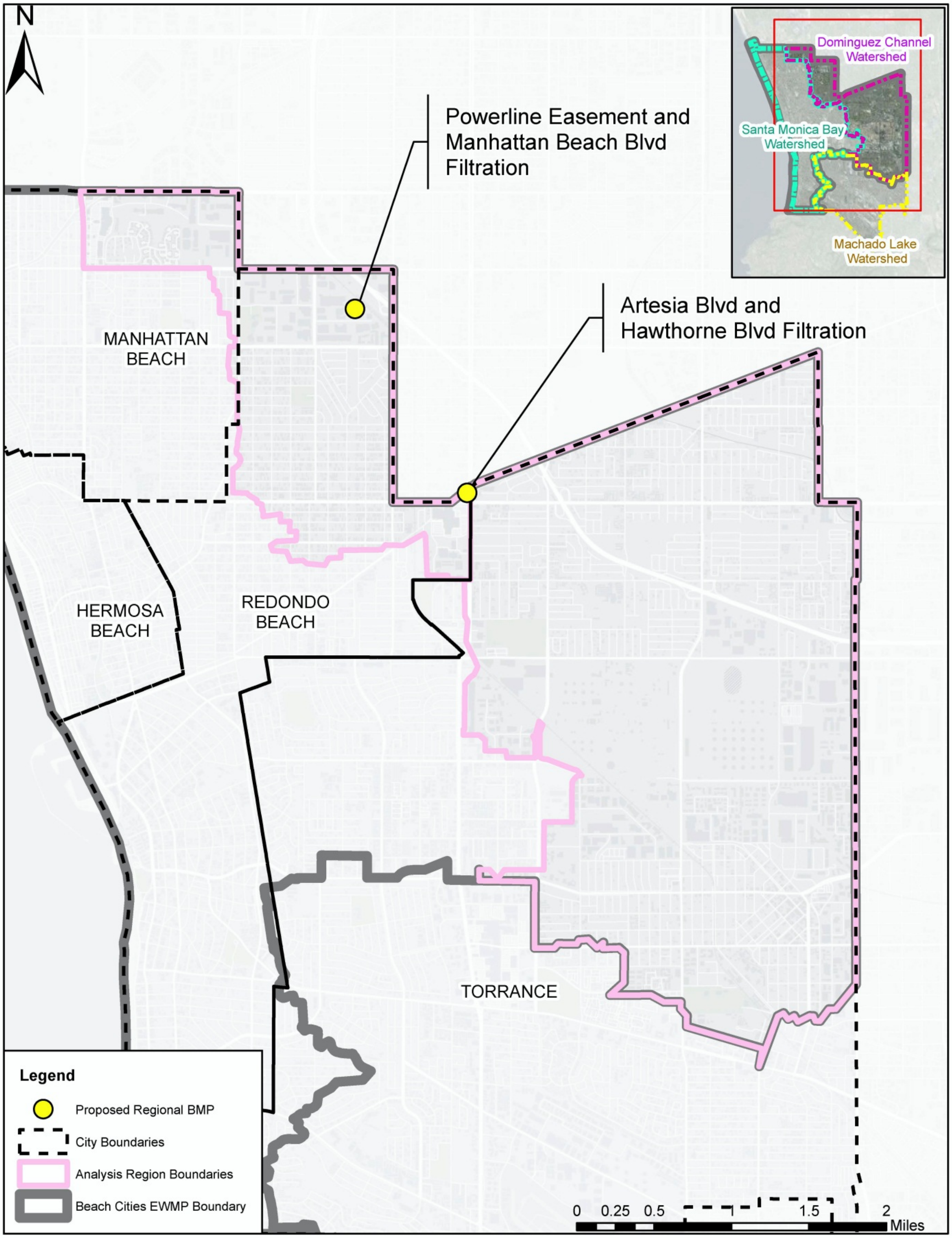


Figure 3-10. Proposed Regional BMPs within the Dominguez Channel Watershed

Existing Regional BMPs

There are no existing regional BMPs in either Dominguez Channel analysis region; as such, none were modeled in SBPAT.

Proposed Regional BMPs

Two regional BMPs are being proposed in the Dominguez Channel Watershed, both within the City of Redondo Beach in Analysis Region DC-RB/MB.

Analysis Region DC – RB/MB

Two proposed regional BMPs in the DC-RB/MB analysis region were modeled in SBPAT based on conceptual design information and discussions with the Beach Cities WMG (**Figure 3-11**). While the BMPs are conceptual at this point, they will include media filtration such as proprietary media filters or bioretention. Infiltration is not feasible due to the low saturated flow rates in the areas where regional BMPs could be constructed (0.3-0.4 in/hr).

Powerline Easement Filtration. This regional BMP would include a filtration system (i.e., media filter, biofilter, or bioretention with underdrains) or systems along the powerline easement. This BMP could be constructed to capture runoff from the EWMP areas draining towards the intersection of Manhattan Beach Blvd and Inglewood Ave. In order to determine a conservative estimate of the footprint available for this BMP, an analysis was conducted along the powerline easement and along Manhattan Beach Blvd that included the following criteria:

- 100 ft away from large utility poles; and
- 25 ft away from roads, railroads, and buildings.

These criteria aim to address some of the concerns with BMP construction within a powerline easement, as was previously described. The resulting approximate footprint shown in **Figure 3-11** should be considered approximate and large enough to allow for construction in the roadway right-of-way or easement or both. It is noted that this is meant to be a conservative estimate given the above criteria and would be sited to capture runoff from the drainage area shown in **Figure 3-11.** The total footprint area calculated for this BMP was 313,500 square feet. It was assumed that approximately 15% of this area would be used for pretreatment (10%) and side slopes (5%) so only 85% of the area was used as the footprint available for filtration. The BMP was modeled as a flow through BMP, with the only storage available being the pretreatment. A media filter was chosen to represent this BMP. The treatment rate was set to 10 inches per hour multiplied by the available footprint. This constitutes a design flow of approximately 48% of the 0.2 in/hr 85th percentile design intensity in the Permit. The BMP was assumed to be 5 feet deep, and the diversion flow rate was estimated based on the flow rate from 0.2 in/hr on the drainage area using the rational method. Modeling criteria are shown in **Table 3-11**.

A potential alternative location to the Powerline Easement Filtration facility is the green space adjacent to Manhattan Beach Blvd and Marine Avenue. Due to limited spatial availability, high-capacity filter media would be required for the alternative location in order to achieve the same reduction objective as the Powerline Easement Filtration facility.

Both potential locations for this BMP would provide the additional benefits of neighborhood greening, potentially mitigating issues such as the urban heat island effect and also raising public education/awareness.

Artesia Blvd and Hawthorne Blvd Filtration. This regional BMP would include a filtration system or systems near the intersection of Artesia Blvd and Hawthorne Blvd. It was assumed that this BMP could be constructed to capture runoff from the EWMP areas draining towards this intersection. A conceptual footprint was developed based on the space available in medians, park strips, and areas that could be converted for subsurface filtration systems. The approximate footprint is shown in **Figure 3-11**.

The total footprint area calculated for this BMP was 43,700 square feet. It was assumed based on other similar BMPs in the Los Angeles region that approximately 15% of this area would be used for pretreatment (10%) and side slopes (5%), so only 85% of the area was used as the footprint available for filtration. The BMP was modeled as a flow-through BMP, with the only storage available being the pretreatment. A treatment plant type BMP was chosen for the modeling, and the EMCs from distributed media filters were assigned to the treatment plant to simulate a regional media filter. The treatment rate was set to 10 inches per hour multiplied by the available footprint. This constitutes a design flow of approximately 63% of the 0.2 in/hr intensity in the Permit. The BMP was assumed to be 5 feet deep, and the diversion flow rate was estimated based on the flow rate from 0.2 in/hr on the drainage area using the rational method. Modeling criteria are shown in **Table 3-11**.

This BMP would provide the additional benefit of neighborhood greening, potentially mitigating issues such as the urban heat island effect and also raising public education/awareness.

Analysis Region Dominguez Channel – Torrance (DC-Torrance)

No regional BMPs are proposed in the DC-Torrance analysis region.

Summary of Proposed Regional BMPs

Two regional BMPs are proposed in the Dominguez Channel portion of the Beach Cities EWMP Area. None of these projects could be feasibly sized to meet the 85^{th} percentile design criteria. However, the BMPs were sized to collectively meet the target load reductions necessary to achieve compliance with the WQBELs and RWLs, in combination with other existing and proposed structural and non-structural BMPs. Proposed regional BMPs, including their location, analysis region, project name, model inputs, and expected performance, are summarized in **Table 3-11.**

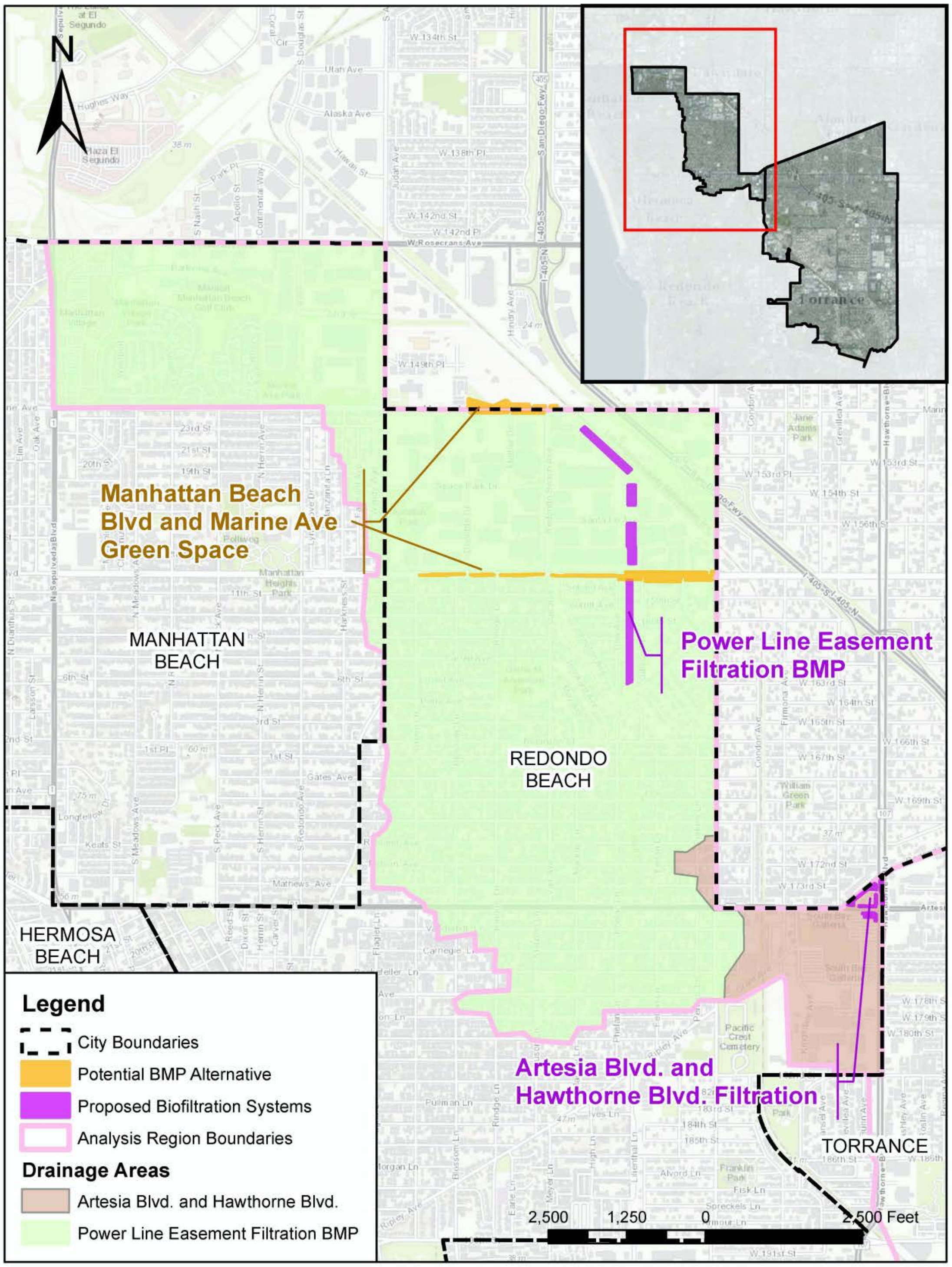


Figure 3-11. Proposed Regional BMPs, DC-RB/MB Analysis Region

Table 3-11. Parameters and Performance for Proposed Regional BMPs Modeled as Media Filters

Location of BMP	Analysis Region	Project Name	Model Assumptions: Design Storm (in/hr)	Treatment Flow Rate (cfs)	Average Basin Depth (ft)	Equalization Volume (cu-ft)	Diversion Flow Rate (cfs)	Infiltration Rate (in/hr)[1]	Expected Performance (load reduction as a % of analysis region baseline load)
Redondo Beach	DC-RB/MB	Powerline Easement Filtration	0.09	62	5	141,086	132	0.00001	Fecal coliform: 36% Zinc: 34% Copper: 26%
Redondo Beach	DC-RB/MB	Artesia Blvd and Hawthorne Blvd. Filtration	0.13	8.6	5	19,682	13.6	0.00001	Fecal coliform: 9% Zinc: 5% Copper: 4%

[1] Model requires some infiltration, but infiltration minimized to essentially 0.

Existing Distributed BMPs

No existing distributed BMPs were accounted for or modeled in the Dominguez Channel portion of the Beach Cities EWMP area.

Proposed Distributed BMPs

Proposed distributed BMPs are depicted in **Figure 3-9**. Distributed green streets BMPs are proposed and were modeled as part of the RAA within the DC-RB/MB analysis region, at an implementation level of 14% (i.e., runoff from 14% of single family residential, multi-family residential, commercial, and industrial land uses would be treated by green streets BMPs designed as described in Section 2.6.4).

Approximately 200 catch basin inlet filters (media filtration devices with a variety of media types and configurations such as cartridge filters, vertical bed filters, etc.) are proposed within the DC-Torrance analysis region. Infiltration of runoff is not feasible in the DC-Torrance analysis region due to the prevalence of Montezuma Clay Adobe soils. Roads represent a potentially significant source of pollutant loads, and therefore treating road runoff is considered a key strategy for multi-pollutant TMDL implementation. Implementing catch basin inlet filters throughout the DC-Torrance Watershed is highly applicable because of the high density of catch basins. The predicted load reduction attributable to catch basin inlet filters was estimated on a percent load removal basis, extracted from a review of relevant literature.

Fact sheets and literature available on commercially available catch basin inlet filters suggest that catch basin inlet filters are effective at capturing and removing pollutants from stormwater runoff including sediments, heavy metals, and bacteria. A study titled, Optimization of Stormwater Filtration at the Urban/Watershed Interface by the University of California, Irvine, Department of Environmental Health (2005), estimated a 99% removal efficiency of lead concentrations by a grate inlet skimmer box/round curb inlet basket. Another study conducted by the City of El Monte at Longo Toyota in 2002 concluded that the grate inlet skimmer box/round curb inlet baskets were effective in removing 95% of zinc and copper concentrations and 87% of lead concentrations.

A more recent independent test conducted in 2013-2014 by the City of Lake Forest showed that the tested catch basin inlet filters achieve 75% removal of heavy metals. The product tested was the Ultra Filter Sock Heavy Metal Drain Filter.

For bacteria, the 2005 UC Irvine study found a fecal coliform removal efficiency of 33% by the grate inlet skimmer box/round curb inlet basket.

In addition, the City of Torrance is in the process of developing the Green Street Program and the ordinances to implement green street design features as part of street redevelopment. While implementing redevelopment of arterial streets, the City of Torrance would assess opportunities for Green Street design features to facilitate treatment through filtration or infiltration. Green street elements may include infiltration trench that provides water quality treatment, reduction in peak flow discharges, and potential groundwater recharge. Other green street elements that may be considered include bioretention/biofiltration practices to achieve water quality treatment through filtration by vegetation and soils to remove pollutants with perforated underdrain to convey the treated runoff. The City of Torrance is committed to developing the Green Street Policy by July 2015, as required by the MS4 Permit.

3.7 Reasonable Assurance Analysis Results

3.7.1 *Discussion of Limiting Pollutants*

Zinc was determined to be the controlling pollutant, therefore the cumulative BMP load reductions for copper, lead, and bacteria are each greater than their respective TLRs. Ammonia, cyanide, pH, selenium, mercury, and cadmium were not modeled as part of the Beach Cities' RAA; however, the implementation of the proposed BMPs is expected to achieve similarly substantive load reductions for these pollutants as for zinc. Meeting the zinc requirement required the most stringent BMP implementation, which is expected to also address all Category 1, 2 and 3 pollutants in Dominguez Channel.

3.7.2 *Wet Weather*

For all pollutants in the DC-RB/MB analysis region, cumulative load reductions are predicted to meet the interim and final TLRs. The non-structural BMPs achieve a relatively minor load reduction for zinc compared to the regional BMPs and the distributed green streets. After accounting for the load reductions attributed to non-modeled programmatic, public incentives and redevelopment, non-MS4 compliance, and regional BMPs, the implementation of distributed green street BMPs to treat stormwater from 14% of residential, commercial, and industrial land uses within Redondo Beach and Manhattan Beach was required to meet the zinc TLR (the limiting pollutant). **Table 3-12** below summarizes the estimated load reductions achieved by the proposed BMPs for both the interim and final compliance deadlines.

Within the DC-Torrance analysis region, cumulative load reductions are dependent on the level of implementation of the planned catch basin inlet filters. At this time, inlet filters are planned for 200 of 643 catch basins in the analysis region, targeting high priority areas. Since the estimated load reduction is applicable per filter, and not to the entire analysis region, monitoring and subsequent adaptive management will be employed through CIMP monitoring to evaluate the achieved load reductions prior to each of the compliance deadlines, installing additional filters as needed or proposing additional structural/non-structural BMPs until compliance is achieved for every applicable WQBEL or RWL. At this time, the City of Torrance is not committing to any regional or distributed BMPs, aside from catch basin inlet filters and a review of green streets opportunities.

It should be noted that if at any time specific distributed green streets or regional/centralized BMPs are found to be infeasible for implementation, alternative BMPs or operational changes will be planned within the same analysis region and within the same timeline, to meet an equivalent load reduction. The performance of the proposed catch basin inlet filters within the City of Torrance will also be evaluated as potential alternatives to the proposed structural BMPs within the Cities of Redondo Beach and Manhattan Beach.

Zinc

The zinc load reductions were quantified on the 90th percentile wet load day which was determined during TLR calculations (**Table 3-12**). Load reductions vary by day due to storm timing and size and due to some variability in the randomly generated pollutant concentrations in the model. To ensure that the load reductions estimated on the 90th percentile load day are not significantly greater than typical daily load reductions, and to get an idea of the variability, the average of the daily load reductions during the 10 year modeling period were also calculated. The predicted zinc load reduction achieved on the 90th percentile load day in the DC-RB/MB analysis region is estimated to be 79%, which is greater than the TLR of 76%. Most of the zinc reduction comes from the proposed regional infiltration BMPs. For comparison, the average daily load reduction was 98%. Because the 90th percentile day has more flow than an average day, the capture rate of the BMPs would be expected to be lower on this day than for smaller storms, thereby justifying the decreased load removal on the 90th percentile day.

The estimated zinc load reduction in analysis region DC-Torrance is 85%, including both non-structural and distributed (catch basin inlet filters) BMPs, which is greater than the TLR of 76%. As noted above, the estimated load reduction cannot be applied to the entire analysis region. Therefore, adaptive management will be strongly employed to evaluate the achieved load reductions prior to each of the compliance deadlines, installing additional filters as needed.

Copper

The copper load reductions were quantified on the 90th percentile wet load day which was determined during TLR calculations (**Table 3-12**). Similar to zinc, the average of the daily load reductions during the 10 year modeling period are also shown to account for variability. The load reduction achieved on the 90th percentile load day in the DC-RB/MB analysis region is predicted to be 85%, which is greater than the TLR of 62%.

The estimated copper load reduction in the DC-Torrance analysis region is predicted to be 89%, which also exceeds the copper TLR of 62%. As noted above, the estimated load reduction cannot be applied to the entire analysis region. Therefore, adaptive management will be strongly employed to evaluate the achieved load reductions prior to each of the compliance deadlines, installing additional filters as needed.

Fecal Coliform

The average bacteria load reduction for TMDL year 1995 was quantified and compared to the TLR calculated for the 90th percentile critical year (1995) (**Table 3-12**). The predicted load reduction of 74% within the DC-RB/MB analysis region is greater than the TLR of 33%. Most of the reduction comes from the regional BMP filtration systems.

In the City of Torrance, the estimated bacteria load reduction is 38%, which is greater than the TLR of 33%. As noted above, the estimated load reduction cannot be applied to the entire analysis region. Therefore, adaptive management will be strongly employed to evaluate the achieved load reductions prior to each of the compliance deadlines, installing additional filters as needed.

Lead

Although the load reductions for lead were not quantified because no load reductions were required to meet the TMDL WQBEL, the implementation of the proposed BMPs will result in similarly substantive load reductions for lead as for other metals. FAA and USEPA efforts to phase out lead from Avgas will further reduce lead in stormwater runoff in the future.

Time Series Output

Electronic input and output SWMM files and Excel summary spreadsheets will be provided to the LARWQCB upon submittal of this Draft EWMP.

Table 3-12. Dominguez Channel Watershed – RAA Results – Interim and Final Compliance

Pollutant	Date	Implementation Benefits (average load reduction as % of baseline for the critical condition[1])							TLR	Compliance (TLR Met)?
		Non-Structural BMPs (Non-Modeled)	Public Retrofit Incentives + Redevelopment	Non-MS4	Regional BMPs	Distributed BMPs	Distributed BMP Implementation Level	Estimated Load Reduction		
Analysis Region DC-RB/MB										
Zinc	2032 (Final)	5%	9%	6%	39%	20%	14% SFR, MFR, COM, IND	**79%**	**76%**	Yes
Copper	2032 (Final)	24%[2]	0%	5%	30%	26%		**85%**	**62%**	Yes
Fecal coliform	2022 (Interim)	2.1%	1.5%	0.7%	0%	4.1%	3% SFR, MFR, COM, IND	**8.4%**	**8.3%**	Yes
	2027 (Interim)	3.5%	2.4%	1.3%	0%	10%	7% SFR, MFR, COM, IND	**17%**	**17%**	Yes
	2032 (Final)	5%	3.2%	1.8%	45%	20%	14% SFR, MFR, COM, IND	**74%**	**33%**	Yes
Analysis Region DC-Torrance										
Zinc	2032 (Final)	5%	0%	0%	0%	75% per filter	Catch basin inlet filters	See note 3	**76%**	See note 3
Copper	2032 (Final)	14%[2]	0%	0%	0%	75% per filter	Catch basin inlet filters	See note 3	**62%**	See note 3
Fecal coliform	2022 (Interim)	2.1%	0%	0%	0%	33% per filter	Catch basin inlet filters	See note 3	**8.3%**	See note 3
	2027 (Interim)	3.5%	0%	0%	0%	33% per filter	Catch basin inlet filters	See note 3	**17%**	See note 3
	2032 (Final)	5%	0%	0%	0%	33% per filter	Catch basin inlet filters	See note 3	**33%**	See note 3

1 The critical condition is TMDL year 1995 for fecal coliform, 11/30/2007 for copper, 2/5/2010 for lead, and 2/26/2006 for zinc.

2 Load reduction attributable to copper brake pad phase-out, after accounting for other BMPs, up to 55%.

3 Load reduction sum cannot be estimated at this time. The individual load reduction for each inlet filter's drainage area is shown under the "Distributed BMPs" column. Initially, 200 of 643 catch basins are planned to be retrofitted in high priority catchments. The total load reduction from inlet filters will be evaluated in the future through CIMP monitoring, as part of the EWMP adaptive management process. At that time, the catch basin BMPs will be modified, with additional filters installed as necessary and additional structural/non-structural BMPs proposed as needed to meet the TLRs required to achieve water quality objectives by the compliance deadlines.

3.7.3 Dry Weather

For dry weather, the applicable pollutants in the Dominguez Channel Estuary are total copper, total lead, and total zinc as Category 1 WBPCs (i.e. WQBELs and/or RWLs are established in Part VI.E and Attachments L through R of [the Permit]) and the applicable pollutant in both the Dominguez Channel and Dominguez Channel Estuary is bacteria as a Category 2 WBPC (i.e., 303(d)-listed but not currently subject to a TMDL).

The City of Torrance's dry weather load reduction strategy will focus on non-structural source control and pollution prevention measures that are designed to reduce the amount of pollutants and understand the effect of pollutants entering runoff though education, enforcement and behavioral modification programs.

Within the Cities of Redondo Beach and Manhattan Beach, the implementation of the two regional BMPs at both outlets from the DC-RB/MB analysis region to address wet weather pollutants will control dry weather flows by capturing the small flows in the pre-treatment volume and either retaining them or treating them in the media filter.

In addition, each of the EWMP Group cities has water conservation regulations which will reduce dry weather runoff at its source. Collectively, by controlling dry weather MS4 flows prior to entering Dominguez Channel using the proposed suite of BMPs, bacteria will be addressed. If necessary, the EWMP Group agencies retain the option of installing low flow diversions sized to effectively eliminate discharges to the receiving water year-round dry weather days. Therefore, reasonable assurance of meeting the applicable RWLs was demonstrated in this EWMP through a qualitative assessment of the proposed BMPs and their overall approach of eliminating or substantially reducing MS4 discharges during dry weather.

3.8 Multiple Benefits

The proposed projects in the Dominguez Channel Watershed not only demonstrate reasonable assurance for the water quality objectives, but also provide multiple benefits beyond pollutant load reduction. Multiple benefits provided by the projects proposed in the Santa Monica Bay watershed are also applicable to those proposed in the Dominguez Channel Watershed, including neighborhood greening, water conservation/supply, and public education and awareness (see Section 2.8 for more detail). However, infiltration in Dominguez Channel Watershed is infeasible due to low saturated flowrates of the soil at the potential structural BMP locations; therefore, groundwater recharge is not considered an added benefit to the proposed structural BMPs in the Dominguez Channel Watershed.

3.9 Parallel Compliance Efforts

During the remaining compliance period, the Beach Cities WMG may also elect to perform special studies to evaluate the Dominguez Channel Toxics TMDL WLAs and/or REC-1 indicator bacteria RWLs. For example, a reevaluation of the site-specific Water Effects Ratio (WER) used to calculate the targets for copper and zinc may result in modifications to the target load and TLR. Another example might include the application of a non-structural pollutant load reduction credit in the case that state legislation restricting zinc in manufactured rubber tires is passed. Through the adaptive management process, the RAA may be reevaluated after any changes to bacteria statewide objectives, TMDL WLAs, and/or Permit limits.

4 Implementation Schedule

4.1 Compliance Schedule

The following sections present the proposed compliance schedules and project sequencing necessary to meet the interim and final compliance deadlines for the Beach Cities EWMP WPBCs.

4.1.1 Santa Monica Bay Watershed

Bacteria, debris, and PCBs and DDTs have been identified as Category 1 WBPCs in the Santa Monica Bay Watershed. No Category 2 or 3 WBPCs are specified in this watershed. The interim and final compliance deadlines in the Santa Monica Bay watershed are summarized in **Table 4-1**.

Table 4-1. Compliance Deadlines associated with Santa Monica Bay Watershed WBPCs

Category	Pollutant(s)	Date	Action
1: Highest Priority	Dry Weather Bacteria	July 2006	Final: Summer-dry single sample Allowable Exceedance Days (AED) met; compliance is currently in effect and attained through diversions and non-structural BMPs.
		November 2009	Final: Winter-Dry period Single Sample AED met; compliance is currently in effect and attained through diversions and non-structural BMPs.
	Wet Weather Bacteria	7/15/2018	Interim: 50% single sample ED reduction
		7/15/2021	Final: Geometric Mean [GM] targets met Final: Single sample AED targets met
	Trash/Debris	3/20/2016	Interim: 20% load reduction
		3/20/2017	Interim: 40% load reduction
		3/20/2018	Interim: 60% load reduction
		3/20/2019	Interim: 80% load reduction
		3/20/2020[27]	Final: 100% load reduction
	DDTs	N/A	Since the TMDL effectively implements an anti-degradation approach (i.e., historic low MS4 concentrations or loads must be kept the same or lower), and the Beach Cities EWMP Agencies are currently presumed to be achieving the WLAs (thus negating the need for RAA), no compliance schedule is proposed.
	PCBs	N/A	
2: High Priority	N/A	N/A	N/A
3: Medium Priority	N/A	N/A	N/A

[27] Manhattan Beach will receive three additional years to meet the final deadline for having enacted all three bans specified in the TMDL prior to the stated deadline, these include bans on plastic bags, restaurant take out polystyrene, and smoking in public places.

The final wet weather compliance deadline for the SMBBB TMDL is proposed to be met through a combination of non-structural, distributed green streets BMPs, and existing, planned, and proposed regional BMPs. The interim compliance deadline for the SMBBB TMDL requires a 50 percent reduction in exceedance days by July 2018; this will be met by achieving 50 percent of the final bacteria TLR (13.2%) on a watershed-wide basis, through a combination of non-structural BMPs including redevelopment, public retrofit incentives, non-MS4 parcels/areas NPDES Permit compliance, and programmatic BMPs, as well as and existing regional BMPs. Neither the load reductions from distributed green streets BMPs, nor planned/proposed regional BMPs, are necessary to meet the interim TLR. **Table 2-17** previously summarized the breakdown of estimated load reductions at the interim and final compliance deadlines. At the time of the interim compliance deadline, 2018, a 14.4% load reduction is estimated based on a combination of existing regional BMPs and existing and proposed non-structural BMPs, which is greater than the interim TLR of 13.2%.

Compliance with the Debris TMDL will be met through a phased retrofit of all catch basins throughout the Beach Cities EWMP Area to meet each interim and final compliance deadline.

4.1.2 DOMINGUEZ CHANNEL WATERSHED

Toxicity, copper, lead, and zinc have been identified as Category 1 WBPCs in the Dominguez Channel Watershed. Additionally, indicator bacteria and ammonia have been identified as a Category 2 WPBC, and cyanide, pH, selenium, mercury, and cadmium have been identified as Category 3 WBPCs. The compliance schedules associated with each WBPC are summarized in **Table 4-2**. The compliance schedule for Category 1 WBPCs is consistent with the associated TMDL. The compliance schedule for the Category 2 WBPC has been selected to achieve the proposed wet and dry weather bacteria milestones, with implementation actions not exceeding one year, in accordance with the Permit (Section ii(5)9B). As described in **Table 4-2**, the compliance schedule for the Category 3 WBPCs will be dependent on the results of the CIMP.

Table 4-2. Implementation Actions and Dates associated with Dominguez Channel Watershed WBPCs

Category	Pollutant(s)	Wet/Dry Weather	Date	Implementation Action
1: Highest Priority	Toxicity[1] Total Copper[1,2] Total Lead[1,2] Total Zinc[1,2] Cadmium[2]	Wet/Dry	Current[4]	Interim: Comply with the interim water quality-based effluent limitations as listed in the TMDL[3]
			March 2032	Final: Comply with the final water quality-based effluent limitations as listed in the TMDL[3]
2: High Priority	Indicator Bacteria	Dry	December 2023	Interim: 50% load reduction
			December 2025[5]	Final: 100% compliance may be demonstrated by the Permittee in one of three ways: 1. Meeting the allowed exceedance days (5 days during the dry weather period); or 2. Meet the allowed exceedance percentage (1.6% during a dry weather period) within the total drainage area served by the MS4. 3. Diversions are in place such that they are consistently operational, well maintained, and sized to effectively eliminate discharges to the receiving water year-round dry weather days.
		Wet	December 2016	Provide documentation supporting MCM enhancements implemented over the past year[6]
			December 2017	Provide documentation supporting MCM enhancements implemented over the past year[6]
			December 2018	Identify planned green streets locations to treat runoff from 3% of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.
			December 2019	City Council approval of Plans & Specifications for green streets to treat runoff from 3% of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach. Begin installation of catch basin inlet filters in the DC-Torrance analysis region.
			December 2020	Develop concept reports for regional BMPs in the cities of Redondo Beach and Manhattan Beach. Begin construction on green streets to treat runoff from 3% of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.
			December 2021	Submit grant application for any one of the proposed regional projects in the cities of Redondo Beach and Manhattan Beach.
			December 2022	Interim Milestone: 25% of target load reduction
			December 2023	Identify planned green streets locations to treat runoff from an additional 4% (7% total) of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.

Category	Pollutant(s)	Wet/Dry Weather	Date	Implementation Action
			December 2024	Begin construction on planned green streets to treat runoff from an additional 4% (7% total) of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach. Continue installation of catch basin inlet filters in the DC-Torrance analysis region.
			December 2025	Release Request for Proposals for regional BMP designs in Redondo Beach and/or Manhattan Beach
			December 2026	Complete construction on planned green streets to treat runoff from an additional 4% (7% total) of SFR, MFR, COM, and IND land uses in cities of Redondo Beach and Manhattan Beach.
			December 2027	Interim Milestone: 50% of target load reduction
			December 2028	Produce regional BMP design reports; identify locations for green streets implementation to treat runoff from an additional 7% (14% total) of SFR, MFR, COM, and IND land uses in the cities of Redondo Beach and Manhattan Beach.
			December 2029	Begin regional BMP permitting process for project in Redondo Beach or Manhattan Beach.
			December 2030	Begin construction on planned green streets to treat runoff from an additional 7% (14% total) of SFR, MFR, COM, and IND land uses in the cities of Redondo Beach and Manhattan Beach.
			December 2031[7]	Begin regional BMP construction of project in Redondo Beach or Manhattan Beach.
			March 2032[8]	Final Milestone: 100% compliance may be demonstrated by the Permittee in one of three ways: 1. Meeting the allowed exceedance days (10 days during a wet weather period, plus high flow suspension days) 2. Meeting the target load reduction (33%); or 3. Meeting the allowed exceedance percentage (19% during a wet weather period) within the total drainage area served by the MS4.
3: Medium Priority[9]	Cyanide pH Selenium Mercury Cadmium Arsenic Chromium Silver Nickel Thallium	N/A	March 2032[8]	Final: Comply with the applicable water quality standards as listed in **Table 3-4.** As required by the Permit, monitoring for these pollutants will occur under the CIMP. If monitoring data suggest that the Beach Cities Agencies' MS4s may cause or contribute to exceedances of these pollutants in the receiving water[10], these contributions will be addressed through modifications to the EWMP as a part of the adaptive management process, as described in Permit section VI.C.2.a.iii.

[1] Toxicity, copper, lead, and zinc are listed as Category 1 wet weather pollutants in Dominguez Channel.

[2] Copper, lead, zinc, and cadmium are listed as Category 1 pollutants in Dominguez Channel Estuary with annual average WQBELs that apply to both wet and dry weather.

[3] Dominguez Channel Estuary WQBELs for total copper, lead, zinc, and cadmium are addressed by the implementation actions taken for Dominguez Channel wet weather WQBELs.

[4] According to monitoring data at Dominguez Channel Mass Emission Station S28, the copper, lead, and zinc exceedance rates of the interim WQBELs are 9%, 3% 10% respectively, based on qualified sampling events between 2002 and 2013. At the Torrance Lateral Mass Emission Station TS19, the copper, lead, and zinc exceedance rates of the interim WQBELs are 5%, 0%, and 8% respectively. These monitoring locations receive flow contributions from the Beach Cities WMG, as well as other WMGs. CIMP monitoring and subsequent adaptive management will evaluate if the Beach Cities WMG are exceeding the interim Category 1 WQBELs and evaluate compliance with the Dominguez Channel Toxics TMDL.

[5] The proposed compliance schedule for dry weather bacteria is the minimum time expected to be necessary for the agencies to plan, design, permit, construct, monitor, and adaptively manage the proposed dry weather BMPs, and is also consistent with the 10-year MS4 compliance schedule for dry weather from the TMDL for indicator bacteria in the San Gabriel River, Estuary and Tributaries, adopted by the LARWQCB in 2015 (Water Quality Control Plan, Attachment A to Resolution No. R15-005, adopted by the RWQCB in 2015).

[6] Proposed milestones for MCM enhancement implementation are detailed in **Table 2-8**.

[7] If regional BMPs are deemed necessary for dry weather compliance, their construction dates will be moved up to meet the dry weather deadlines.

[8] The proposed compliance schedule for wet weather bacteria and all Category 3 pollutants was selected to be consistent with the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (Dominguez Channel Toxics TMDL) (RWQCB, 2011). This compliance schedule is the minimum time expected to be necessary for the agencies to plan, design, permit, construct, monitor, and adaptively manage the proposed wet weather BMPs.

[9] Cyanide, pH, selenium, mercury, and cadmium are Category 3 pollutants in Dominguez Channel. Arsenic, chromium, silver, nickel, mercury, and thallium are Category 3 pollutants in Dominguez Channel Estuary.

[10] This will be assumed to be the case if monitoring data show that outfall concentrations and receiving water concentrations are in excess of the applicable water quality criteria for the same monitoring event.

Table 3-12 previously summarized the load reductions achieved for the quantified WBPCs for the interim and final compliance deadlines.

Zinc has been identified as the controlling pollutant for BMP implementation, as it would likely produce load reductions for the other pollutants greater than their individual TLRs. Therefore, it is assumed that the nonstructural and structural BMPs proposed to meet the zinc final TLR by 2032 would also achieve compliance with the other metals TLRs. Therefore, distributed green streets BMPs at a final implementation level of 14%[28] and all regional BMPs are planned to be implemented no later than 2032 (with the exception of the Powerline Easement Project, as discussed below). At the time of the proposed final compliance deadline (2032), the proposed projects result in a 79% (DC-RB/MB analysis region) to 80% (DC-Torrance analysis region) load reduction, both of which are greater than the TLR of 76%. Copper TLRs are also proposed to be met in both analysis regions, in combination with the adaptive management approach discussed previously.

For bacteria, within the DC-RB/MB analysis region, the proposed final wet weather compliance deadline of March 2032 is proposed to be met through the suite of non-structural and structural BMPs, including distributed green streets BMPs at a 14% implementation level[29]. At the time of the proposed final compliance deadline (2032), this implementation plan results in a load reduction of 74% in analysis region DC-RB/MB, which is greater than the TLR of 33%. A 38% bacteria load reduction is estimated in the DC-Torrance analysis region. As shown in **Table 3-12**, the interim deadlines for bacteria are also proposed to be met through a combination of non-structural and distributed green streets BMPs, phased in over the compliance period.

It should be noted that although the inlet filters proposed in the DC-Torrance analysis region are not planned for 100% of catch basins (200 of 643 are currently planned in high priority drainage areas), the achieved load reduction will be evaluated through adaptive management, with additional filters to be installed as necessary to meet the TLRs by the specified compliance deadlines.

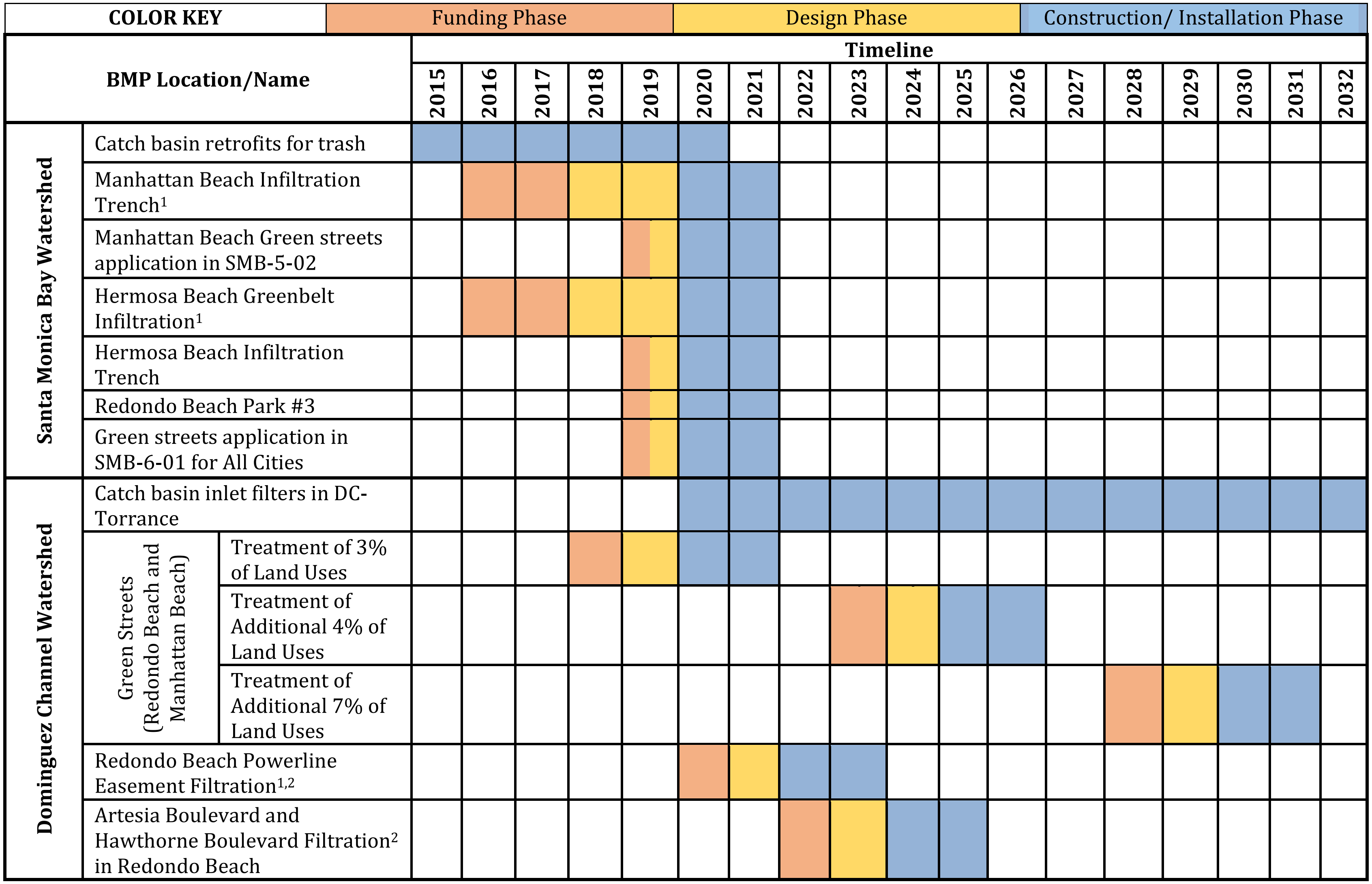
4.2 Project Sequencing

In order to meet the compliance deadlines for the WBPCs discussed above based on load reduction projections in the RAA, the proposed structural BMPs within the Santa Monica Bay and Dominguez Channel Watersheds would be implemented per the timeline provided in **Figure 4-1**.

[28] An "implementation level" of 14% is defined here to mean that runoff from 14% of land use areas (commercial, single family residential, multi-family residential, and industrial land uses) would be treated by green street BMPs (bioretention and biofiltration systems) designed as described in Section 2.6.3.

[29] An "implementation level" of 7% is defined here to mean that runoff from 7% of land use areas (commercial, single family residential, multi-family residential, and industrial land uses) would be treated by green street BMPs (bioretention and biofiltration systems) designed as described in Section 2.6.3.

Figure 4-1. Proposed Project Sequencing



[1]Alternative project locations have also been identified

[2]Current regional BMP project sequencing in Dominguez Channel helps achieve dry weather bacteria TMDL compliance. If compliance is met through other means, regional BMP scheduling in Dominguez Channel may be pushed back so that regional projects are instead complete by March 2032.

5 ASSESSMENT AND ADAPTIVE MANAGEMENT FRAMEWORK

Adaptive management is a critical component of the EWMP implementation process, and EWMP updates are required at two-year cycles by the Permit. The CIMP will gather additional data on receiving water conditions and stormwater/non-stormwater quality. These data will support adaptive management at multiple levels, including: (1) tracking improvements in water quality over the course of EWMP implementation and (2) generating data not previously available to support model updates. Furthermore, over time, the experience gained through intensive BMP implementation will provide lessons learned to support modifications to the control measures identified in the EWMP.

The adaptive management process also includes a schedule for developing and reporting on the EWMP updates, the approach to conducting the updates, and the process for implementing any modifications to the RAA and EWMP to reflect the updates.

The adaptive management approach for the Beach Cities EWMP area is designed to address the EWMP planning process and the relationship between monitoring, scheduling, and BMP planning. The adaptive management process outlines how the EWMP will be modified in response to monitoring results, updated modeling results, and lessons learned from BMP implementation. It is designed to accomplish three goals:

1. Clarify the short-term and long-term commitments of the Beach Cities WMG within the EWMP.
2. Provide a structured decision-making process for modifications to the EWMP based on the results of monitoring data.
3. Propose a structure for evaluating compliance with water-quality based permit requirements within an adaptive structure.

As outlined in Section 4, the schedule and milestones for the EWMP have been designed around meeting the interim and final TMDL requirements for bacteria and metals. While the EWMP identifies actions that will lead to compliance with the final TMDL limitations, the specific actions taken will be informed by monitoring data collected under the CIMP, special studies that may be conducted during implementation, and any applicable regulatory changes that could influence the remaining interim and final milestones and schedule. For example, the Statewide Bacteria Amendments have the potential to modify water quality objectives in the Ocean Plan and Basin Plan, as well as the TMDL WLAs and their WQBEL and/or RWL expressions in the Permit. These changes could affect the required load reductions for bacteria as well as the watershed control measures identified herein.

Monitoring data will be utilized to measure progress towards achieving RWLs and WQBELs. An evaluation of monitoring data will be carried out on a biennial basis in accordance with **Figure 5-1** to determine if modifications to the EWMP are necessary. Modifications that are warranted because final milestones are achieved *more quickly* than anticipated can be made at any time (i.e. no more actions are needed if fewer control measures result in meeting RWLs and/or WQBELs).

Modifications that are warranted because insufficient progress is being made will be noted every two years in the annual report and a schedule for implementation will be provided. A full update to the EWMP and the RAA is not anticipated as the schedule for bacteria compliance is only six years long. Updating the EWMP and RAA is a significant and costly undertaking that is not necessary unless conditions change significantly and additional modeling is needed to inform implementation decisions. However, at any point, the Beach Cities Agencies could choose to update the EWMP and the associated RAA, particularly if deemed appropriate based on monitoring data.

If at any point during the implementation period any of the permit conditions are modified in response to a regulatory action, TMDL modification, or local studies, the receiving water and outfall monitoring data will be compared to the new RWLs and WQBELs. The same procedure will be followed for evaluating the data and adapting the EWMP, but the new RWLs and WQBELs will be used for the analysis.

The process outlined in **Figure 5-1** applies during the implementation period for the EWMP. At the end of the implementation period for the TMDLs, if the final RWL and/or WQBELs are not being met, either the TMDL must be modified to adjust the schedule or the permittees will need to apply for a Time Schedule Order or other mechanism to get an extension of the compliance deadlines.

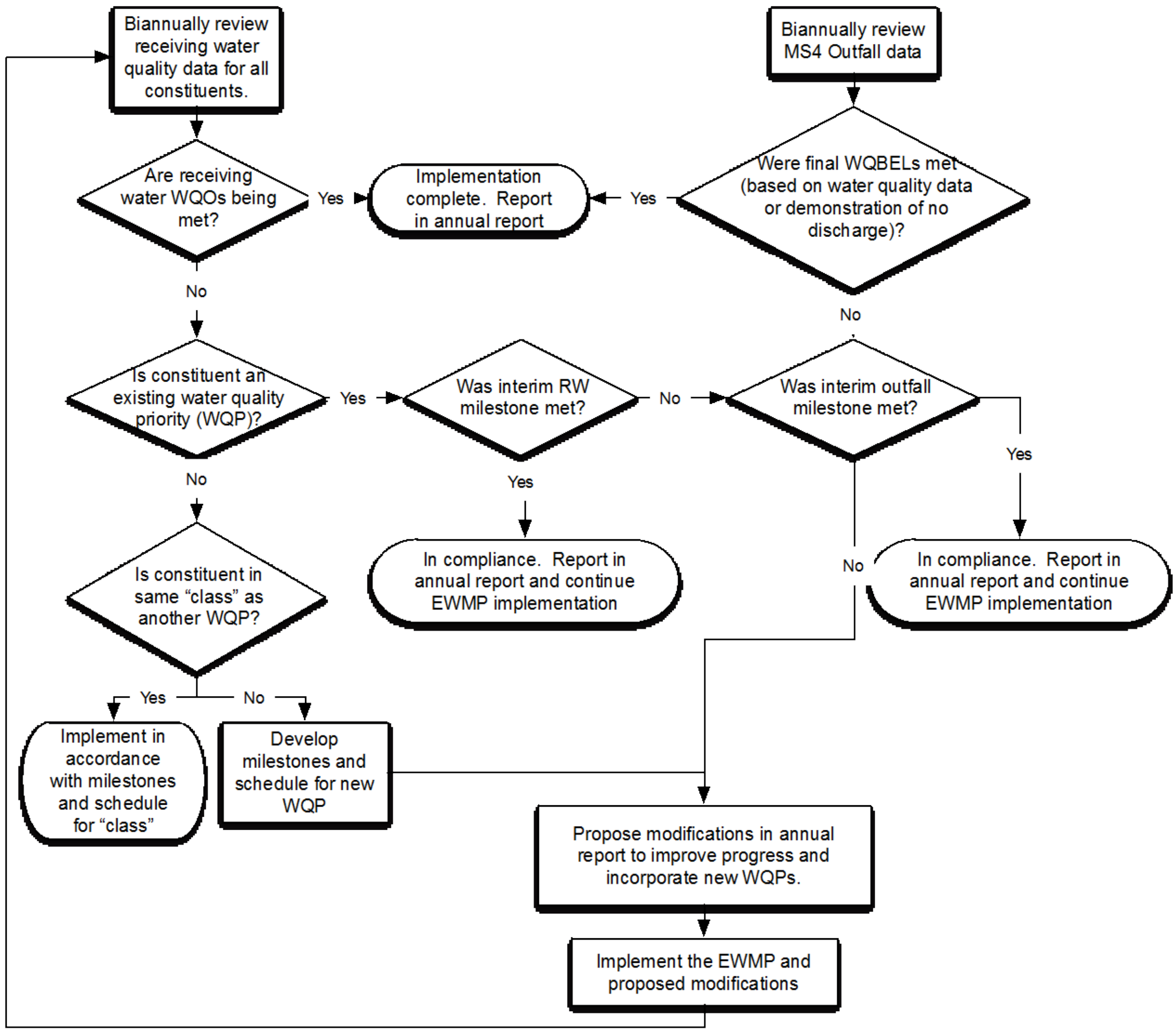


Figure 5-1. Adaptive Management Approach

6 Financial Analysis

In June of 2014, the Beach Cities WMG submitted the Beach Cities EWMP Work Plan to the LARWQCB (Beach Cities WMG, 2014). The EWMP Work Plan described the approach to cost estimation and scheduling for the EWMP, which is addressed in this section. This section provides an order-of-magnitude estimate of the financial resources that may be required to attain compliance with the 2012 MS4 Permit's RWLs and WQBELs, as well as a recommended project scheduling in order to meet TMDL compliance deadlines and interim deadlines. Planning-level cost opinions associated with implementation of the proposed structural BMPs within the Beach Cities WMG area are provided based on RAA results.

Prior to and separate from the EWMP, BMP cost effectiveness (i.e., pollutant load removed per dollar cost) were developed and evaluated by Geosyntec using SBPAT for a variety of BMP implementation scenarios. For example, it was found that regional infiltration BMPs, followed by regional flow-through treatment BMPs, followed by distributed green streets provide the greatest cost effectiveness, in part due to the economies of scale that benefit regional BMPs. Within those categories, greater BMP cost effectiveness is achieved for a given pollutant in order of the tributary land uses' EMC and runoff coefficient product (for example, for bacteria, commercial land use has a very high EMC and runoff coefficient; therefore, a given BMP type is most cost effective when placed downstream of a commercial area). This relative cost effectiveness understanding was applied by Geosyntec in identifying and prioritizing BMP implementation scenarios for agency consideration in this WMG. The most cost effective yet implementable BMPs were then sequentially incorporated into the EWMP (i.e., with the most cost effective BMPs added first) until reasonable assurance of compliance was demonstrated.

Cost opinions are presented as an aid for decision makers, and contain considerable uncertainties. Given the iterative and adaptive nature of the EWMP and the many variables associated with the projects, the budget forecasts are order-of magnitude opinions, and are subject to change based on site-specific BMP feasibility assessment findings, preliminary and final BMP designs and landscaping, BMP effectiveness assessments, results of outfall and receiving water monitoring, and special studies such as those that might result in site specific objectives which could modify water quality objectives or TMDL Waste Load Allocations for a specific WBPC.

A financial strategy and details regarding potential funding sources and programs to support the financial resources required for the structural BMPs being proposed in the EWMP are also provided herein. These funding sources and programs may be utilized depending on applicability and feasibility.

6.1 BMP Cost Methodology and Assumptions

6.1.1 Hard Cost Assumptions

Costs estimated for structural BMPs include "hard" costs for tangible assets and are determined using a line item unit cost approach, which separately accounts for each material cost element required for the installation of a given BMP. Quantities for each line item were calculated based on

BMP storage/treatment volumes and typical design configurations. A safety factor was applied to the BMP footprints for calculation of design parameters, for both the low and high cost estimates. Unit costs were taken from RS Means [30], past projects based in Southern California, recent construction cost/bid information, and vendors. Line item unit costs of the proposed structural BMPs are included in **Appendix O**. Since the majority of proposed BMPs were located on publicly owned land to reduce land acquisition costs to the extent possible, land acquisition costs were not considered as part of this analysis.

6.1.2 Soft Cost Assumptions

Structural BMP cost opinions also include "soft" costs, which include considerations such as design and permitting. Soft costs are project costs that cannot be calculated on a unit cost basis. For conceptual cost estimating, these costs are generally calculated as a percentage of total capital costs. The soft costs considered for each BMP were:

- **Utility Realignment**— Costs associated with the relocation of utilities that are located within the proposed BMP footprint or inhibit construction activities.
- **Mobilization and Demobilization** – The costs associated with activation/deactivation of equipment and manpower resources for transfer to/from a construction site until completion of the contract.
- **Planning, Permitting, Bond, and Insurance Costs** – Cost, including planning and permit fees and personnel hours, of obtaining required permits for BMP installation. Examples of permits needed may include erosion and sediment control, stormwater, construction, and public space permits. Potential bond and insurance costs are also included.
- **Engineering and Planning** – Costs associated with BMP and site design, as well as access for maintenance, environmental mitigation, buried objects, safety/security, traffic control, limited space, and site restoration.
- **Construction Management** – The costs associated with management and oversight of the construction of the BMP, from project initiation until completion of the contract.

Estimated soft costs as percent of total project capital costs are presented in **Table 6-1**. These percentages were based on literature, best professional judgment, and data from past projects (Brown and Schueler, 1997; International Cost Engineering Council, 2014).

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

Table 6-1. Range of Soft Costs for Proposed Structural BMP Projects as a Percent of Capital

Cost Item	Cost Range	
	Low	High
Utility Realignment	0%	3%
Mobilization/Demobilization[1]	3%	10%
Planning, permitting, bond, and insurance costs	5%	10%
Engineering and Planning	20%	40%
Construction Management	8%	15%

[1] $2,000 minimum fee

6.1.3 Operations and Maintenance

Annual Operations and Maintenance (O&M) costs were assumed to be two percent of the capital cost for subsurface infiltration basins, two percent of the capital cost for sub-surface biofilters, five percent of the capital cost for subsurface infiltration trenches, and six percent of the capital cost for green streets (USEPA, 2005; Weiss et al., 2007). O&M opinions for underground infiltration basins include cleaning and removal of debris after major storm events, mowing and maintenance of surface vegetated areas, and sediment cleanout. O&M necessary for maintaining sub-surface biofilters includes landscape maintenance, media and gravel replacement once clogged when surface scarification is no longer effective, pest control, sediment and pre-treatment cleanout. O&M for underground infiltration trenches includes cleaning and removal of debris, repairs to inlet/control structures, and pre-treatment cleanup. O&M for green streets includes repairs to eroded areas, incremental landscape maintenance, media and gravel replacement once clogged and surface scarification is no longer effective, removal of trash and debris, and removal of aged mulch with installation of a new layer. O&M costs have been summarized as 20-year lifecycle costs, with no discounting applied, also including post-construction monitoring.

Additional maintenance will be necessary after the 20-year lifecycle. Extended maintenance for subsurface infiltration includes excavation and washing of all drain rock on a 25-year cycle and is estimated to be approximately 60 percent of capital costs. All drainage elements should be replaced on a 50-year cycle, at approximately 125 percent of capital costs. Cisterns should be replaced after a useful life of approximately 50 years, at 125 percent of the capital cost. Green streets should be excavated, disposing of existing soil media, and backfilled with new soil media every 25 to 50 years at approximately 90 percent of capital costs.

Typical maintenance for trash exclusion devices includes removal of trash and sediment, and catch basins should be cleaned at a minimum of once or twice per year. Trash exclusion devices can be plugged if they are overloaded with sediment or debris, greatly reducing their efficiency. Inspection and cleanout is recommended after major storm events, or storms with a rainfall intensity of greater than one inch in 12 hours.

6.1.4 *Additional Design Assumptions*

Additional design details were assumed for the purpose of the cost estimation presented herein, including, but not limited to:

- The percentage of excavated material requiring hauling;
- The type and length of BMP inflow and outflow conveyance structures;
- The type and quantity of vegetation required for the post-BMP condition;
- The percentage of the parcel area requiring hydroseeding for the post-BMP condition;
- The type of pre-treatment used for each BMP.

6.2 Proposed Structural BMPs

As previously described, regional and distributed structural BMP options are proposed to achieve compliance with the RWLs and WQBELs. **Table 6-2** summarizes the basic, concept-level design assumptions for each of the proposed structural BMPs which formed the basis for the conceptual cost opinions.

Table 6-2. Proposed BMP Design Assumptions for Conceptual Cost Opinions

Analysis Region	BMP Name[1]	BMP Description	Design Storage Volume (cu-ft)	Tributary Area (acres)
SMB-5-02	Manhattan Beach Infiltration Trench – Alternative 1	Located along the coast of Manhattan Beach, the sub-surface trench has a potential surface area of 2.2 ac, an average depth of 2.1 ft with a diversion rate of 160 cfs and an infiltration rate under the trench of 13 in/hr.	198,000	1,475[2]
SMB-5-02	Manhattan Beach Infiltration Trench – Alternative 2	Located along the coast of Manhattan Beach, the sub-surface trench has a potential surface area of 1.6 ac, an average depth of 2.1 ft with a diversion rate of 128 cfs and an infiltration rate under the trench of 13 in/hr.	158,400	1,475[2]
SMB-5-02	Polliwog Park Infiltration Gallery – Alternative 2	Located adjacent to Manhattan Beach Boulevard in Manhattan Beach, the sub-surface infiltration gallery has a potential surface area of 1 ac, an average depth of 4 ft, a diversion flowrate of 11 cfs, and an infiltration rate of 0.74 in/hr.	148,100	470
SMB-5-02	Distributed Green Streets – Alternative 1	The distributed green streets, proposed to address runoff from 5% of single family residential, multi-family residential, and commercial land uses, are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	205,500	66
SMB-5-02	Distributed Green Streets – Alternative 2	The distributed green streets, proposed to address runoff from 5% of single family residential, multi-family residential, and commercial land uses, are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	142,100	45
SMB-6-01	Hermosa Beach Infiltration Trench	Located along the coast of Hermosa Beach, the sub-surface trench has a potential surface area of 0.2 ac, an average depth of 1.7 ft, a diversion flowrate of 25 cfs, and an infiltration rate of 12.5 in/hr.	13,300	2,000[2]
SMB-6-01	Hermosa Beach Greenbelt Infiltration[3]	Located between Valley Dr. and Ardmore Ave., the sub-surface trench has a potential surface area of 1.5 ac, an average depth of 5 ft, a diversion flowrate of 48 cfs, and an assumed infiltration rate of 12 in/hr.	319,000	1,800[2]
SMB-6-01	Park #3	Located northwest of Blossom Lane and 190th street, the sub-surface infiltration basin has a potential surface area of 0.4 ac, an average depth of 5ft , a diversion flowrate of 13 cfs, and an infiltration rate of 1 in/hr.	87,100	1,430[2]

Analysis Region	BMP Name[1]	BMP Description	Design Storage Volume (cu-ft)	Tributary Area (acres)
SMB-6-01	Distributed Green Streets	The distributed green streets, proposed to address runoff from 25% of single family residential, multi-family residential, and commercial land uses, are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	605,200	190
SMB 5-02, SMB 6-01, DC – MB/RB	Trash exclusion devices	The City of Redondo Beach plans to retrofit 1,085 catch basins (634 of which are County-owned), the City of Hermosa Beach will retrofit 151 (79 of which are County-owned), and the City of Manhattan Beach plans to retrofit 640 (200 of which are County-owned) catch basins. All cities will retrofit catch basins with automatic retractable screens (ARS) and connector pipe screen full capture trash systems (CPS).	N/A	-
DC – MB/RB	Powerline Easement and Manhattan Beach Blvd Infiltration	Located along powerline easements and/or adjacent to Marine Avenue and Manhattan Beach Boulevard, the sub-surface biofilter has a potential surface area of 7.2 ac, an average depth of 5 ft, a diversion flowrate of 132 cfs, and a negligible infiltration rate.	N/A (Flow-through BMP)	1,500
DC – MB/RB	Artesia Blvd. and Hawthorne Blvd. Filtration	Located near the intersection of Artesia Blvd. and Hawthorne Blvd., the sub-surface biofilter has a potential surface area of 1 ac, an average depth of 5 ft, a diversion flowrate of 13.6 cfs, and a negligible infiltration rate.	N/A (Flow-through BMP)	130
DC-MB/RB	Distributed Green Streets	The distributed green streets are assumed to have 6 in of ponding, 1.5 ft of amended soil, 3 in of mulch, and an infiltration rate of 0.15 in/hr.	636,300	200
DC-Torrance	Catch basin inlet filters	The City of Torrance plans to retrofit 200 of 643 catch basins with inlet filters.	N/A	5,760

[1] All projects listed in this table (except for the catch basin inlet filters in DC-Torrance) were modeled in the RAA and sized to collectively comply with the WQBELs and RWLs in combination with other existing and proposed structural and non-structural BMPs. Within the DC-Torrance analysis region, catch basin inlet filters are assumed to achieve WQBEL/RWL compliance based on a review of literature/studies on their performance. The total load reduction from inlet filters will be evaluated in the future through CIMP monitoring, as part of the EWMP adaptive management process. At that time, the catch basin BMPs will be modified, with additional filters installed as necessary and additional structural/non-structural BMPs proposed as needed to meet the TLRs required to achieve water quality objectives by the compliance deadlines.

[2] This includes upstream BMPs and associated tributary drainage areas

[3] Alternative project locations have also been identified

6.2.1 COST OPINION - SMB WATERSHED - ANALYSIS REGION SMB-5-02

For the SMB subwatershed tributary to compliance monitoring location SMB-5-02, two implementation alternatives were identified in the RAA. Alternative 1 includes the Manhattan Beach Infiltration Trench and distributed green streets at a 5% application rate[31]. Alternative 2 includes a reduced volume of the Manhattan Beach Infiltration Trench (i.e., reducing the volume by approximately 20%), the Polliwog Park Infiltration Gallery project, and distributed green street BMPs at a 5% application rate.

Table 6-3 outlines the costs associated with Alternative 1 and **Table 6-4** outlines the costs associated with Alternative 2. Based on projected cost alone, Alternative 1 (larger beach infiltration trench, without Polliwog Park project) is the preferred option, however a preliminary engineering study is needed to verify the feasibility of Alternative 1 so Alternative 2 is included to demonstrate an alternate approach to reasonable assurance. Trash exclusion devices will also be implemented in the SMB 5-02 analysis region. These costs were determined for each city (Redondo Beach, Manhattan Beach, and Hermosa Beach) and are presented in Section 6.2.5.

Further cost opinion details are provided in **Appendix O**.

[31] An "application rate" of 5% is defined here to mean that 5% of RAA-specified land use areas (commercial, single family residential, and multi-family residential land uses) would be treated by green street BMPs (bioretention and biofiltration systems) designed as described in Section 2.6.3.

Table 6-3. Estimated Construction and O&M Costs for Structural BMPs in Analysis Region SMB-5-02, Alternative 1

Project Name	**Manhattan Beach Infiltration Trench**		**Distributed Green Streets**	
Location of BMP	**Manhattan Beach**		**Manhattan Beach**	
Cost Range	**Low**	**High**	**Low**	**High**
Capital Subtotal	$2,700,000	$3,800,000	$1,800,000	$3,600,000
Utility Realignment	$0	$110,000	$0	$110,000
Mobilization/Demobilization	$81,000	$380,000	$53,000	$360,000
Planning, permitting, bond, and insurance costs	$140,000	$380,000	$89,000	$360,000
Engineering and Planning	$540,000	$1,500,000	$350,000	$1,500,000
Construction Management	$220,000	$570,000	$140,000	$550,000
Total Estimated Project Construction Cost	**$3,700,000**	**$6,800,000**	**$2,400,000**	**$6,500,000**
Annual O&M	$140,000	$190,000	$110,000	$220,000
Total 20-year Lifecycle Cost	**$6,100,000 (low) to $13,000,000 (high)**			

Table 6-4. Estimated Construction and O&M Costs for Structural BMPs in Analysis Region SMB-5-02, Alternative 2

Project Name	**Manhattan Beach Infiltration Trench**		**Polliwog Park Infiltration Gallery**		**Distributed Green Streets**	
Location of BMP	**Manhattan Beach**		**Manhattan Beach**		**Manhattan Beach**	
Cost Range	**Low**	**High**	**Low**	**High**	**Low**	**High**
Capital Subtotal	$2,200,000	$3,300,000	$2,100,000	$2,500,000	$1,200,000	$2,500,000
Utility Realignment	$0	$98,000	$0	$74,000	$0	$75,000
Mobilization/Demobilization	$67,000	$330,000	$64,000	$250,000	$37,000	$250,000
Planning, permitting, bond, and insurance costs	$110,000	$330,000	$110,000	$250,000	$61,000	$250,000
Engineering and Planning	$450,000	$1,300,000	$430,000	$990,000	$240,000	$1,000,000
Construction Management	$180,000	$490,000	$170,000	$370,000	$98,000	$380,000
Total Estimated Project Construction Cost	**$3,000,000**	**$5,800,000**	**$2,900,000**	**$4,400,000**	**$1,700,000**	**$4,500,000**
Annual O&M	$110,000	$160,000	$43,000	$50,000	$73,000	$150,000
Total 20-year Lifecycle Cost	**$7,600,000 (low) to $15,000,000 (high)**					

6.2.2 COST OPINION - SMB WATERSHED – ANALYSIS REGION SMB-6-01

The RAA within analysis region SMB-6-01 predicts that the TLR will be met with reasonable assurance through implementation of the proposed Hermosa Beach Infiltration Trench, Hermosa Beach Greenbelt Infiltration, Park #3, and a combination of green street BMPs at an application rate of 25%[32]. **Table 6-5** outlines the costs associated with this structural BMP combination which, when implemented with the existing structural regional BMPs and non-structural control measures[33] detailed in the RAA modeling efforts, will achieve TLR compliance at CML SMB-6-01.

Trash exclusion devices will also be implemented in the SMB 6-01 analysis region. These costs were determined for each city (Redondo Beach, Manhattan Beach, and Hermosa Beach) and are presented in Section 6.2.5. Further cost estimate details are provided in **Appendix O.**

[32] An "application rate" of 25% is defined here to mean that runoff from 25% of RAA-specified land use areas (commercial, single family residential, and multi-family residential land uses) would be treated by green street BMPs (bioretention and biofiltration systems) designed as described in Section 2.6.3.

[33] Non-structural control measures include redevelopment, public retrofit incentives, non-MS4 parcels/areas, and programmatic BMPs.

Table 6-5. Estimated Construction and O&M Costs for Structural BMPs in Analysis Region SMB-6-01

Project Name	**Hermosa Beach Infiltration Trench**		**Hermosa Beach Greenbelt Infiltration**		**Park #3**		**Distributed Green Streets**	
Location of BMP	**Hermosa Beach**		**Hermosa Beach or Redondo Beach**		**Redondo Beach**		**Hermosa Beach, Manhattan Beach, Redondo Beach, Torrance**	
Cost Range	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Capital Subtotal	$370,000	$640,000	$4,100,000	$4,500,000	$1,400,000	$1,700,000	$5,200,000	$11,000,000
Utility Realignment	$0	$19,000	$0	$130,000	$0	$50,000	$0	$320,000
Mobilization/Demobilization	$11,000	$64,000	$120,000	$450,000	$42,000	$170,000	$160,000	$1,100,000
Planning, permitting, bond, and insurance costs	$18,000	$64,000	$200,000	$450,000	$70,000	$170,000	$260,000	$1,100,000
Engineering and Planning	$74,000	$260,000	$810,000	$1,800,000	$280,000	$660,000	$1,000,000	$4,200,000
Construction Management	$29,000	$96,000	$320,000	$670,000	$110,000	$250,000	$410,000	$1,600,000
Total Estimated Project Construction Cost	**$500,000**	**$1,100,000**	**$5,500,000**	**$8,000,000**	**$1,900,000**	**$3,000,000**	**$7,000,000**	**$19,000,000**
Annual O&M	$18,000	$32,000	$81,000	$90,000	$28,000	$33,000	$310,000	$640,000
Total 20-year Lifecycle Cost	**$15,000,000 (low) to $31,000,000 (high)**							

6.2.3 Cost Opinion - Dominguez Channel Watershed – Analysis Region DC-RB/MB

According to the Beach Cities RAA model analysis of the Redondo Beach and Manhattan Beach areas within the Dominguez Channel Watershed, it is predicted that the TLR will be met with reasonable assurance through implementation of the proposed Powerline Easement Infiltration Project, Artesia Boulevard Infiltration Project, and a combination of green street BMPs at an application rate of 14%[34]. **Table 6-6** outlines the costs associated with these proposed projects which, when implemented with non-structural control measures[35] detailed in the RAA modeling efforts, are predicted to achieve TLR compliance within the Manhattan Beach and Redondo Beach areas within the Dominguez Channel Watershed.

Trash exclusion devices will also be implemented in the DC-RB/MB analysis region. These costs were approximated for each city (Redondo Beach, Manhattan Beach, and Hermosa Beach) and are presented in Section 6.2.5. Further cost estimate details are provided in **Appendix O.**

[34] An "application rate" of 14% is defined here to mean that runoff from 14% of RAA-specified land use areas (commercial, single family residential, and multi-family residential land uses) would be treated by green street BMPs (bioretention and biofiltration systems) designed as described in Section 2.6.3.

[35] Non-structural control measures include redevelopment, public retrofit incentives, non-MS4 parcels/areas, and programmatic BMPs.

Table 6-6. Estimated Construction and O&M Costs for Structural BMPs in Analysis Region DC-RB/MB[1]

Project Name	**Powerline Easement Infiltration**		**Artesia Blvd Infiltration**		**Distributed Green Streets**	
Location of BMP	**Redondo Beach**		**Redondo Beach**		**Redondo Beach/Manhattan Beach**	
Cost Range	**Low**	**High**	**Low**	**High**	**Low**	**High**
Capital Subtotal	$8,200,000	$9,200,000	$1,500,000	$1,800,000	$5,500,000	$11,000,000
Utility Realignment	$0	$270,000	$0	$53,000	$0	$340,000
Mobilization/Demobilization	$250,000	$920,000	$45,000	$180,000	$160,000	$1,100,000
Planning, permitting, bond, and insurance costs	$410,000	$920,000	$75,000	$180,000	$270,000	$1,100,000
Engineering and Planning	$1,600,000	$3,700,000	$300,000	$710,000	$1,100,000	$4,500,000
Construction Management	$660,000	$1,400,000	$120,000	$260,000	$440,000	$1,700,000
Total Estimated Project Construction Cost	**$11,000,000**	**$16,000,000**	**$2,000,000**	**$3,100,000**	**$7,400,000**	**$20,000,000**
Annual O&M	$160,000	$180,000	$30,000	$35,000	$330,000	$670,000
Total 20-year Lifecycle Cost	**$20,000,000 (low) to $39,000,000 (high)**					

[1] Costs for the Powerline Easement Infiltration project and Artesia Boulevard Infiltration project were estimated based on cost information for lined biofilters with engineered media; the design elements of which cover a range of infiltration options.

6.2.4 Cost Opinion - Dominguez Channel Watershed – Analysis Region DC-Torrance

An analysis of the proposed catch basin inlet filters predicts an estimated load reduction attributable to each inlet filter installed. **Table 6-7** outlines the approximate high and low capital and O&M costs associated with 200 retrofits. Further cost estimate details are provided in **Appendix O**.

Table 6-7. Estimated Construction and O&M Costs for Structural BMPs in Analysis Region DC-Torrance

Project Name	**Catch Basin Inlet Filters**	
Location of BMP	**Torrance**	
Cost Range	**Low**	**High**
Capital Subtotal	$240,000	$360,000
Total Estimated Project Construction Cost	**$240,000**	**$360,000**
Annual O&M	$130,000	$170,000
Total 20-year Lifecycle Cost	**$2,840,000 (low) to $3,760,000 (high)**	

6.2.5 Cost Opinion – Trash Exclusion Devices – All Analysis Regions

The Cities of Manhattan Beach, Redondo Beach, and Hermosa Beach plan to retrofit catch basins with trash exclusion devices (either automatic retractable screens [ARSs] and/or connector pipe screen [CPS] full capture trash systems in the Santa Monica Bay watershed). The City of Redondo Beach plans to retrofit 1,085 catch basins (634 of which are County-owned), the City of Hermosa Beach will retrofit 151 catch basins (79 of which are County-owned), and the City of Manhattan Beach plans to retrofit 640 catch basins (200 of which are County-owned) catch basins. These catch basin retrofits will be located in SMB-5-02, SMB-6-01, as well as in the other analysis regions in SMB; these catch basin retrofits will work in combination with other regionally sited BMPs. The City of Torrance has substantially completed retrofit of its Santa Monica Bay watershed area through several recent grant funded projects so costs for City of Torrance trash exclusion devices are not included. Not included in these costs are the retrofits of catch basins in high priority areas of Dominguez Channel to meet the MCMs in the MS4 Permit for areas without trash TMDLs.

Table 6-8 outlines the costs associated with these retrofits, as approximated by each city. Annual O&M costs for trash exclusion devices reflect additional costs for cleaning the inserts/screens only. An estimate of current costs spent to clean non-retrofitted catch basins was subtracted from the annual O&M estimate, resulting in annual O&M required for the addition of the inserts/screens only. Further cost estimate details are provided in **Appendix O**.

Table 6-8. Estimated Construction and O&M Costs for Catch Basin Retrofits

Location of BMP	Hermosa Beach		Redondo Beach		Manhattan Beach	
Cost Range	**Low**	**High**	**Low**	**High**	**Low**	**High**
Capital Subtotal[1]	$110,000	$370,000	$790,000	$2,600,000	$470,000	$1,600,000
Mobilization[2]	$5,500	$18,000	$40,000	$130,000	$23,000	$78,000
Permitting[3]	$40,000	$40,000	$320,000	$320,000	$100,000	$100,000
Total Estimated Project Construction Cost	**$160,000**	**$430,000**	**$1,100,000**	**$3,100,000**	**$590,000**	**$1,700,000**
Annual O&M	$50,000	$64,000	$360,000	$460,000	$210,000	$270,000
Total 20-year Lifecycle Cost	**$1,900,000 (low) to $5,200,000 (high)**					

[1] Includes cost of both ARS and CPS

[2] 5% of capital subtotal cost

[3] $500 for each County-owned catch basin only

6.2.6 *Summary of Cost Opinions*

Table 6-9 summarizes the total 20-year life-cycle cost opinions for each proposed structural BMP, which are composed of the cost to construct or implement each structural BMP plus the associated annual O&M costs over 20 years. In order to account for possible variations in BMP design, BMP configurations, and site-specific constraints, as well as for uncertainties in available BMP unit costs from literature or estimated BMP unit costs, a range of costs is presented. **Table 6-9** includes combined costs for proposed structural BMPs by analysis region and by watershed. Not included in these costs are the annual monitoring costs for implementing the CIMP or the costs associated with implementing baseline and enhanced MCMs.

From the analysis of potential costs in this section as summarized in **Table 6-9**, it is clear that projected costs of implementing the EWMP are substantial and orders of magnitude higher than have previously been expended by the agencies under the previous MS4 Permit. Thus availability of funds will be critical for the implementation of the EWMP. Currently, the Beach Cities do not have sufficient funds or dedicated funding streams to construct and maintain the projects proposed in this EWMP.

The Beach Cities agencies are working with the Los Angeles County Division of the League of California Cities and the California Contract Cities Association to partner with other affected agencies to collectively influence State policies, pursue changes in legislation and lobby high level officials for additional stormwater funding. Working together with the other cities will increase effectiveness, communication, collaboration, and reduce redundant efforts. The LACFCD will also work with the Beach Cities WMG in their efforts to address source controls; assess, develop, and pursue funding for structural BMPs, and promote the use of water reuse and infiltration. As regional project scopes are further refined, the LACFCD will determine on a case-by-case basis their contribution to the projects.

In addition to working with other affected cities on a regional level, the Beach Cities WMG individually and collaboratively are committed to pursue funding sources at a local level including but not limited to:

- *Grants* - Collaboration and coordination between the Beach Cities will be important to increase accessible grant funding opportunities for stormwater projects, however alternative funding sources will also be needed to provide stable O&M revenues since grants typically do not provide for O&M.
- *Interagency Partnerships* – Interagency partnerships, like the Beach Cities WMG, can allow agencies to leverage local funding resources to make cost intensive projects possible.
- *Local Bond Issuance* - Two types of local bonds can be utilized. General Obligation (GO) bonds are issued by local governments and repaid through a property tax surcharge. Revenue bonds are tax-exempt securitized bonds repaid through utility rate increases charged directly to customers.
- *Local Stormwater Assessments* - Stormwater charges are potentially the most critical local funding source to finance stormwater programs. These charges include stormwater fees and taxes.

- *Direct Subsidies* - Direct financial subsidies to local projects do not contribute to cash revenue generation. However, subsidies can create a financial incentive to encourage local participation without providing the full cost for project implementation. Such an approach can increase financial efficiency by leveraging financial input from communities.

These potential sources of funding are discussed in greater detail in Section 7.

6.2.7 Closing Discussion

In concluding its review of the LA MS4 Permit in response to petitions on the order, the SWRCB acknowledges that:

> "Addressing the water quality impacts of municipal storm water is a complex and difficult undertaking, requiring innovative approaches and significant investment of resources. We recognize and appreciate the commendable effort of the Los Angeles Water Board to come up with a workable and collaborative solution to the difficult technical, policy, and legal issues, as well as the demonstrated commitment of many of the area's MS4 dischargers and of the environmental community to work with the Los Angeles Water Board in the development and implementation of the proposed solution. We also recognize the extensive work that interested persons from across the state, including CASQA, have invested in assisting us in understanding how the watershed-based alternative compliance approach developed by the Los Angeles Water Board may inform statewide approaches to addressing achievement of water quality requirements. While storm water poses an immediate water quality problem, we believe that a rigorous and transparent watershed-based approach that emphasizes low impact development, green infrastructure, multi-benefit projects, and capture, infiltration, and reuse of storm water is a promising long-term approach to addressing the complex issues involved. We must balance requirements for and enforcement of immediate, but often incomplete, solutions with allowing enough time and leeway for dischargers to invest in infrastructure that will provide for a more reliable trajectory away from storm water-caused pollution and degradation. We believe that the Los Angeles MS4 Order, with the revisions we have made, strikes that balance at this stage in our storm water programs, but expect that we will continue to revisit the question of the appropriate balance as the water boards' experience in implementing watershed-based solutions to storm water grows." [Revised draft Order, April 24, 2015, p.86-87 conclusion][36]

[36] Revised Draft April 24, 2015. State of California State Water Resources Control Board Order WQ 2015-XX In the Matter of Review of Order No. R4-2012-0175, NPDES Permit No. CAS004001 Waste Discharge Requirements for the Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4. Issued by the California Regional Water Quality Control Board, Los Angeles Region. SWRCB/OCC Files A-2236(a)-(kk).

The SWRCB also states that:

> "The WMP/EWMP provisions constitute an effort to set ambitious, yet achievable, targets for Permittees; receiving water limitations, on the other hand, while the ultimate goal of MS4 permitting, may not in all cases be achievable within the five-year permit cycle. Generally, permits are best structured so that enforcement actions are employed when a discharger shows some shortcoming in achieving a realistic, even if ambitious, permit condition and not under circumstances where even the most diligent and good faith effort will fail to achieve the required condition." [Revised draft Order, April 24, 2015, p.35][37]

Additionally, SWRCB in discussing compliance with receiving water limitations provisions stated:

> "Yet, we are sympathetic to the assertions made by MS4 dischargers that the receiving water limitations provisions mandated by our Order WQ 99-05 may result in many years of permit noncompliance, because it may take years of technical efforts to achieve compliance with the receiving water limitations, especially for wet weather discharges. Accordingly, we believe that the MS4 permits should incorporate a well-defined, transparent, and finite alternative path to permit compliance that allows MS4 dischargers that are willing to pursue significant undertakings beyond the iterative process to be deemed in compliance with the receiving water limitations." [Revised draft Order, April 24, 2015, p. 17][38]

The Beach Cities WMG agencies appreciate the SWRCB acknowledgement of the challenges that lie ahead, the understanding of the need for adaptive management in this complex and difficult undertaking, and the significant commitment of resources that must be secured to carry out this ambitious plan to address the water quality impacts of municipal stormwater.

[37] Revised Draft April 24, 2015. State of California State Water Resource's Control Board Order WQ 2015-XX In the Matter of Review of Order No. R4-2012-0175.

[38] Revised Draft April 24, 2015. State of California State Water Resource's Control Board Order WQ 2015-XX In the Matter of Review of Order No. R4-2012-0175.

Table 6-9. Capital, O&M, and 20-year Life-Cycle Cost Opinion for Proposed Structural BMPs by Analysis Region

Watershed/ Analysis Region		Location of BMP	Project Name	Construction Cost Range		Annual O&M Range		Total 20-Year Life-Cycle[1] Range	
				Low	High	Low	High	Low	High
Santa Monica Bay Watershed	SMB-5-02, Alternative 1	Manhattan Beach	Manhattan Beach Infiltration Trench[2]	$3.7M	$6.8M	$140K	$190K	$6.5M	$11M
		Manhattan Beach	Distributed Green Streets	$2.4M	$6.5M	$110K	$220K	$4.6M	$11M
		SMB-5-02 Alternative 1 Combined Costs		**$6.1M**	**$13M**	**$250K**	**$410K**	**$11M**	**$22M**
	SMB-6-01	Hermosa Beach	Hermosa Beach Infiltration Trench	$500K	$1.1M	$18K	$32K	$860K	$1.7M
		Hermosa Beach	Hermosa Beach Greenbelt Infiltration[2]	$5.5M	$8.0M	$81K	$90K	$7.1M	$9.8M
		Redondo Beach	Park #3	$1.9M	$3.0M	$28K	$33K	$2.5M	$3.7M
		Hermosa Beach	Distributed Green Streets	$7.0M	$19M	$310K	$640K	$13M	$32M
		SMB-6-01 Combined Costs		**$15M**	**$31M**	**$440K**	**$800K**	**$23M**	**$47M**
	All Analysis Regions	Hermosa Beach	Trash exclusion devices	$160K	$430K	$50K	$64K	$1.1M	$1.7M
		Redondo Beach	Trash exclusion devices	$1.1M	$3.1M	$360K	$460K	$8.3M	$12M
		Manhattan Beach	Trash exclusion devices	$590K	$1.7M	$210K	$270K	$4.8M	$7.1M
	Combined Costs in Santa Monica Bay Watershed			**$23M**	**$50M**	**$1.3M**	**$2.0M**	**$49M**	**$90M**
Dominguez Channel Watershed	DC-RB/MB	Redondo Beach	Powerline Easement Infiltration[2]	$11M	$16M	$160K	$180K	$14M	$20M
		Redondo Beach	Artesia Blvd Infiltration	$2.0M	$3.1M	$30K	$35K	$2.6M	$3.8M
		Redondo Beach + Manhattan Beach	Distributed Green Streets	$7.4M	$20M	$330K	$670K	$14M	$33M
		DC-RB/MB Combined Costs		**$20M**	**$39M**	**$520K**	**$890K**	**$31M**	**$57M**
	DC-Torrance	Torrance	Catch basin inlet filters	$240K	$360k	$130K	$170k	$2.8M	$3.7M
		DC-Torrance Combined Costs		**$240K**	**$360k**	**$130K**	**$170k**	**$2.8M**	**$3.7M**
	Combined Costs in Dominguez Channel Watershed			**$20M**	**$39M**	**$650K**	**$1.1M**	**$33M**	**$61M**
Combined Costs of All Proposed Structural BMPs				**$43M**	**$89M**	**$2.0M**	**$3.1M**	**$82M**	**$150M**

M = Million dollars, K = Thousand dollars

[1] Life-cycle costs include construction costs and 20 years of annual O&M (in 2015 dollars) and are not discounted.

[2] Alternative project locations have also been identified, but are not included in combined cost opinion

7 Potential Funding Sources and Financial Strategy

The availability of funds will be critical for the implementation of the EWMP. This section provides an overview of potentially available funding sources for programs proposed in the EWMP. The funding sources included in this section for consideration are grants, interagency partnerships, bonds, State Revolving Funds, local funding opportunities, and public private partnerships.

The Beach Cities will establish a Memorandum of Understanding (MOU) for implementation of the EWMP. Development of the MOU will be initiated in March 2016 with the goal of completing the MOU by December 2016. At minimum, the scope of the MOU will address how the group will investigate and pursue funding for regional structural BMP projects described in the EWMP, and will include such details as delineation of responsibility, funding milestones, methods to secure funding, and others. The scope of the MOU may also include but is not limited to other joint EWMP implementation activities such as public information and participation programs.

In addition, each City in the Beach Cities WMG is also committed to pursuit of funding for individual EWMP implementation projects and programs related to water quality improvement within their respective cities, as demonstrated by the following examples:

- The City of Hermosa Beach has committed financial support for continuing work under the Stormwater Funding Options study (Farfsing and Watson, 2014 which will assist the City in identifying and implementing strategies for the establishment of sustainable revenue sources to manage stormwater programs and implement water quality improvement projects. In June 2015, the City passed a sanitary sewer fee for residents and commercial property owners to fund maintenance and rehabilitation of its aging sewer infrastructure that had previously been funded from the City's general fund. This dedicated fee for sanitary sewers will allow the City to redirect part of those general fund dollars, for capital improvements and maintenance of the City's storm drain system, including green street projects. The City won multiple awards for its Pier Avenue green street project and the City Council has recently committed to funding green alleyways between Beach Drive and Hermosa Avenue in an effort to improve water quality and flood impacts near the beach.
- The City of Manhattan Beach, like the City of Hermosa Beach, has committed financial support for continuation of the Stormwater Funding Options study. The City is also committed to implementing its Green Street Policy for capital improvement projects in the public right-of-way, has established a minimum runoff capture design goal for such projects, and will also use the EWMP to identify opportunities for green street BMP retrofits in the high priority area. City staff has an excellent track record and enjoys the support of its Council in the pursuit of funding for and implementation of green infrastructure as evidenced by two previous example projects: a 130,000 square feet porous concrete paving project on seven municipal parking lots, and the Greenbelt Infiltration Project installed within the linear greenbelt parkland.
- The City of Redondo Beach's green streets policy requires green street BMPs to be integrated with capital improvement projects (CIPs), thereby ensuring that BMPs be funded as part of ongoing and future CIPs. An example of this policy is the recent addition of catch basin trash screening devices into the Esplanade Street Resurfacing Project. In addition, the City has a

successful track record of pursuing and implementing water quality improvements grant funding such as the Alta Vista Diversion and Re-use Project and the Sapphire Stormdrain Diversion and Infiltration Project.

- The City of Torrance has appropriated funding for their catch basin inlet filters in the Dominguez Channel Watershed and has appropriated funding to complete their TMRP implementation by the end of 2016 (four years ahead of the TMDL compliance deadline). In addition, the City's green streets policy requires green street BMPs to be integrated with CIPs. The City of Torrance has an established record for pursuing grant funds for Storm Water Quality Projects. Completed projects include Bioswales for City Yard ($150,000 State grant funds), Machado Lake Trash TMDL Project ($1,000,000 State grant funds), and the Stormwater Basin Enhancement Project ($3,300,000 State grant funds and $300,000 Federal grant funds).

The foregoing examples illustrate the willingness of Beach Cities' staff and elected officials to pursue funding for EWMP implementation projects. Additional sources of funding will also be investigated, as described below.

7.1 Grant Opportunities

Grants have historically been a backbone for financing stormwater projects. The majority of the water-related grants are designated for flood control, drinking water, and watershed protection; very few grants are made available for the sole purpose of stormwater permit compliance. For example, the State of California has planned to spend $7.5 billion under the Water Quality, Supply and Infrastructure Improvement Act (2014), but only $200 million have been designated for stormwater capture projects statewide to enhance regional water reliability. In order to increase the likelihood of getting grant funding, a stormwater project might need to be added to a larger project or program that serves different proposes and has different objectives rather than just for stormwater management. Thus, collaboration and coordination between stormwater agencies and other public agencies would be important to increase accessible grant funding opportunities for stormwater projects.

It is noted that many grant funds do not cover 100% of the project costs, but instead, cost sharing from local governments (as much as 50%) is required under grant provisions. Furthermore, grants typically cover only project capital costs, but do not provide funding to cover ongoing operations and maintenance, and replacement costs of the infrastructure. Thus, alternative funding sources would be needed to provide stable O&M revenues as well as costs for replacement for any funded projects. **Table 7-1** presents the potential grant opportunities available that the Beach Cities can apply to fund the EWMP projects. The Beach Cities WMG intends to pursue the following grant opportunities:

The Beach Cities WMG has expressed commitment to pursue grant opportunities. The first joint effort will be for Prop 1 Coastal Conservancy in March 2016 for design of two priority regional projects – the Manhattan Beach Infiltration Trench Project and the Hermosa Beach Greenbelt Infiltration Project. Initiation of this pursuit has already begun, with the grant application expected to be submitted by the March 2016 deadline. The Beach Cities WMG intends to submit the Beach Cities EWMP for incorporation into the Integrated Regional Water Management Plan.

Since SB-985-Stormwater Resource Planning became effective in 2014, local governments have been required to have a stormwater resource plan and be in compliance with provisions of SB-985 in order to receive grants for stormwater and dry-weather runoff capture projects from a bond act approved by the voters after January 1, 2014. The EWMP could potentially be utilized as a functionally equivalent plan but further clarification will need to be provided in the guidance document which is anticipated to be established by the State Water Resource Control Board by July 1, 2016. Agencies and the LARWQCB staff should review and comment on the guidance document to ensure that these plans can be utilized.

Table 7-1. Relevant Grant Opportunities

Program	Department	Purpose	Ineligible Uses	Funding Limits
WaterSMART: Water and Energy Efficiency Grants	US Bureau of Reclamation	Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered and threatened species, facilitate water markets, or carry out other activities to address climate related impacts on water or prevent any water-related crisis or conflict.	Normal operations, maintenance, and replacement (OM&R). OM&R is described as system improvements that replace or repair existing infrastructure or function without providing increased efficiency or effectiveness of water distribution over the expected life of the improvement. Construction of a building.	Funding will be awarded at one of two levels: Funding Group I: Up to $300,000 per agreement for a project up to 2 years. Funding Group II: Up to $1,500,000 for an agreement for up to 3 years for a small number of projects.
WaterSMART: Cooperative Water Management Program (CWMP) Grants	US Bureau of Reclamation	The purpose is to improve water quality and ecological resilience and to reduce conflicts over water through collaborative conservation efforts in the management of local watersheds. The primary goal is to address two major concerns synonymous with watershed groups – 1) the need for funding to pay the salary of a full-time coordinator and 2) the limited funding available for project management.	Please visit the following website for evaluation criteria: http://www.usbr.gov/WaterSMART/cwmp/docs/CWMPEvaluationCriteria.pdf	Phase I funds shall be used to establish or enlarge a watershed group, to develop a mission statement for the watershed group, to develop project concepts, and to develop a restoration plan. Phase II funds shall be used to plan and carry out watershed management projects. Phase III funds shall be used to plan and carry out at least one watershed management project.
IRWM Implementation Program Proposition 84 (Chapter 2, §75026)	Department of Water Resources	Award funds for implementation of projects consistent with IRWM Plans to assist local public agencies in meeting long-term water management needs of the state, including the delivery of safe drinking water, flood risk reduction, and protection of water quality and the environment.	Operation and maintenance activities	Bond funding allocation for entire program is $1 billion. Prop 84 allots grant funding to 11 funding areas.

Program	Department	Purpose	Ineligible Uses	Funding Limits
Flood Corridor Program Propositions 1E, 84 and 13	Department of Water Resources	Flood risk reduction through non-structural projects that include wildlife habitat enhancement and/or agricultural land preservation components	Flood protection projects that do not include wildlife habitat enhancement or agricultural land preservation benefits	$5 million per eligible project. 10% non-state, non-federal cost share required; may be reduced to 5% or no-cost share if serving disadvantaged or severely disadvantaged community
Flood Control Subventions Program Propositions 1E and 84	Department of Water Resources	Implementation of federally authorized flood control projects (minor or major) and Watershed Protection Flood Prevention Projects	Flood control projects without federal authorization	Variable state cost-share percentage based on multipurpose objectives for projects, ranging from a minimum of 50% to a maximum of 70%
Statewide Flood Emergency Response Program Proposition 84	Department of Water Resources	Preparing or updating local emergency plan; Coordinating flood emergency planning and preparedness (including training & exercise); Developing communication & coordination response process; Collecting & exchange of flood information; Purchase & installing equipment for interoperable emergency communication.	Projects not included in guidelines. Projects in the Legal Delta.	$10 million for Statewide (outside the legal Delta) for Prop 84.
Santa Monica Bay Restoration Plan Proposition 84 ($18 million allocated)	Santa Monica Bay Restoration Commission	Providing a funding source for implementation of projects that protect Santa Monica Bay beaches and coastal waters, prevent contamination and degradation of coastal waters and watersheds, and protect and restore the Bay's marine, freshwater, and terrestrial habitats.	Projects that do not meet the Clean Beaches Program requirements. O&M projects are not eligible.	A minimum of $150,000 and a maximum of $6 million per project. Approximately $7 million have been made available for the recent request for proposals that closes on January 15, 2016.
California Coastal Conservancy, Prop 1 ($100.5 million allocated)	California Coastal Conservancy	Funding for multi-benefit water quality, water supply, and watershed protection and restoration projects.	Projects that do not comply with the Proposition 1 Grant Program Guidelines. Projects that use potable water for irrigation. O&M projects are not eligible.	$10 million per year grants will be made available over the next 10 years.

Program	Department	Purpose	Ineligible Uses	Funding Limits
Storm Water Grant Program, Prop 1. ($200 million), approved as part of the Water Quality, Supply and Infrastructure Improvement Act (2014).	State Water Resources Control Board and Regional Water Quality Control Boards	Funding for multi-benefit storm water management projects which will improve regional water self-reliance, security, and adapt to the effects on water supply arising from climate change.	Projects that 1) must seek eminent domain as part of their project implementation timeline; 2) do not meet the requirements of the Prop 1 Storm Water Grant Program Guidelines, the Storm Water Resources Plan Guidelines, Water Code, and Prop 1; 3) consist of only education and outreach activities.	Planning projects: min. $50K and max. $500K; Implementation projections: min. $250K and max. $10M.
IRWM Grant Program, Prop 1 ($510M, 2014) and Prop 84 ($232M, remaining).	Department of Water Resources	Funding for planning and implementation of IRWM, and groundwater sustainability.	IRWM plans/projects that do not contribute to addressing climate change risks; do not meet the requirements stated in the Prop 1 and Prop 84 Program Guidelines.	A total of $98M of the Prop 1 funding has been allocated to the Los Angeles Region. The Los Angeles Region has about $40M of remaining balance from Prop. 84 (after 2014 Drought Grant Awards).

7.2 Project-Specific Interagency Partnerships

Stormwater management projects often overlap with the jurisdiction of other public agencies, including water agencies, as well as parks and schools. Interagency partnerships would not only allow agencies involved to leverage one other's available funding resources to make cost intensive projects possible, but would also improve local government funding efficiency. These types of interagency partnership projects could also optimize the potential social, environmental, and economic benefits provided to the community. An interagency partnership also provides an alternative avenue for stormwater agencies to access to grant funding that would otherwise not be available to them. In addition to the above benefits, a partnership with public utility agencies, such as water and refuse collection services, might also provide a mechanism for cost transfer from stormwater agencies to these agencies. For example, the use of stormwater for non-potable water may conserve drinking water. The cost for providing the infrastructure and the ongoing O&M could be partly funded through fees charged by water agencies as part of their cost for water conservation. **Table 7-2** provides a list of potentially viable partnerships and the benefits derived from management of stormwater runoff.

Table 7-2. Added Benefits of Interagency Partnership for Stormwater Management

Potential Partners	Benefits Derived from Stormwater Management
Flood control district	• Flood protection • Climate change mitigation
Water agencies	• Potable water conservation through stormwater use for non-potable water purposes • Surface water pollution prevention • Increase non-potable water storage through installation of underground cisterns
Parks, Coastal Commission	• Terrestrial and marine habitat protection by reducing trash from entering the ocean and other terrestrial habitats • Water pollution prevention • Erosion reduction

7.3 Local Bond Issuance

Bonds have been utilized by local governments to provide funding for stormwater projects. There are two types of bonds that can be utilized. One of them is GO bonds. GO bonds are issued by local governments, which are repaid through a tax surcharge (e.g. property). The City of Los Angeles, for example, has used GO bonds to fund their stormwater projects. The City sold $440 million GO bonds under Proposition O Clean Water Bonds. The bond proceeds were used for implementation of 39 projects but could not be used for ongoing maintenance, operations and replacement of these facilities (Farfsing and Watson, 2014). The challenge of utilizing GO bonds is that GO bond issuance and the amount to be issued must be approved by two-third of the voters. The main drawback of election approval requirement is that the cost of holding an election can be high and the chance of success is often unpredictable.

Another type of bonds that can be used at the local level is revenue bonds. Revenue bonds are tax-exempt securitized bonds that are issued by utility agencies, such as water agencies. These bonds are repaid through utility rate increases charged directly to customers. Recent enactment of AB-850-Public Capital Facilities: Water Quality allows local publically owned water agencies to finance water quality and water conservation related projects by issuance of revenue bonds through a Joint Powers Authority (JPA). Under the provisions of AB-850, water agencies are allowed to use the bond proceeds to pay for construction, repair, maintenance, and operations of eligible projects. Both stormwater capture and water quality compliance projects are considered as eligible projects that can be financed through bond issuance under the AB-850 mechanism. Additionally, AB-850 authorizes water agencies to repay these bonds through water utility rate increases – the same way as other revenue bonds not issued under the SB-850 mechanism by water agencies. Such rate increases are also subject to Proposition 218 approval under the exempt category (i.e. only a public hearing is required).

Since the enactment of AB-850, a JPA, called Southern California Public Water Authority (SCPWA), has been established by the Los Angeles Department of Water and Power and the Burbank Water and Power (LADWP, 2015). The first two members of the SCPWA are the City of Los Angeles and the City of Burbank. The Beach Cities can consider becoming members of the SCPWA. However, details on how bond proceeds can be directed to pay for eligible stormwater projects identified in the EWMP will need to be further evaluated. It is expected that high level of collaboration and coordination between stormwater and water agencies would be required.

SB-628–Enhanced Infrastructure Financing Districts (EIFD) will allow issuance of general obligation bonds within the EIFD inside a city or a county. The Bill authorizes a legislative body to establish an enhanced infrastructure financing district, adopt an infrastructure financing plan, and issue bonds upon approval by 55% of the voters to finance public capital facilities such as collection and treatment of water for urban uses and flood control projects. Under the provisions of SB-628, a City or a County can establish an EIFD of any size. If a defined EIFD has fewer than 12 registered voters, only a protest hearing is required to be conducted for landowners. The number of votes that each landowner gets will depend on the size of the land they own. The ballot will specify a vote per acre or a portion of an acre. The bonds issued under this bill will be repaid through property tax increase (i.e. tax increment financing). The district will cease to exist in no more than 45 years from the date on which bond issuance is approved.

7.4 State Revolving Funds

Clean Water State Revolving Fund (CWSRF) Program, which is managed by the State Water Resource Control Board and funded by the US Environmental Protection Agency, is an alternative funding source for development of new infrastructure projects that will benefit water quality. The CWSRF finances water quality projects similar to those proposed in the EWMP, including nonpoint source, watershed protection or restoration, estuary management projects (USEPA, 2014). The main advantage of CWSRF is that their interest rates are typically much lower than market rates (e.g. 3% for a 20-year loan instead of 6%). The loans are project-specific and can serve as a good financial resource for funding project design and construction. The cost-saving achieved from utilizing the CWSRF can vary between 17% and 25% of the total project costs compared to conventional loans (USEPA, 2014; SWRCB, 2014). The maximum repayment term is 20 years. The CWSRF also has an Expanded Use program that provides funding for stormwater treatment and diversion, sediment and erosion control as well as stream restoration projects (CFCC, 2015). This special program offers interest rate at one-half of the general obligation bond rate with a repayment period of up to 30 years. There is no limit in terms of the amount an agency can borrow under this program. The main limitation of the CWSRF is that it cannot be used for project operation and maintenance (O&M) purposes (USEPA, 2013b).

The Infrastructure State Revolving Fund Program managed by the California Infrastructure and Economic Development Bank provides financing for public infrastructure projects for environmental mitigation purposes (CFCC, 2015). The loan can be used for construction or modification of public infrastructure, including educational, cultural, and social facilities, purchase and installation of pollution control equipment, and parks and recreation facilities. The loan size can range between $50,000 and $25 million with a maximum repayment period of 30 years. The interest rate is based on market rate but may be adjusted based on the social and economic status of the area where the project will be implemented.

Access to the State Revolving Funds is limited by the agencies' ability to borrow due to repayment of other debt obligations (e.g. lease burden). It has been reported that a typical median net lease burden for a California county is 1.7% of general fund revenues while the total burden of lease and General Fund obligations is 1.9% (Moody, 2012). Loan repayment will require alternative funding sources if reliance on general fund resources is not an option.

7.5 Local Public Funding Opportunities and Approval Procedures

Stormwater charges are potentially the most critical local funding source to finance stormwater programs in California. These charges include stormwater fees and taxes, as well as other funds generated through general obligation and revenue bond issuance. **Table 7-3** provides an overview of potential local funding sources that may be utilized to provide funds to finance stormwater programs. An important factor to consider when utilizing these funding mechanisms is the respective approval mechanisms as discussed below.

Table 7-3. Local Funding Opportunities

Fees	Taxes	Bonds
• Fixed and volumetric service fees • Property assessments or fees • Developer fees or connection fees (a one-time fee) • Permitting fees	**General taxes** • Property, sales, and other activities **Special taxes** • Parcel taxes to pay for flood protection, stormwater management, watershed protection • Sales tax add-ons • Transient Occupancy Tax to pay for creeks restoration and water quality improvement projects	**General bonds** • Repaid through a property tax surcharge **Revenue bonds** • Issued by local utilities (e.g. water) • Repaid by service fees, developer fees, plus occasional special taxes

Local funding opportunities presented in **Table 7-3** are subject to approval mechanisms that can vary from holding a simple written protest hearing to an election, depending on the type of funding sought after (**Table 7-4**). The types of charges that are deemed to be most suitable for stormwater-related services are property-related fees. For a property-based flood control-related stormwater management fees, an election is required to be conducted under the provisions of Proposition 218. However, there are two categories under Proposition 218 that are exempt from the election approval requirements. They are water-related and refuse collection services. The recent approval of AB2403 has extended the definition of water in Proposition 218 to include stormwater capture projects for infiltration and direct non-potable uses, which means that these projects are also exempt from the election requirement under Proposition 218.

Even with the extended definition of water in the California Constitution, the existing form of Proposition 218 still requires voter approval for stormwater fees which has limited stormwater agencies' ability to generate sufficient revenue to support stormwater projects related to permit compliance. An amendment to Proposition 218 that will allow stormwater fees to be treated like water, sewer, and refuse fees, is being discussed and considered (CSQA, 2015). A new AB-1362, which is designed to include the definition of "stormwater" into the California Constitution's Article XIII C and Article XIII D, was introduced to the State Assembly on February 27, 2015. The introduction of this Bill marks the first step toward such an amendment of Proposition 218.

Given the existing unique regulatory framework and limitation of Proposition 218, some local governments have broken down the stormwater revenue requirements by functions instead of a single property-related fee. Some of them have utilized the exempt category under Proposition 218 to fund stormwater projects with success. The Cities of Signal Hill, Poway, and Solana Beach, for example, have utilized a surcharge on trash collection fees to cover the some of the cost for stormwater-related trash collection and management. A surcharge on water utility fees has also been used by the Cities of Del Mar, Oceanside, and Solana Beach to provide funding to fund stormwater operation as part of the drinking water pollution prevention effort (Farfsing and Watson, 2014).

Pollution prevention is an important component in stormwater management. Given that majority of the pollutants in stormwater runoff originate from vehicles, some local governments have used other non-property-related surcharges to provide funding for stormwater programs. For example, the Orange County Transportation Authority has used the County's sales tax to provide some funding for a water quality improvement and environmental cleanup program. The San Mateo County has also added a surcharge on the vehicle license fee to provide funding for their stormwater pollution management program. It is also foreseeable that pollutant specific, such as a TMDL-related fee could be established to provide funding for TMDL compliance related programs in the future.

In addition to fees that provide steady revenue, another possible revenue source would be to charge fines to property owners that violate discharge limits (volumetric- or TMDL-based). Fines are not considered as a stable financial income, however it discourages behavior or practices that will lead to non-compliance. Furthermore, fines are exempt from election requirements under Proposition 26 and have been commonly used by water agencies to discourage excessive water consumption behavior. The use of fines under Proposition 26 as a financial instrument to management stormwater discharge in urban areas is still uncommon but might worth exploring.

Table 7-4. Local Funding Approval Mechanisms

	Proposition 13 (1978)	**Proposition 218 (1996)**	**Proposition 26 (2010)**
General taxes	Flexible	Simple majority for cities and counties, not available to special districts	*(rules from the earlier proposition remain in place)*
General obligation bonds	Two-thirds of local voters	Two-thirds of local voters	Two-thirds of local voters
Special taxes	Two-thirds of local voters	*(rules from the earlier proposition remain in place)*	*(rules from the earlier proposition remain in place)*
Property taxes	1% of purchase price + 2% annual increases	*(rules from the earlier proposition remain in place)*	*(rules from the earlier proposition remain in place)*
Property-related fees and assessments	Flexible	1. All water-related and refuse collection services: strict cost-of-service requirements 2. All water-related and refuse collection services: property-owner protest hearing 3. Floods and stormwater: 50% of property owners or two-third popular vote	*(rules from the earlier proposition remain in place)*
Non-property-related fees	Flexible	Flexible	Stricter requirements (more likely to be a tax)
Wholesale fees	Flexible	Flexible	Stricter cost-of-service requirements

Source: Public Policy Institute of California (PICC), 2014.

7.6 Public Private Partnerships

Public private partnerships (P3) can be achieved through two approaches. The conventional approach will involve having the private partner to undertake design and construction, and sometimes even operation and maintenance of the facilities. The private partner will recover the cost plus their return-on-investment through a guaranteed revenue stream (e.g. a user fee) over a long period (e.g. 30- 40 years). The main advantage of such an approach is that the upfront financing costs are provided through the private partner while the project performance is guaranteed by the private partner. Also, P3 can be utilized when agencies have restrictions on the amount of debt that they can carry (e.g. agencies want to maintain low lease burden or have high lease burden). Potential cost saving can be achieved through higher financial efficiency during project implementation phase. P3 can also expedite project implementation by simplifying administrative procedures for financing as well as eliminating the need for tendering. The main challenge for implementation of P3 is to get voters to approve a longer revenue stream to repay the private partner. The amendment of Proposition 218 is expected to lower such hurdle for providing such a revenue stream.

The second P3 approach is through direct financial subsidies to local projects that do not contribute to cash revenue generation. However, subsidies can create a financial incentive to encourage local participation without providing the full cost for project implementation. Such an approach can increase financial efficiency by leveraging financial input from communities. A list of cities that utilize financial subsidies to maximize their local stormwater capture capacity is provided in **Table 7-5**. Based on these examples presented in **Table 7-5**, subsidies can be given out in forms of 1) rebates per project with caps for stormwater runoff reduction projects, 2) rebate per rain barrel or cistern, 3) rebate per parcel, 4) stormwater fee reduction, and 5) cost sharing.

Among all the runoff capture subsidy programs listed in **Table 7-5**, the approach adopted by the City and County of San Francisco is considered as the most progressive. The City and County adopted the onsite Water Reuse for Commercial, Multi-family, and Mixed Use Development Ordinance which amended the San Francisco Health Code to allow for the collection, treatment, and use of alternative water sources (including stormwater runoff) for non-potable applications. The City and County has since developed a Non-potable Water Program that allows commercial, mixed use, and multifamily residential property owners to collect, treat and reuse water from various sources onsite, including stormwater runoff. The Program also allows the property owners to act as local non-potable water suppliers to provide non-potable water to buildings in the vicinity. Property owners or developers are required to comply with stringent monitoring and reporting requirements for 10 years in order to maintain such privilege. The San Francisco Public Utilities Commission (SFPUC) has created a grant assistant program that provides up to $250,000 for single building projects and up to $500,000 for district-scale projects meeting specific eligibility criteria to encourage participation.

Table 7-5. Selected Cities that provide Financial Subsidies to encourage the Development of Stormwater Infrastructure in Private Properties

Reference	Runoff Reduction	Runoff Capture and Use
San Francisco, CA (SFPUC, 2015)	**Grants** • Up to $30,000 with 35% match requirement • Up to $100,000 with 25% match requirement	**Grants (treatment is required)** • Up to $250,000 for single building projects • Up to $500,000 for district-scale projects
Palo Alto, CA (City of Palo Alto, 2015)	**Rebates** • Permeable pavement, ≤ $1,000 at $1.5/sq. ft., • Green roofs, ≤ $1,000 at $1.5/sq. ft.	**Rebates (roof runoff)** • Rain barrel $50 each • Cisterns ≤ $1,000 at $1.50/sq. ft.
Seattle, WA (Seattle Public Utilities [SPU], 2015)	• Rebates for onsite facility installation, e.g. rain garden • Stormwater drainage fee reduction	• Rebates for onsite facility installation, e.g. cistern (Roof runoff) • Stormwater drainage fee reduction
Montgomery County, MD (County of Montgomery, 2015)	**Rebates** • Residential, ≤ $2,500 per parcel • Commercial, ≤ $10,000 per parcel	**Rebates (roof runoff)** • Residential, ≤ $2,500 per parcel • Commercial, ≤ $10,000 per parcel
Washington, D.C. (Washington D.C., 2015)	Residential rebates Trees, ≤ $50 or $100 per tree Pervious surface, ≤ $2,500 at $1.25/sq. ft. All customers: Provide ≤55% stormwater fee discount	Residential rebates (roof runoff) Cisterns, ≤ $500 at $1/gallons All customers: Provide ≤55% stormwater fee discount

7.7 Financial Strategy

The above examples describe how the stormwater management program can potentially be funded using multiple approaches rather than a single fee arrangement. Such a strategy could potentially reduce the risk of insufficient support by voters or property owners. Based on the above discussions, a summary of potential financial approaches is provided in **Table 7-6**.

Table 7-6. Funding Approach Summary

Approach	Funding Type	Limitations	Potential Significance (with Respect to Overall Funding)
Grants	New Revenue	• Competitive • No guarantee of funding accessibility • Infrastructure projects only • Application preparation/submission requires significant staff time • Can only be used to pay for infrastructure-related projects • O&M costs are typically excluded	Medium
Project-Specific Interagency Partnerships	New Revenue	• Requires coordination between agencies • Varying project implementation schedules between agencies limit the viability of such an option	High
Local Bond Issuance	Financing	• GO bonds require approval by voters. • Revenue bond requires to be backed by a revenue stream • There is a financing cost • Infrastructure projects only • O&M costs are typically excluded	High
State Revolving Funds	Financing	• Revenue stream is needed to obtain loans • There is a financing cost • Infrastructure projects only • O&M costs are typically excluded	High
Local Public Funding Opportunities	New Revenue	• Requires voter approval • Infrastructure projects only (except for stormwater fee) • O&M costs are typically excluded (except for stormwater fee)	High
Public Private Partnership	Financing	• Revenue stream is needed to allow the private partner to recover their cost as well as provide return on investment	High
	Direct Subsidies / Cost-Sharing	• Funding source is needed to fund a subsidy program • Some projects may underperform due to poor project implementation, O&M, and monitoring	Low

7.8 Watershed Management Program Budgets

Table 7-7 provides watershed management program budget information for the Cities of Hermosa Beach, Manhattan Beach, Redondo Beach, and Torrance, as presented in the cities' Annual Reports per NPDES No. CAS 004001 Los Angeles County Municipal Storm Water Permit Order No. 01-182 and certain provisions of Order No. R4-2012-0175.

Table 7-7. Watershed Management Program Budgets for the Beach Cities WMG

	City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
Program Element	**Expenditures in FY14-15**	**Budget FY15-16**	**Expenditures in FY14-15**	**Budget FY15-16**	**Expenditures in FY14-15**	**Budget FY15-16**	**Expenditures in FY14-15**	**Budget FY15-16**
1. Program Management	$26,567	$15,900	$29,700	$29,700			$126,525 (CDD staff) $36,416 -MS4 Annual Fee	$140,000
a. Administrative staff time	included	included	included	included	$13,000	$13,000	Included	included
b. Administrative consultant support	included	included	included	included	$22,414	$19,800	included	Included
c. NPDES Permit fee and WDR fee	N/A	N/A	N/A	N/A	$10,000	$9,594	N/A	N/A
2. Public Information and Participation								
a. Public Outreach and Education	$8,184	$5,400	$7,700	$7,700	$8,057	$6,600	$6,500	$10,000
b. Employee Training	$9,716	$9,600	$7,700	$7,700	$6,092	$9,300	$2,500	$3,500
c. Used Oil, BCR (Hermosa Beach)/ c. Corporate Outreach (Redondo Beach, Torrance)	N/A	N/A	$6,600	$6,600	$15,692	$15,455	N/A	$1,500
d. Business Assistance	$1,735	$1,500	$7,700	$7,700	$3,085	$3,300	N/A	$1,000
3. Industrial/Commercial			$99,000	$99,000			$126,691 (fire-inspection & enforcement)	$135,000
a. Consultant	$1,112	$ 900	Included	Included	$3,263	$900	N/A	N/A

	City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
Program Element	Expenditures in FY14-15	Budget FY15-16	Expenditures in FY14-15	Budget FY15-16	Expenditures in FY14-15	Budget FY15-16	Expenditures in FY14-15	Budget FY15-16
b. Restaurant Inspect (incl. FOG)	$37,500	$35,000	Included	Included	City's cost recovered through fees	City's cost recovered through fees	N/A	N/A
c. Commercial Inspections	$9,500	$12,000	Included	Included	N/A	N/A		
4. Development Planning	$16,783	$2,400	$16,500	$16,500			N/A	N/A
a. Consultant/Special Projects	included	included	Included	Included	$9,797	$2,400	N/A	N/A
b. SUSMP and priority project	included	included	Included	Included	City's cost recovered through fees	City's cost recovered through fees	N/A	N/A
5. Development Construction								
a. Consultant	N/A	N/A	N/A	N/A	N/A	$4,500	N/A	N/A
b. Construction Site Inspections	$12,000	$3,600	$26,400	$26,400	City's cost recovered through fees	City's cost recovered through fees	$45,000 (BMP Investigation, Inspection)	$55,000
6. Public Agency Activities								
a. Public Facility Inventory and BMPs	N/A	N/A	$26,400	$26,400	N/A-	$9,000	$686,305.65	TBD
b. Municipal street sweeping	$346,000	$352,000	$1,045,000	$1,045,000	$164,354	$169,286	$1,240,000	$124,000
c. Downtown cleaning	N/A	N/A	N/A	N/A	$141,577	$153,815	N/A	N/A
d. Catch basin and insert cleaning	$135,000	$138,000	$66,000	$66,000	$20,000	$28,688	$135,000	$135,000
e. Trash collection/recycling	$3,414,000	$3,483,000	$660,000	$660,000	N/A	N/A	$10,340,000 (PW), $402 (Transit)	$10,500,00 0
f. Capital Costs	N/A	$440,000	N/A	N/A	$957,626	$5,000	$76,000	$4,000,000
g. Consultant assistance	$10,831	$9,000	N/A	N/A	N/A	N/A	N/A	N/A
h. Community Services (Parks)	N/A	N/A	N/A	N/A			$9,570	TBD

	City of Manhattan Beach		City of Redondo Beach		City of Hermosa Beach		City of Torrance	
Program Element	**Expenditures in FY14-15**	**Budget FY15-16**	**Expenditures in FY14-15**	**Budget FY15-16**	**Expenditures in FY14-15**	**Budget FY15-16**	**Expenditures in FY14-15**	**Budget FY15-16**
7. IC/ID Program			$30,800	$30,800			N/A	N/A
a. Sewer line hydro flushing	N/A	N/A	N/A	N/A	$126,885	$126,885	N/A	N/A
b. Sewer CCTV, emergency repairs	N/A	N/A	N/A	N/A	$188,000	$272,325	N/A	N/A
c. IC/ID Program			N/A	N/A	$1,518	$9,000	N/A	N/A
d. Operations and Maintenance	$3,100	N/A	Included	Included	N/A	N/A		
e. Consultant Assistance	$10, 831	$9,000			N/A	N/A		
8. Monitoring and TMDL Compliance			$30,800	$30,800			$150,000	$160,000
a. CIMP Implementation	N/A	$80,000			N/A	$26,222	included	Included
b. CSMP Monitoring and Compliance	$11,130	$11,350			$3,457	N/A	included	included
9. Watershed Planning and Implementation							N/A	N/A
a. WMG Planning	N/A	N/A			$10,276	$14,700	N/A	N/A
b. EWMP and CIMP development	$65,000	$10,000			$27,704	$85,000	N/A	N/A
c. TMDL Consulting Services	$12,500	$61,060			N/A	N/A	N/A	N/A
10. Other	N/A	N/A	$209,000	$209,000	N/A	N/A	$20,000 (PW and Parks)	$25,000 (PW and Parks)
11. Total	$4,131,489	$4,679,710	$2,275,900	$2,275,900	$1,732,797	$984,770	$13,000,910	15,290,000

8 LEGAL AUTHORITY

The Beach Cities WMG Permittees have the necessary legal authority to implement the BMPs identified in the EWMP, as provided in **Appendix P**.

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Appendix A

Notice of Intent

NOTICE OF INTENT

Enhanced Watershed Management Program
&
Coordinated Integrated Monitoring Program

December 17, 2013 ~~June 28, 2013~~

Beach Cities
Watershed Management Group
City of Redondo Beach
City of Manhattan Beach
City of Hermosa Beach
City of Torrance
Los Angeles County Flood Control District

1. Introduction

The Cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance and the Los Angeles County Flood Control District (LACFCD), collectively the Beach Cities Watershed Management Group (Beach Cities WMG), respectfully submit this Notification of Intent (NOI) to develop an Enhanced Watershed Management Program (EWMP) per Part VI.C.4.b. of Order No. R4-2012-0175 (MS4 Permit). Additionally, this NOI includes a statement of the Beach Cities WMG agencies' intent to follow a Coordinated Integrated Monitoring Program (CIMP) approach.

The Beach Cities WMG has determined to jointly develop an EWMP and CIMP to address both the Santa Monica Bay and Dominguez Channel Watershed areas within their jurisdictions. The development of the Work Plan, CIMP, and EWMP will be a collaborative process between the Beach Cities WMG agencies, coordinated with the Technical Advisory Committee as well as with Beach Cities watershed stakeholders.

The information provided in the following sections satisfies the EWMP requirements for NOI submittal as provided by Section VI.C.4.b of the MS4 Permit and the CIMP notification requirement as provided by Attachment E Section IV.C.1. Each of the following section headings includes the permit reference to the NOI requirement being addressed by that particular section.

2. Notification of Intent (Section VI.C.4.b.i and Attachment E Section IV.C.1.)

The Beach Cities WMG hereby notifies the Los Angeles Regional Water Quality Control Board (LARWQCB) of its intention to collaboratively develop an EWMP for the Santa Monica Bay and Dominguez Channel Watershed areas within their jurisdictions, and request submittal of the final Work Plan no later than 18 months after the effective date of the MS4 Permit (June 28, 2014) and submittal of the draft EWMP Plan no later than 30 months after the effective date of the MS4 Permit (June 28, 2015).

Additionally, the Beach Cities WMG agencies hereby notify the LARWQCB by this NOI of their intention to collaboratively develop a CIMP to address all of the monitoring elements required by the MS4 Permit for its jurisdictions and request submittal of the Draft CIMP 18 months after the effective date of the MS4 Permit (no later than June 28, 2014).

3. Interim and final TDML compliance deadlines (Section VI.C.4.b.ii)

Table 1 lists the TMDLs that are applicable within the Beach Cities WMG EWMP.

Table 1. TMDLs applicable within Beach Cities WMG.

TMDL	LARWQCB Resolution Number	Effective Date
Santa Monica Bay Beaches Bacteria TMDL	2002-004 and 2002-022 amended by R12-007	07/15/2003 R12-007 not yet effective
Machado Lake Trash TMDL [1]	2007-006	03/06/2008
Machado Lake Nutrient TMDL [2]	2008-006	03/11/2009
Machado Lake Toxics TMDL [3]	R10-008	03/20/2012
Los Angeles and Long Beach Harbors Toxics & Metals TMDL [4]	R11-008	03/23/2012
Santa Monica Bay Nearshore Debris TMDL [5]	R10-010	03/20/2012
Santa Monica Bay DDT and PCB TMDLs [6]	USEPA Region IX	03/26/2012

[1] Responsible agencies: Redondo Beach, Torrance, LACFCD
[2] Responsible agencies: Redondo Beach, Torrance, LACFCD
[3] Responsible agencies: Redondo Beach, Torrance, LACFCD
[4] Responsible agencies: Redondo Beach, Torrance, LACFCD, Manhattan Beach
[5] Responsible agencies: Redondo Beach, Torrance, LACFCD, Manhattan Beach, Hermosa Beach
[6] Responsible agencies: Redondo Beach, Torrance, LACFCD, Manhattan Beach, Hermosa Beach

Interim and final trash TMDL deadlines and final TMDL deadlines occurring prior to the anticipated approval date of the EWMP (April 28, 2016) are included in Table 2.

Table 2. Interim (trash) and final TMDL compliance deadlines prior to EWMP approval

TMDL	Milestone	Interim/Final	Deadline
Santa Monica Bay Beaches Bacteria Summer Dry Weather TMDLs	WLAs	Final	07/15/2006
Santa Monica Bay Beaches Bacteria Winter Dry Weather TMDLs	WLAs	Final	07/15/2009
Santa Monica Bay Nearshore Debris TMDL	20% of baseline load	Interim	3/20/2016
Machado Lake Trash TMDL	20% reduction of baseline load	Interim	03/06/2012
	40% reduction of baseline load	Interim	03/06/2013
	60% reduction of baseline load	Interim	03/06/2014
	80% reduction of baseline load	Interim	03/06/2015
	100% reduction of baseline load	Final	03/06/2016

The Beach Cities WMG will continue the implementation of watershed control measures concurrently with the EWMP development to meet these interim and/or final milestones. These control measures being implemented to meet the requirements of the interim and final trash water quality based effluent limits (WQBELs) and all other final WQBELs include but are not limited to the following:

Santa Monica Bay Beaches Bacteria TMDL – Dry Weather

All storm drains discharging at point zero shoreline monitoring locations within the Beach Cities EWMP subwatersheds have been diverted through cooperation with LACFCD and the Sanitation Districts of Los Angeles. A total of seven low flow diversions are operational within the subwatersheds as follows:

- Two low flow diversions operated by the LACFCD within the 28th Street storm drain system which outfalls at the zero point of SMB 5-2—one of the diversions is at the outfall, and the other is on a major catchment within the City of Manhattan Beach.
- A low flow diversion is operated at the outfall of the Manhattan Beach Pier drain by the City of Manhattan Beach and serves SMB 5-3.
- Hermosa Strand Infiltration Trench, a joint project of the City of Hermosa Beach and LACFCD started up in April 2010 and has been diverting both dry weather and wet weather flows from the Pier Avenue storm drain in Hermosa Beach and serves SMB 5-5.
- Herondo low flow diversion installed by the LACFCD diverts runoff from the Herondo storm drain which outfalls at the zero point of SMB 6-1.

- A low flow diversion installed by the City of Redondo Beach on the outlet to SMB-6-3 diverts dry weather flow to a biofiltration system before being infiltrated into the ground.
- A low flow diversion installed by the LACFCD on the outlet to SMB-6-5 diverts dry weather flows to the sanitary sewer system.

Santa Monica Bay Nearshore and Offshore Debris TMDL

Each of the Beach Cities WMG incorporated cities has individually submitted a Trash Monitoring and Reporting Plan to the LARWQCB describing an approach and schedule for meeting the interim and final deadlines for reductions in trash waste load allocation from baseline for point source discharges from the MS4. The Beach Cities WMG agencies are individually responsible for meeting those deadlines for point source discharges from the MS4.

Machado Lake Trash TMDL TMRPs

Only the cities of Redondo Beach and Torrance within the Beach Cities WMG are tributary to the Machado Lake subwatershed within the Dominguez Channel Watershed. The City of Redondo Beach accounts for only 0.02% of the Machado Lake Watershed and there are no catch basins within the City of Redondo Beach tributary to Machado Lake—the first catch basin which receives runoff for that area of Redondo Beach is in the City of Torrance. Therefore, the City of Torrance's plans to address the Machado Lake TMDLs are inclusive of the City of Redondo Beach. The City of Torrance submitted a Trash Monitoring and Reporting Plan to describe the approach and schedule for meeting the interim and final deadlines for reductions in trash waste load allocations from baseline for point source discharges from the MS4.

4. Geographic Scope (Section VI.C.4.b.iii.(1))

The geographic scope of the Beach Cities WMG EWMP encompasses all of the incorporated MS4 areas of the cities of Redondo Beach, Manhattan Beach, Hermosa Beach and Torrance and includes the infrastructure of the LACFCD within those jurisdictions.

The County of Los Angeles does own and operate 172 acres of beach area within the jurisdiction~~-~~s of the Beach Cities. These beach areas do not have any storm drain infrastructure that collects and discharges beach runoff directly to the receiving water and should therefore be considered non-point sources and would not be subject to the MS4 permit or EWMP requirements. The storm drains that outlet at the beaches are collecting and discharging drainage from upstream land areas. The City of Hermosa Beach owns the beach above the mean high tide line along its coastline and, like the County-owned beaches, the beaches of Hermosa Beach are non-point sources, not equipped with storm drain infrastructure, and as such are not subject to the MS4 Permit or EWMP requirements.

The Hermosa Beach Pier is not equipped with an MS4 infrastructure, rather the surface of the pier is slightly sloped so that stormwater sheet-flows off the pier laterally. Similarly, the Manhattan Beach Pier is not equipped with an MS4 infrastructure or stormwater conveyance system--rainfall sheet flows off the pier through multiple openings along its length which, depending on location along the pier, either falls onto the beach or into the ocean. Accordingly, the Hermosa Beach and Manhattan Beach piers are not part of the MS4; they are non-point sources excluded from the MS4 Permit scope and therefore the EWMP.

The Redondo Beach Pier including the King Harbor Marina are included in the geographic scope of the Beach Cities WMG EWMP as these areas are equipped with MS4 infrastructures.

Attachment 1 provides a map of the watershed boundaries and the delineations of the land areas of the incorporated cities within the watershed. The breakdown of the Beach Cities WMG EWMP area by watershed and incorporated city is provided in Table 3.

Table 3. Beach Cities WMG EWMP watershed land area distribution and EWMP participation

Participation Agency	Santa Monica Bay Watershed Management area (acres)	Dominguez Channel Watershed Management area (acres)	Total EWMP Area (acres)	Total EWMP Percentage
City of Redondo Beach	2,613.50	1,217.61	3,831.11	19%
City of Manhattan Beach	2,078.37	350.07	2,428.44	12%
City of Hermosa Beach	831.51	0	831.51	4%
City of Torrance	2,313.76	11,056.79	13,370.55	65%
LACFCD	N/A	N/A		N/A
Area of Beach Cites WMG EWMP:	**7,837.14**	**12,624.47**	**20,461.61**	**100%**

5. Plan Concept (Section VI.C.4.b.iii.(1))

Based on studies and work done to date, the Beach Cities WMG has previously identified opportunities for regional projects within two high priority subwatersheds and anticipates that significant opportunities exist within the collective jurisdictional areas for collaboration on additional multi-benefit projects that will meet the intent of the EWMP approach. The Beach Cities WMG strong preference is to address both watersheds to which they are tributary within one EWMP.

Santa Monica Bay Watershed

The agencies of the Beach Cities have been working together since 2004 to implement the previously developed Jurisdictional Groups 5 and 6 Implementation Plan for the Santa Monica Bay Beaches Bacteria Total Maximum Daily Load (TMDL), including a Structural Best Management Practice (BMP) Siting Study and Dry Weather Source Characterization and Control Study for two high priority subwatersheds, along with joint implementation of programmatic solutions. Since 2004 the Beach Cities have also been jointly funding receiving water monitoring consistent with the Coordinated Shoreline Monitoring Plan for the Santa Monica Bay Beaches Bacteria (SMBBB) TMDL along the shoreline of the Beach Cities WMG. These ongoing efforts by the Beach Cities WMG to comply with the SMBBB TMDL will provide an effective springboard for the development of an EWMP.

Additionally, the agencies have submitted individual Trash Monitoring and Reporting Plans (TMRPs) for the Santa Monica Bay Debris TMDL.

Dominguez Channel Watershed

The cities of Redondo Beach, Manhattan Beach, Torrance and the LACFCD facilities within these cities are also tributary to the Dominguez Channel watershed. With the exception of the development of the City of Torrance Stormwater Quality Master Plan, there has not been extensive work to address the pollutants of the Dominguez Channel primarily because the TMDLs for Dominguez Channel were only recently approved by the State Water Resources Control Board. The EWMP for the Beach Cities WMG will leverage elements of the City of Torrance Stormwater Quality Master Plan to address the Dominguez Channel Watershed aspects of the Beach Cities EWMP. Due to the strong working relationship established among these agencies to implement the Santa Monica Bay Beaches Bacteria TMDLs, collaboration among these agencies to develop an EWMP that also addresses the Dominguez Channel Watershed is likely to yield a successful partnership.

The cities of Redondo Beach, Torrance and the LACFCD facilities within the Beach Cities Watershed Management Group are also tributary to the Machado Lake watershed within the Dominguez Channel Watershed. The City of Redondo Beach accounts for only 0.02% of the Machado Lake Watershed and storm drains within the City of Torrance receive runoff from this small area of Redondo Beach. Therefore, the City of Torrance's plans to address the Machado Lake TMDLs are inclusive of the City of Redondo Beach. To date, the City of Torrance has submitted a Special Study #3 Report for Machado Lake Nutrient TMDL monitoring. The City of Torrance is also preparing a BMP Implementation Plan to address Machado Lake Nutrient and Toxics TMDLs. The LACFCD has also submitted the "Machado Lake Nutrient & Toxics TMDL Monitoring & Reporting Plan. The Beach Cities WMG EWMP will incorporate the Machado Lake BMP Implementation Plans prepared by the City of Torrance and LACFCD as an appendix to the EWMP.

6. Cost estimate for plan development (Section VI.C.4.b.iii.(2))

The Beach Cities WMG agencies collaboratively prepared a scope of work and requested proposals for development of the EWMP Work Plan, the CIMP and the draft and final EWMP. Based on the response to the request for proposals, the Beach Cities WMG is developing a cost sharing agreement for the memorandum of agreement based on an estimate of $760,000 which includes $90,000 for the Work Plan, $155,000 for the CIMP, and $439,000 for the EWMP with an additional allocation of $76,000 for project administration by the lead agency. This estimate is based on a number of assumptions including that the CIMP and EWMP will leverage the existing Santa Monica Bay Beaches Bacteria TMDL Implementation Plan and Coordinated Shoreline Monitoring Plan work to-date. An additional key assumption for this cost estimate is that the City of Torrance Machado Lake TMDL Monitoring and Implementation Plans will be incorporated as stand-alone appendices to the EWMP and CIMP so that effort for the Machado Lake subwatershed of the Dominguez Channel is excluded from the cost estimate since it is being borne individually by the City of Torrance. In addition, the Beach Cities WMG agencies will contribute several hundred thousand of dollars in staff time and in-kind services.

7. Memorandum of Understanding (Section VI.C.4.b.iii.(3))

Attachment 2 includes the final drafts of the Memoranda of Understanding between the City of Redondo Beach, as the lead agency, and the other Beach Cities WMG agencies. All agencies have committed to the execution of the agreement as indicated by the signed letters of intent (Attachment 3). The agreement will be executed no later than December 28, 2013.

8. Interim milestones and deadlines for plan development (section VI.C.4.b.iii.(4))

Table 4 summarizes the interim milestone and deadlines for Work Plan, CIMP, and EWMP Plan development which are based on the scope of work for developing the Work Plan, CIMP, and EWMP prepared by the Beach Cities WMG. Technical memoranda supporting the development of the plans are utilized as milestones. It is expected that the draft technical memos will not be finalized; rather, the information presented in the memos will be revised based on comments and presented in the Work Plan, CIMP, and EWMP Plan.

Table 4. Proposed interim milestones and deadlines for plan development

• Milestones	Deadlines
Work Plan	
Draft Workplan Elements/Approach • Identification of Water Quality Priorities • Existing and Potential Control Measures • Reasonable Assurance Analysis Approach	• March 2014
Draft Work Plan	• April 2014
Final Work Plan submitted to the LARWQCB	**June 2014**
Coordinated Integrated Monitoring Plan	
Draft Technical memos • Outfall and receiving water monitoring approach • Monitoring sites selection • New development and redevelopment effectiveness tracking	• March 2014
Draft CIMP	• April 2014
Final Draft CIMP submitted to the LARWQCB	**June 2014**
Enhanced Watershed Management Program	
Draft Technical memos • Approach to US EPA TMDLs, 303(d) listings, other exceedances of RWLs • Initial list and screening of regional projects • Identify Selected Watershed Control Measures and Conduct Reasonable Assurance Analysis • Project schedules and cost estimates	• March 2015
Draft EWMP	• May 2015
Final Draft EWMP submitted to the LARWQCB	**June 2015**
Final EWMP submitted to the LARWQCB	**January 2016**
Approval of final EWMP by LARWQCB	**April 2016**

9. Structural BMP Implementation (Section VI.C.4.b.iii.(5))

The Beach Cities WMG commits to implement the following structural BMPs or suite of BMPs to provide meaningful water quality improvement within each watershed within 30 months of the effective date of the MS4 Permit, that is, between the MS4 Permit effective date of December 28, 2012~~3~~ and the deadline for EWMP submittal on June 28, 2015. The Beach Cities WMG plans to implement the following structural BMPs or suite of BMPs:

Manhattan Beach Greenbelt Infiltration System

The Manhattan Beach Greenbelt Infiltration project was designed to utilize the linear greenbelt parkland which runs through the City of Manhattan Beach to intercept and infiltrate dry weather and wet weather low flows from existing storm drains that cross or abut the parkway. Low flows from a 50-acre drainage area are screened to remove trash and gross solids before flowing by gravity to a subsurface infiltration system which also provides limited storage of storm flows for subsequent percolation into the sandy soils below the greenbelt. The Greenbelt Low Flow Infiltration system was designed to effectively divert dry-weather and wet-weather low flows from the storm drain system year round. The project construction was recently completed on February 19, 2013, within the 30 month period required as discussed in Section VI.C.4.b.iii of the MS4 Permit. Monitoring of project effectiveness is currently underway and a final report on this project will be available in advance of the EWMP submittal deadline.

Torrance Stormwater Basin Recharge and Enhancement Project

The Torrance Stormwater Basin Recharge and Enhancement Project will retrofit three existing detention basins serving 1,453 acres of drainage area in total within the City of Torrance. The project will utilize a number of BMPs in order to conserve water, recharge the aquifer, create critical habitat, and improve stormwater quality that discharges into the Santa Monica Bay, and eliminate non-stormwater discharges to the Dominguez Channel. Historically, the basins have provided temporary detention for stormwater and urban runoff—during the winter period discharge from this system has been pumped to the Herondo Storm Drain which discharges to the Santa Monica Bay, while the summer period flows from the system have been pumped to a storm drain discharging to the Dominguez Channel. This Stormwater Basin Recharge and Enhancement project proposes significant advances over the current system by providing wetland treatment of stormwater and non-stormwater runoff at the detention basins, recharging vitally needed groundwater supplies, and sustaining wetland habitat during the dry season in the basins.

The Project will eliminate dry weather run off and associated load for multiple pollutants for 1,453 acres of the Santa Monica Bay watershed. The Project will treat all stormwater from 1,453 acres for multiple pollutants, including priority pollutants such as trash and sediments by a combination of wetland treatment and infiltration. The project will capture and recharge an estimated 20 acre feet per year of runoff that would have otherwise been discharged to the Santa Monica Bay.

The project will enable the elimination of all discharges from the drainage area to Dominguez Channel, will eliminate dry weather discharges to Santa Monica Bay and will reduce the ~~winter~~ wet weather discharge to the Santa Monica Bay from this system. The project budget is $4.4 million and construction is scheduled for Spring 2014~~3~~.

The scope of the project includes:

Amie Basin [463 acre tributary area]:

1. Construction of a 2-acre wetland for storm water treatment. Clearing and grubbing of non-native plants and re-planting with native and wetland-suitable plants and trees.

2. Installation of a one-horsepower, energy-efficient submersible sump pump and 500 linear feet of irrigation pipelines to circulate and oxidize the storm water, provide UV exposure to eliminate bacteria, and promote wetland growth.

3. Installation of trash screens on all catch basins in the watershed to trap and remove solid waste from flowing into the basins from the stormwater inlets.

4. Replacement of pumps and controls for the Amie Basin Pump Station.

Henrietta Basin [594 acre tributary area]:

1. The construction of a 1.5-acre wetland for storm water treatment. Clearing and grubbing of non-native plants and re-planting with native and wetland-suitable plants and trees.

2. Construction of a 1.5 acre infiltration area which will be located at the south end of the basin.

3. Installation of an energy-efficient, one-horsepower submersible sump pump and 500 linear feet of irrigation pipelines to circulate and oxidize the water, provide UV exposure to eliminate bacteria, and promote wetland growth.

4. Installation of trash screens on all catch basins in the watershed to trap and remove solid waste from flowing into the basin from the stormwater inlets.

Entradero Basin [463 acre tributary area]:

1. The construction of a 15,031-square-foot infiltration area.

2. Installation of trash screens on all catch basins in the watershed to trap and remove solid waste from flowing into the basin from the stormwater inlets.

3. Installation of the new biofiltration swale next to the dog training area to capture and treat runoff from this specific area of the public park site and pet waste stations at trail heads.

4. Installation of 1,800 linear feet of irrigation pipeline and fittings to provide recycled water irrigation to the ball fields and native landscaped areas.

Accelerated Implementation of Machado Lake Trash TMDL

The City of Torrance is conducting accelerated implementation of the Machado Lake Trash TMDL by installing 631 Automatic Retractable Screens and 2,000 ‘no parking’ signs as well as a program of outreach and education. The screens will prevent trash from being carried into Machado Lake from urban runoff and storm drain flows, and the 'no parking' signs are to improve the effectiveness of street sweeping operations and the effectiveness of the Automatic Retractable Screens. The project will have multiple benefits because eliminating trash and plant debris from the storm drains will reduce the growth of bacteria and enhanced street sweeping will reduce sediment and nutrients bound in plant debris from being transported through the storm drains. The project is scheduled for construction in Fall of 2013 which is 2.5 years in advance of the March 2016 deadline for achieving zero trash discharge to Machado Lake.

10. LID ordinance (Sections VI.C.4.b.iii.(6) and VI.C.4.c.iv. (1))

Table 5 summarizes the status of Low Impact Development (LID) ordinances by the various Beach Cities WMG agencies. As presented in Table 5, greater than 50% of the land area within the geographic scope of the EMWP is addressed by LID ordinances that are in draft.

Table 5. Summary of percent EWMP area addressed by LID ordinances

EWMP agency	% EWMP area	Status LID ordinance
City of Redondo Beach	19	Draft LID Ordinance
City of Manhattan Beach	12	Draft LID Ordinance
City of Hermosa Beach	4	Draft LID Ordinance
City of Torrance	65	Draft LID Ordinance
LACFCD	N/A	N/A
Total	100	

Status Descriptions:

- Draft Ordinance – Permittee has completed or will complete by June 28, 2013 the development of a draft LID Ordinance that is in compliance with the MS4 Permit for its portion in the watershed.

11. Green street polices (Sections VI.C.4.b.iii.(6) and VI.C.4.c.iv. (2))

Table 6 summarizes the status of green street policies by the various Beach Cities WMG agencies. As presented in Table 6, greater than 50% of the land area within the geographic scope of the EMWP is addressed by green streets policies that are in place or in draft.

Table 6. Summary of percent EWMP area addressed by Green Street policies

EWMP agency	% EWMP area	Status Green Street Policies
City of Redondo Beach	19	Draft policy
City of Manhattan Beach	12	Draft policy
City of Hermosa Beach	4	In Place
City of Torrance	65	Draft policy
LACFCD	N/A	N/A
Total	100	

Status Descriptions:

- In Place – Permittee has an existing policy for its portion of the watershed.

- Draft Policy – Permittee has completed or will complete by June 28, 2013 the development of a draft Green Street Policy that is in compliance with the MS4 Permit for its portion in the watershed.

Attachment 1. Beach Cities WMG EWMP Boundary and Watershed Delineation

Attachment 2. Draft Memorandum of Understanding

Attachment 3. Letters of Intent

Appendix B

Reasonable Assurance Analysis for Dominguez Channel Watershed within the City of Torrance

CITY OF TORRANCE

BEACH CITIES EWMP

TECHNICAL MEMORANDUM NO. 2

REASONABLE ASSURANCE ANALYSIS FOR DOMINGUEZ CHANNEL WATERSHED WITHIN THE CITY OF TORRANCE

DRAFT
May 2015

CITY OF TORRANCE

BEACH CITIES EWMP

TECHNICAL MEMORANDUM
NO. 2

REASONABLE ASSURANCE ANALYSIS FOR DOMINGUEZ CHANNEL

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REASONABLE ASSURANCE ANALYSIS FOR DOMINGUEZ CHANNEL

1.0 EXECUTIVE SUMMARY

In order to satisfy the Los Angeles Municipal Separate Storm Sewer System (MS4) Permit (Permit) requirements, the Cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance, along with the Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an Enhanced Watershed Management Program (EWMP) for both the Santa Monica Bay Watershed and Dominguez Channel Watershed areas within their jurisdictions. This group is hereafter referred to as the Beach Cities Watershed Management Group (Beach Cities WMG).

A required element of the EWMP is the Reasonable Assurance Analysis (RAA). The Permit requires compliance with appropriate water quality standards as developed through applicable total maximum daily loads (TMDLs) and other Permit limitations including water quality based effluent limitations (WQBELs), receiving water limitations (RWLs), and water quality objectives (WQOs).

This RAA includes a qualitative analysis based on literature review to demonstrate that proposed catch basin filters would be effective in meeting the TMDL requirements. The ultimate goal is to identify cost-effective water quality improvement projects through an integrated, watershed-based approach.

On March 25, 2014, the Los Angeles Regional Water Quality Control Board (Regional Board) issued “RAA Guidelines” (LARWQCB 2014) to provide information and guidance to assist permittees in development of the RAA. The Storm Water Management Model (SWMM) was utilized to perform the RAA for the portion of the Dominguez Channel within the City of Torrance. The portion of the Dominguez Channel watershed within the City of Torrance is referred to as DC-Torrance Watershed in this report. The pollutant combinations assessed by this RAA fall into two categories; Category 1 and Category 2. The Category 1 pollutants are copper, lead, and zinc and Category 2 pollutant is fecal coliform. The baseline load for the metals were determined using the 90th percentile wet weather (days with rainfall > 0.1”) daily load from the 10 year period from November 1, 2002 to October 31, 2012. The baseline load for fecal coliform was based on 90th percentile wet year load from November 1, 1994 to October 31, 1995. However, the target load reductions (TLRs) were established for both metals and bacteria by the South Bay Beach Cities Watershed Management Group and were used in this RAA memo to maintain consistency. The difference between the baseline load and the target load resulted in a TLR for the 90th percentile load day, which was the load reduction required to meet the allowable TMDL concentration.

Based on literature review documenting high removal efficiencies demonstrated by the catch basin filters, the City of Torrance has proposed to implement catch basin filters to meet the target load reductions (TLRs) set forth by the Dominguez Channel Toxics TMDL. All references reviewed as part of the literature review are included in Appendix B.

In addition, the City of Torrance is in the process of developing the Green Street Program and the ordinances to implement Green Street design features as part of street redevelopment. While implementing redevelopment of arterial streets, the City of Torrance would assess opportunities for Green Street design features to facilitate treatment through filtration or infiltration. Green Street elements may include infiltration trench that provides water quality treatment, reduction in peak flow discharges, and potential groundwater recharge. Other Green Street elements that may be considered include bioretention/biofiltration practices to achieve water quality treatment through filtration by vegetation and soils to remove pollutants with perforated underdrain to convey the treated runoff. The City of Torrance is committed to developing the Green Street Ordinance established and in effect by July 2015 as required by the MS4 Permit.

For bacteria, a combination of non-structural BMPs including Public Education and Outreach, reduction of irrigation return flows, and future development and implementation of Green Street design features would assist with meeting the TLRs for bacteria. In addition, the study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 indicated Fecal Coliform (bacteria) removal efficiency of 33% by the Grate Inlet Skimmer Box/Round Curb Inlet Basket.

These recommendations serve as goals for the Beach Cities WMG to seek opportunities for implementation over time, but strategies may change as opportunities for more cost-effective BMPs are identified throughout the schedule.

The publically available County's LSPC model, calibrated by California Watershed Engineering (CWE) in January 2015 for the Dominquez Channel Enhanced Watershed Management Program was used to calibrate the DC-Torrance SWMM model.

As part of the RAA, the metals TLRs reflect daily load reductions on the 90th percentile wet weather load days and bacteria TLRs is based on daily exceedance days.

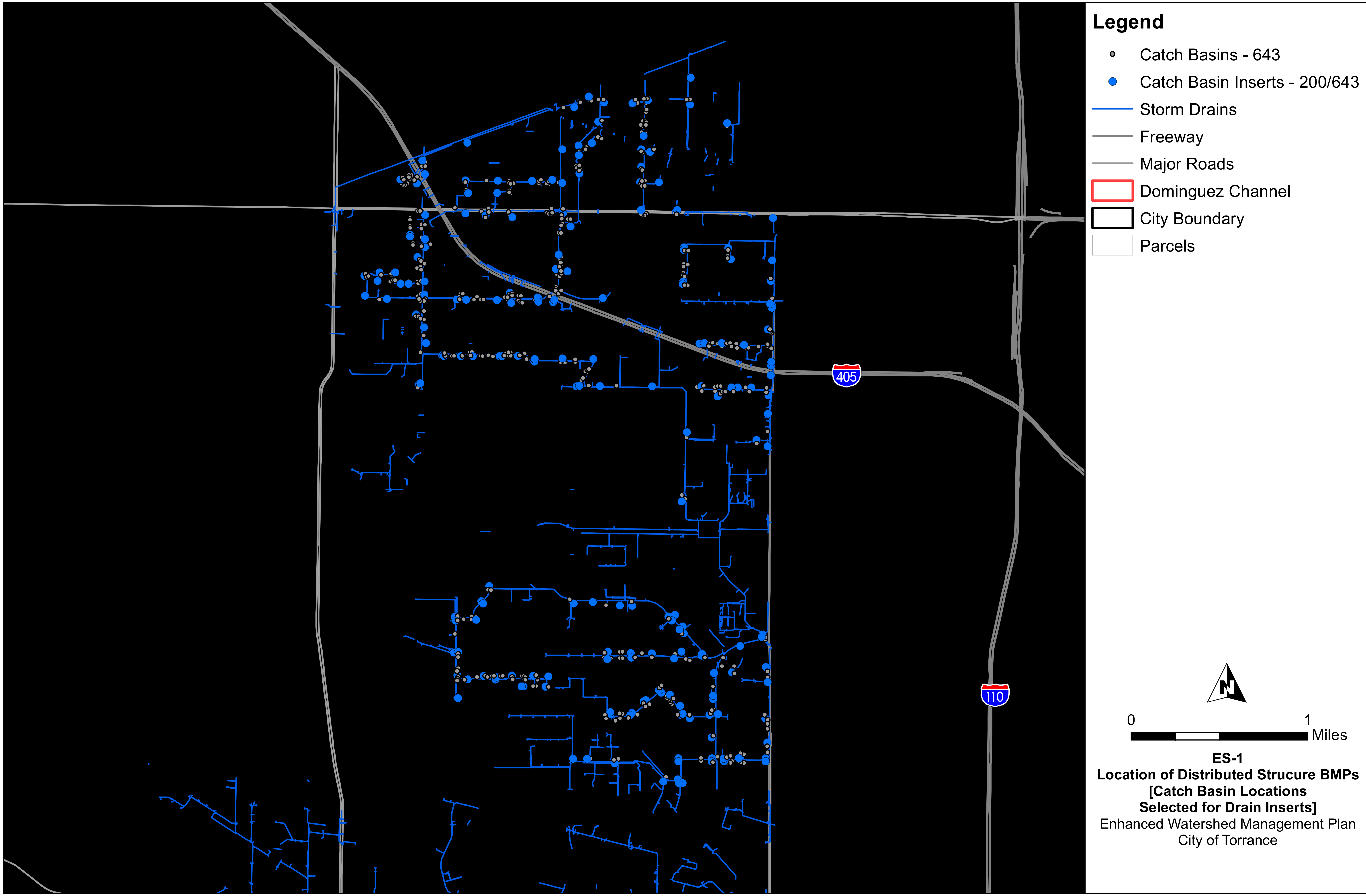
To meet the phased WQO, RWL and TMDL implementation schedules, a combination of distributed structural (catch basin filters) and nonstructural BMPs were identified to be considered by the City of Torrance for implementation. Table ES.1 lists the new nonstructural BMPs, enhancements to existing nonstructural BMPs, and their anticipated effectiveness with the treatment of concerned pollutants.

Table ES.1 Summary of Nonstructural BMPs to Support Pollutant Removal Beach Cities EWMP City of Torrance				
	Condition		Pollutants Addressed	
Nonstructural BMP	Wet Weather	Dry Weather	Bacteria	Metals
Enhancements to Existing BMPs				
Smart gardening program enhancements	√	√	◗	◗
TMDL-specific stormwater training	√	√	◗	◗
Enhancement of commercial and industrial facility inspection	√	√	◗	◗
Enhancement escalation procedures	√	√	◗	●
Improved street sweeping technology	√		◗	◗
New BMP				
Reduction of irrigation return flow	√	√	●	●
√ - applicable; ◗ - partially effective; ● - effective				

For identification of structural BMPs, distributed structural BMPs (Catch Basin filters) were considered. Distributed BMPs refer to those practices that provide the control or treatment (or both) of stormwater runoff at the site level. Table ES.2 summarizes the distributed structural BMPs (catch basin filters) identified through the RAA to address the TMDL implementation. The location of the identified distributed structural BMPs (catch basin filters) are shown on Figure ES.1.

Table ES.2 Summary of Distributed Structural BMPs to Support TMDL Implementation Beach Cities EWMP City of Torrance				
	Condition		Pollutants Addressed	
Structural BMP	Wet Weather	Dry Weather	Bacteria	Metals
Distributed BMPs				
Catch basin filters	√	√	●	●
Green Street Elements	√	√	●	●
√ - applicable; ○ - not effective; ● - effective				

For most nonstructural BMPs, quantification of benefits in terms of pollutant load reductions are challenging and often require extensive survey and monitoring information to assess performance. For the purposes of this RAA, a qualitative approach was used to evaluate the effectiveness and feasibility of the nonstructural BMPs.



ES-1
Location of Distributed Strucure BMPs
[Catch Basin Locations
Selected for Drain Inserts]
Enhanced Watershed Management Plan
City of Torrance

Fact sheets and literature available on commercially available catch basin filters suggested that the proposed catch basin filters were effective at capturing and removing pollutants from stormwater runoff including sediments, heavy metals, and oil and grease. One of the literatures summarized the pollutant removal efficiencies provided by Grate Inlet Skimmer Box/Round Curb Inlet Basket (Schematic included in Appendix B). It included numeric pollutant reductions from various studies or independent tests between 1998 and 2007. The study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 was an independent test conducted to assess the pollutant removal efficiency of the Grate Inlet Skimmer Box/Round Curb Inlet Basket. This study in 2005 concluded a 99% reduction in Lead. Other studies include the field test conducted by the City of El Monte in 2002 that concluded that the Grate Inlet Skimmer Box/Round Curb Inlet Basket were effective in removing 95% of Zinc and Copper each and 87% of Lead concentrations. In addition, we also referred to the independent performance assessment conducted by the City of Los Angeles in 2005 to evaluate the performance of storm drain inlet filter devices at removing oil and grease and associated pollutants from stormwater. The study aimed at evaluating the performance (at various stages of their useable lives) of four (4) different catch basin filters currently used by the City of Los Angeles in removing and retaining used motor oil and associated pollutants from urban runoff. This study tested the performance of five (5) different types of catch basin filters at removing sediments, trash, oil and grease, and metals for a flow rate ranging between 10 and 25 gallons per minute. It involved four (4) sampling events and five study sites. The key summary points indicated that qualitatively, the results of the study found that all of the units were moderately effective at removing oil and grease, suspended solids, and heavy metals. Furthermore, the study indicated that for most insert types, inspection and maintenance should occur before and after each rain event during wet weather and monthly during dry weather to maintain their performance integrity and to minimize leaching of previously captured pollutants.

A more recent independent test conducted in 2013-2014 by the City of Lake Forest suggested that the catch basin filters were effective in a heavy metal removal of 75%. The product tested was the Ultra Filter Sock Heavy Metal Drain Filter.

Based on literature review documenting the removal efficiencies demonstrated by the catch basin filters, the proposed catch basin inserts would meet the TLRs set forth by the Dominguez Channel Toxics TMDL with 75% as the estimated target load reduction for a flow rate ranging between 10 to 25 gallons per minute.

Pollutant reductions by catch basin filters resulted from various studies/literature review are summarized in Table ES.3 and shows that the TLRs would be met for each metal. The TMDL year was determined to represent typical rainfall frequencies and magnitudes observed over the recent 25-year rainfall record. The conclusions from literature review and fact sheets show that the catch basin filters would be effective in meeting the target reduction loads set up by the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (the Dominguez Channel Toxics TMDL).

For bacteria, a combination of non-structural BMPs including Public Education and Outreach, reduction of irrigation return flows, and future development and implementation of Green Street design features would assist with meeting the TLRs for bacteria. In addition, the study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 indicated Fecal Coliform (bacteria) removal efficiency of 33% by the Grate Inlet Skimmer Box/Round Curb Inlet Basket.

Table ES.3 Pollutant Reduction After Implementing Catch Basin BMPs
Beach Cities EWMP
City of Torrance

Pollutants	Existing Load	Target Load Reduction (%)	Nonstructural BMP	Distributed Structural BMPs (Catch Basin Filters)	Structural + Nonstructural BMPs
Zinc 90th Percentile Load Day - 11/08/2002					
Copper (lb/d)	36.99	62%	5%	75%	80%
Zinc (lb/d)	133.39	76%	5%	75%	80%
Critical Wet Year - 1995					
Fecal Coliform (MPN/yr) x10^14	627	53%	5%	33%	38% plus filtration/infiltration opportunities through potential Green Street Implementation in future.

No TMDL developed for fecal coliform. Target Load Reduction calculated based on REC-1 standard and high-flow suspension days.

Note:

The City of Torrance is following the adaptive management approach that would allow them to monitor the performances of proposed distributed structural (catch basin filters) and non-structural best management practices with respect to meeting the established TLR requirements.

In addition, the City of Torrance is in the process of developing the Green Street Program and the ordinances to implement Green Street design features as part of street redevelopment. While implementing redevelopment of arterial streets, the City of Torrance would assess opportunities for Green Street design features to facilitate treatment through filtration or infiltration. Green Street elements may include infiltration trench that provides water quality treatment, reduction in peak flow discharges, and potential groundwater recharge. Other Green Street elements that may be considered include bioretention/biofiltration practices to achieve water quality treatment through filtration by vegetation and soils to remove pollutants with perforated underdrain to convey the treated runoff. The City of Torrance is committed to implementing the Green Street Ordinance established and in effect by July 2015 as required by the MS4 Permit.

Based on the monitoring results, the City of Torrance would consider additional control measures if the required TLRs were not met or other improvements to existing best management practices were found necessary. This would allow changes in the number and type of best management practices selected for implementation. Through adaptive management and based on the future monitoring results, the implementation schedules may be modified to reflect the increased knowledge of the watershed. Actual schedule for Implementation of BMPs will occur as funding becomes available.

2.0 INTRODUCTION

As required by the Permit, the Beach Cities WMG has to perform a Reasonable Assurance Analysis (RAA) as part of the EWMP. The report is prepared in compliance with Part VI,C.5.b.iv.(5) of Waste Discharge Requirements for MS4 Discharges within the Coastal Watersheds of Los Angeles County, Order Number R4-2012-0175 (NPDES Permit Number CAS004001).

The SWMM model used for this RAA was calibrated to the County's LSPC model calibrated by CWE for the Dominguez Channel Enhanced Watershed Management Program. However, the target load reductions (TLRs) were established for both metals and bacteria by the South Bay Beach Cities Watershed Management Group and were used in this RAA memo to maintain consistency. The difference between the baseline load and the target load resulted in a TLR for the 90th percentile load day, which was the load reduction required to meet the allowable TMDL concentration.

The baseline critical wet conditions for fecal coliform were simulated using SWMM for the time period ranging from November 1, 1994 through October 31, 1995. The wet conditions baseline load for the metals for metals were based on simulation results from 90th percentile load day for each metal.

2.1 Physiographic Setting – DC-Torrance Watershed

The City of Torrance (City) is located about 15 miles south of Downtown Los Angeles (LA), in southern LA County, just north of the Palos Verdes Hills. The City comprises 20.5 square miles in area. The City is bounded by Redondo Beach on the west and north, Lawndale and Gardena on the north, LA on the east, Lomita to the southeast, and Rolling Hills Estates and Palos Verdes Estates on the south. The City's stormwater conveyance systems are interconnected with neighboring city systems. The neighboring cities located at generally higher elevation such as Rolling Hills Estate and Palos Verde Estate discharge stormwater into the City's and/or Los Angeles County Flood Control District's (LACFCD's) stormwater conveyance systems located within the City's boundaries. The location of the City is shown on Figure 2.1.

The DC-Torrance Watershed area is approximately 9 square miles. The drainage within the watershed is largely to the east, via storm drains and stormwater from the east side of the City is routed via the Torrance Lateral to Machado Lake. This channel replaced the Dominguez Creek and its tributaries, once a system of braided streams, marshes, and small ponds that eventually reached San Pedro Bay. The portion of the Palos Verdes Hills that borders the City is drained by several north-trending canyons, including, from east to west, Bent Spring, Sepulveda, Agua Magna, Agua Negra, and Malaga canyons, as well as numerous smaller, unnamed canyons. Carrying significant amounts of water only during the winter, these streams now flow into storm drain structures.

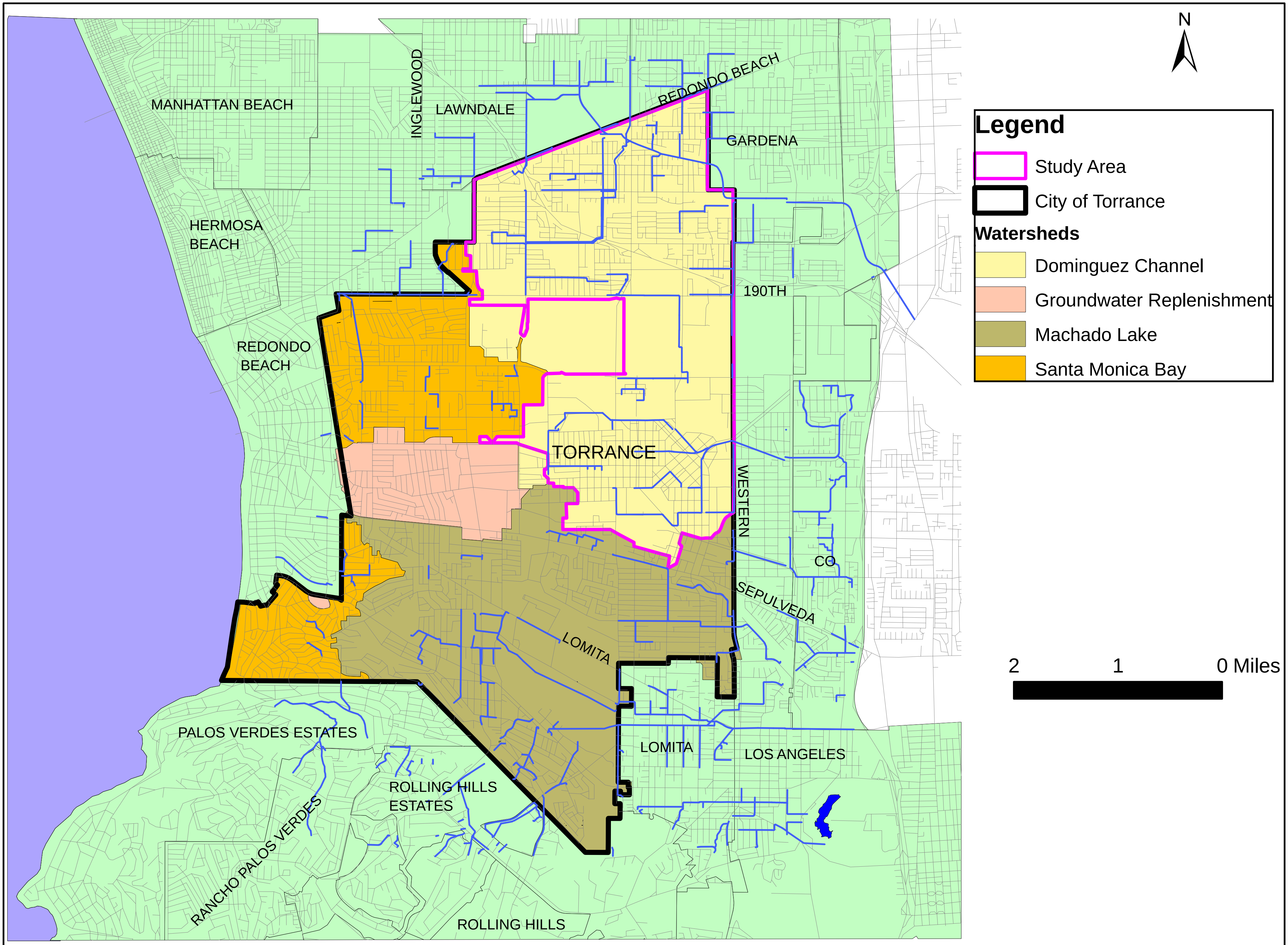


Figure 2.1 Subregional Location of City of Torrance

2.2 Climate

Like most of Southern California, Torrance has a Mediterranean climate characterized by hot, dry summers, and cool, somewhat rainy winters. Average summer temperatures range from highs in the high 80s to lows in the mid 60s (degrees Fahrenheit). Average winter temperatures range from highs in the low 70s to lows in the high 40s.

The average yearly precipitation in the Torrance area is about 13 inches whereas nearly 15 inches of precipitation fall annually in Los Angeles. Not only does rainfall vary from one location to the next, often within short distances, it is also extremely variable from year to year, ranging from one-third the normal amount to more than double the normal amount.

There are three types of storms that produce precipitation in southern California: winter storms, local thunderstorms, and summer tropical storms. Winter storms are characterized by heavy and sometimes prolonged precipitation over a large area. These storms usually occur between November and April, and are responsible for most of the precipitation recorded in southern California. Local thunderstorms can occur at any location, and usually affect relatively small areas. These storms are usually more prevalent in the higher mountains during the summer. Tropical rains are infrequent, and typically occur in the summer or early fall. These storms originate in the warm, southern waters off Baja California, in the Pacific Ocean, and move northward into southern California.

2.3 Watersheds and Storm Drains

The City is divided into four main watersheds as shown on Figure 2.1. These four main watersheds are;

1. Dominguez Channel.
2. Santa Monica Bay.
3. Groundwater Replenishment.
4. Machado Lake.

The RAA study area, DC-Torrance, includes only the portion of Dominguez Channel within the City excluding the groundwater replenishment basin. The groundwater replenishment basin does not discharge into the Santa Monica Bay or the Dominguez Channel. The ground water retention basins facilitate infiltration of stormwater and hence there are no flows exiting the basins.

The groundwater replenishment basin includes three active retention basins that are used to percolate stormwater into the groundwater basin. There are no discharges from these basins. Table 2.1 lists the three active retention basins along with volume and location. The City worked with the RWQCB to recognize the tributary areas to these basins as sub-regional BMPs for permit and TMDL compliance. Since these basins do not discharge to Section 303(d) listed impaired bodies of water, TMDLs, RWLs, and WQOs are not applicable to stormwater discharge from the tributary areas to these basins. It should be noted that the Del Amo Center retention basin, though listed in Table 2.1, is privately owned. The relevant documentation about the groundwater replenishment basin is provided as an Appendix to the Model Calibration TM (TM01).

The DC-Torrance study area is shown on Figure 2.1. The DC-Torrance Watershed represents about 6.7 percent of the Dominguez Channel Watershed and about 44 percent of the City's total surface area. The DC-Torrance Watershed is highly urbanized and as a result, runoff is largely controlled by streets, retention basins, storm drains, and flood control channels. The main channels in the study area are the Dominguez Channel and the Torrance Lateral. The Dominguez Channel, which is maintained by the Los Angeles County Flood Control District, collects storm runoff from sections of the Cities of Hawthorne, Gardena, Lawndale, and Redondo Beach. The channel flows southerly, emptying into the Los Angeles Harbor area.

Table 2.1 Summary of Active Retention Basins
Beach Cities EWMP
City of Torrance

Basin Name	Volume (af)	Design Surface Elevation (ft-MSL)	Location
Bishop Montgomery	122	84	Palos Verdes Boulevard and Torrance Boulevard
Ocean Avenue	229	79	Ocean Avenue and Sepulveda Boulevard
Del Amo Center	86	75	Madrona Avenue and Plaza Del Amo
Total	**437**		

2.3.1 Discharge Locations

The City's stormwater system discharges into LACFCD storm drains at several locations, which are indicated on Figure 2.2. As shown on this figure, these points of discharge are primarily located along the east boundary of the City's service area. In addition, there are several discharge locations along the Dominguez Channel in the northeast portion of the City.

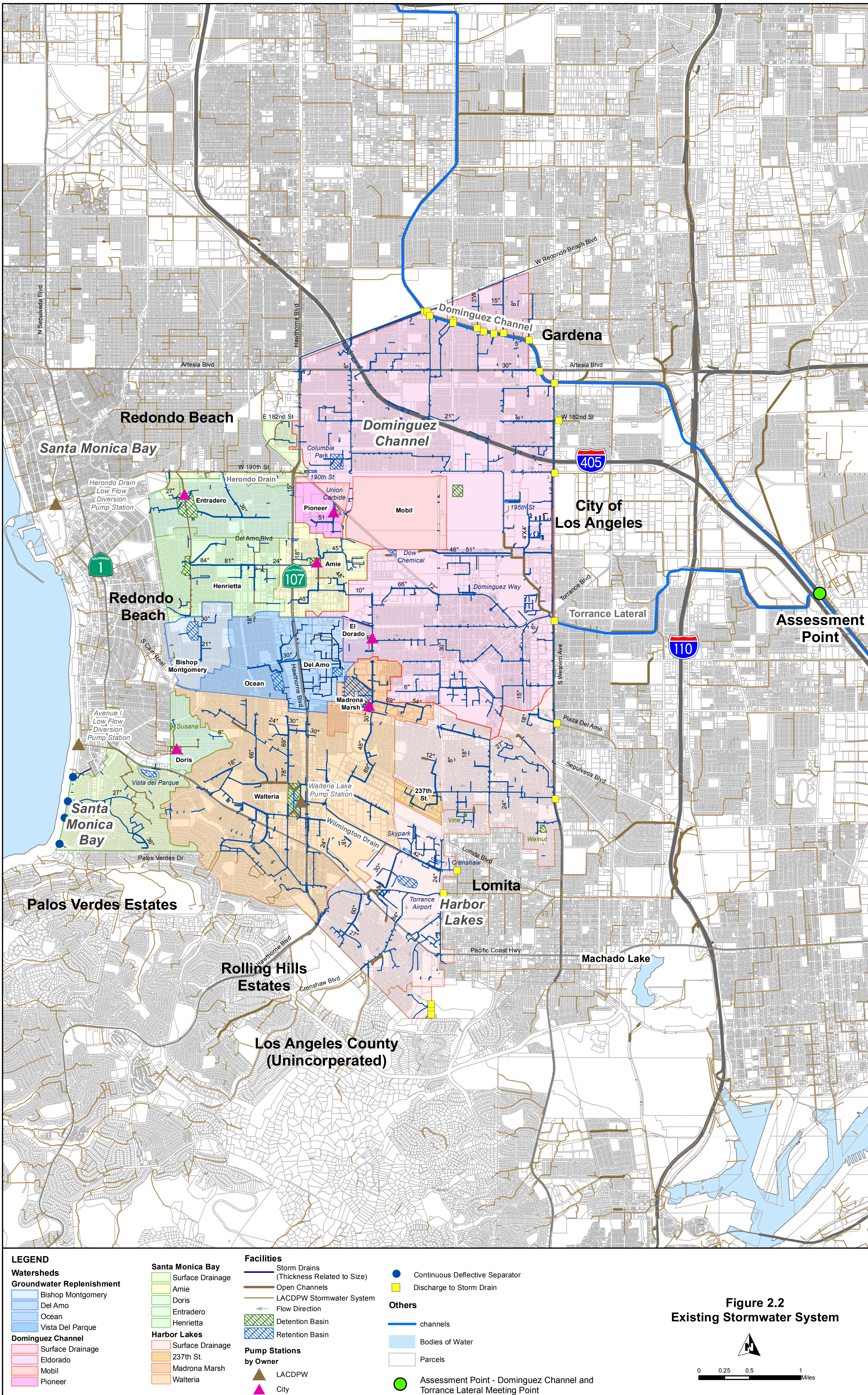


Figure 2.2
Existing Stormwater System

The stormwater collection system shown on Figure 2.2 also shows how stormwater is routed throughout the City. In general, the routing is as follows:

- Stormwater from the east side of the City is routed via the Torrance Lateral to Machado Lake.
- Stormwater from the west side of the City, stormwater discharge is routed to Santa Monica Bay.
- Stormwater from the northwest areas of the City's service area that are within the Santa Monica Bay watershed, is routed through LACFCD's Herondo Drain, which discharges stormwater into the Santa Monica Bay at the Redondo Beach King Harbor Marina and Pier. The Herondo Drain is also equipped with a low flow diversion pump station, which diverts dry weather flows into the sewer system.
- Stormwater from the southwest areas of the City's service area that are within the Santa Monica Bay watershed, is either directly discharged into Santa Monica Bay at Torrance Beach, passing through one of several Continuous Deflective Separation (CDS) units or is routed into LACFCD's storm drain network within Redondo Beach, which passes through the Avenue I Low Flow Diversion Pump Station, diverting dry weather flows to sanitary sewer.

3.0 APPLICABLE INTERIM AND FINAL REQUIREMENTS

The EWMP for Beach Cities follows the process in the Permit and identify the Water Quality Priorities (WQ Priorities) including the highest (Category 1) Water Quality Priorities, which are subject to TMDLs and WQBELs. Practically all of these TMDLs include associated compliance schedules that are considered in this RAA. Also included in this RAA is Category 2 pollutant (bacteria). There is no TMDL for bacteria; however, it is listed in the 303d list. The TMDL and EWMP milestones/compliance dates were considered while assessing the BMP options and the schedule for potential implementation. 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. In line with the RAA Guidelines, for all final TMDL and TMDL/EWMP milestones that occur in 2032, the catch basin filters expected to result in attainment of the corresponding Permit limits are identified.

The waste load allocations (WLAs) in the Dominguez Channel Toxics TMDL are shown in Table 2.2. The Permits require the EWMP to provide reasonable assurance for the TMDL milestones that occur in the current Permit term. If applicable TMDLs do not prescribe a milestone in the current Permits, a milestone must be established. For bacteria, allowed exceedance days were set consistent with the Ballona Creek bacteria TMDL by taking 10 percent of wet days (at least 0.1 inch of rain plus following three days) that are not High Flow Suspension (HFS) days (at least 0.5 inches of rain plus the following day). An "exceedance" is defined as a sample that is above the WQO value of>4,000 MPN/100 mL fecal coliform.

Table 2.2	Summary of Schedule for Interim and Final Milestones Beach Cities EWMP City of Torrance		
	Schedule		
Pollutant	Interim (03/23/12)	Final (03/23/32)	Source
Copper	207.51 ug/L	9.7 ug/L	Automobile operation, industry, legacy pollutant
Lead	122.88 ug/L	42.7 ug/L	Vehicle brake pads, atmospheric deposition, soil erosion
Zinc	898.87 ug/L	69.7 ug/L	Vehicle tires, galvanized metal, atmospheric deposition
	REC-2 WQO		
Fecal Coliform	4000 #/100 mL[1]		Wastewater treatment plants, on-site septic systems, domestic and wild animal manure

Note:

(1) Obtained from Los Angeles Regional Water Quality Control Board (LARWQCB) Basin Plan Chapter 3 titled Water Quality Objectives, dated May 2, 2013 Section on In Waters Designated for Non-contact Water Recreation (REC-2)

4.0 WATERBODY POLLUTANT COMBINATIONS

A RAA involves providing an initial assessment of current baseline pollutant loading for water body pollutants using relevant subwatershed data and the best available representative land use and pollutant loading data collected within the last 10 years. Baseline loading estimates include modeling critical conditions that are used in the Dominguez Channel Toxics TMDL. There is only one TMDL (the Dominguez Channel Toxics TMDL) being evaluated here. As stated earlier, there is no TMDL for bacteria (Category 2) but it is being evaluated as it is listed on the 303(d) list.

Pollutant combinations assessed by a RAA fall into one of three categories:

- Category 1 (Highest Priority): Water body-pollutant combinations for which water quality based effluent limitations and/or receiving water limitations are established in Part VI.E, TMDL Provisions, and Attachments L through R of the Municipal Separate Stormwater Sewer System (MS4) Permit.
- Category 2 (High Priority): Pollutants for which data indicate water quality impairment in the receiving water according to the State Water Resources Control Board's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State's Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment.

- Category 3 (Medium Priority): Pollutants for which there is insufficient data to indicate water quality impairment in the receiving water according to the State's Listing Policy, but which exceed applicable water limitations contained in Order R4-2012-0175 and for which MS4 discharges may be causing or contributing to the exceedance.

The water body pollutant classifications (WBPCs) were classified into one of the three MS4 Permit categories (Category 1-3). Those WBPCs with a TMDL were classified as Category 1, those WBPCs listed on the State's 303(d) list as impairing a particular water body segment were classified as Category 2, and those remaining WBPCs without an associated TMDL or on the State's 303(d) list, but showing exceedances of water quality criteria were classified as Category 3. A summary of these categorizations is presented in Table 2.3.

As part of the EWMP plan, a RAA for the Dominguez Channel is conducted for Category 1 (Highest Priority) pollutants and Category 2 (Fecal coliform). The RAA consists of an assessment, through catch basin filter literature review, to demonstrate that the activities and control measures (i.e., catch basin filters) identified are performed to demonstrate that applicable water quality based effluent limitations and/or receiving water limitations with compliance deadlines during the permit term will be achieved.

**Table 2.3 Categorized Water Body-Pollutant Combinations
Beach Cities EWMP
City of Torrance**

Water Body	Category 1 (TMDL)	Category 2 (303(d) List)	Category 3 (Other)
Dominguez Channel (lined portion above Vermont Ave)	Total copper, Total Lead, Total Zinc, Toxicity	Indicator Bacteria, Ammonia, Diazinon	Cadmium(diss.), Chromium (diss.), Mercury (diss.), Thallium (diss.), Bis(2Ethylhexl) phthalate, pH, Dissolved Oxygen
Torrance Lateral	Total Copper, Total Lead, Total Zinc	Coliform Bacteria	Cadmium (diss.), Cyanide, pH, Ammonia, PCBs (sed.), DDT (sed.)

5.0 POTENTIAL SOURCES OF POLLUTANTS OF CONCERN

5.1 Copper

Dominguez Channel is designated as impaired for copper and included on the Clean Water Act Section 303(d) list of impaired waterbodies for this pollutant and prioritized under the Dominguez Channel Toxics TMDL. The source of the copper in this watershed is not well known. Possible urban sources of metal loading include runoff from light industrial, transportation, and retail/commercial land uses with critical sources from auto repair, motor freight transportation, and auto dealerships. Other potential urban sources of metals to the watershed include wet and dry atmospheric deposition and natural background loading.

Urban sources of copper include industrial sources and vehicle brake pads. Motor vehicles are a major source of copper, a metal that originates from brake pad wear. Copper and other pollutants are deposited on roads and other impervious surfaces and then transported to aquatic habitats via stormwater runoff.

Pollutant loads of copper from urban land uses is expected to decrease due to Senate Bill (SB) 346 which was signed into law on September 25, 2010. This legislation phases out copper in vehicle brake pads over a period of years; milestones include the following dates:

- January 1, 2021: Limits the use of copper in motor vehicle brake pads to no more than five percent by weight.
- January 1, 2025: Limits the use of copper in motor vehicle brake pads to no more than 0.5 percent by weight.

Full implementation of the legislation is expected to remove approximately 61 percent of the copper from urban runoff in metropolitan Los Angeles area watershed. Although vehicle brake pad wear is not expected to contribute as much copper in DC-Torrance Watershed as in the more urbanized metropolitan Los Angeles area, a decrease in copper loading is expected from vehicles due to the law's implementation.

5.2 Lead

Dominguez Channel is designated as impaired for lead and prioritized under the Dominguez Channel Toxics TMDL. The source of lead is associated with wet weather discharges from major municipal point sources (SWRCB 2011). Sources of lead in the urban environment also include automobile operation and industries with practices that may expose metals to stormwater. Lead was formerly used as an additive in gasoline. This has caused widespread contamination of soils near highways and streets and in drainage ways in urban areas. Exhaust particulates, fluid losses, drips, spills, and mechanical wear products continue to contribute lead to street dust.

5.3 Zinc

Dominguez Channel is designated as impaired for zinc and prioritized under the Dominguez Channel Toxics TMDL. Zinc loading can occur during wet weather storm events. Road dust, contaminated by tire wear, and erosion of zinc-plated material (i.e., galvanized chain link fences) are major contributors of zinc to urban runoff.

5.4 Fecal Coliform

Fecal coliform is listed in the 303d list for Dominguez channel. Fecal Coliforms are used as indicator of possible sewage contamination because they are commonly found in human and animal feces. Although they are generally not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. Therefore, their presence in streams suggests that pathogenic microorganisms might also be present and that swimming and eating shellfish might be a health risk. Since it is difficult, time-consuming, and expensive to test directly for the presence of a large variety of pathogens, water is usually tested for coliforms and fecal streptococci instead. Antroponic sources of fecal contamination to surface waters include wastewater treatment plants, on-site septic systems, domestic and wild animal manure, and storm runoff. Non-antropogenic sources of fecal coliform include soils, (sediments), vegetation, decaying organic material, biofilms/regrowth, and atmospheric deposition.

6.0 APPROACH USED FOR THE RAA

This RAA involved a pollutant load reduction plan based on a cost-effective BMP implementation strategy that begins with enhancements to existing nonstructural BMP programs and development of new programs in some cases. This step is usually followed by implementation of distributed structural BMP (Catch basin filters) to meet TMDL reduction objectives.

Based on literature review documenting the removal efficiencies demonstrated by the catch basin filters, the proposed catch basin inserts would meet the TLRs set forth by the Dominguez Channel Toxics TMDL and bacteria target load reductions.

6.1 Uncertainty Analysis

There is often great uncertainty in water quality modeling for urban drainage systems because water quality variation in systems is complex and affected by many factors. The uncertainty analysis was done to assess uncertainty in the build-up and wash-off modeling of pollutants based on a calibrated water quantity SWMM model. A total of four SWMM 5 runoff parameters were considered for uncertainty analysis. The parameters were assumed to follow uniform distribution as done in Muleta and Nicklow (2005), and lower and upper bounds (+-10%) were assigned for each parameter. Values of the parameters vary from subbasin to subbasin depending on soil, land use, imperviousness, topography and/or other characteristics of the subbasin. The four parameters considered were imperviousness, infiltration parameters, subbasin width, and slope. During the uncertainty analysis, these baseline values were altered from the calibrated parameters by multiplying the parameter by the values in lower and upper bounds. This way, the baseline values would be scaled up or down while preserving the spatial variability determined from the watershed characteristics.

Comparison of uncertainties in the pollutant build-up and wash-off in SWMM indicated that those uncertainties varied slightly. This may be a consequence of the specific characteristics of rainfall events. The uncertainty analysis of water quality parameters in SWMM is conducive to effectively evaluating model reliability.

6.2 Estimated Required Pollutant Load Reduction

Using the 90th percentile load days for metals and critical wet year for bacteria (1995), the required pollutant reductions were calculated for attainment of final limitations. Per the RAA Guidelines, the percent reduction used to determine the control measures necessary to attain the final limits are based on the 90th percentile year. Even though the average year is included in the analysis, it should be noted that the interim limits, which were effective as of March 2012, for the Dominguez Channel Toxics TMDL are based on the 95th percentile of historic monitoring data (i.e., antidegradation-based), therefore MS4 agencies are assumed to be in compliance with these limits as of the effective date.

Required load reductions were evaluated at this RAA Assessment Point located just downstream of where Torrance Lateral and Dominguez Channel meet. The RAA Assessment Point represents location where the collective discharge from all subbasins in DC-Torrance Watershed can be assessed to contribute to pollutant loads to the Dominguez Channel. Pollutant loads outside of the DC-Torrance Watershed are not considered in this loading analysis at the RAA Assessment Point.

6.3 Baseline Loading - Average and 90th Percentile Wet Years

This RAA is based on continuous simulation, and a “representative” year-long time period was selected to represent the average year and a separate wet year was selected for bacteria as depicted in Table 2.4. The year-long simulation allows the modeling to capture the variability of rainfall and storm sizes and conditions. The metals baseline loading was based 90th percentile wet weather daily load from 10 year period from November 1, 2002 to October 31, 2012.

Table 2.4 Average and 90th Percentile Years by Pollutant
Beach Cities EWMP
City of Torrance

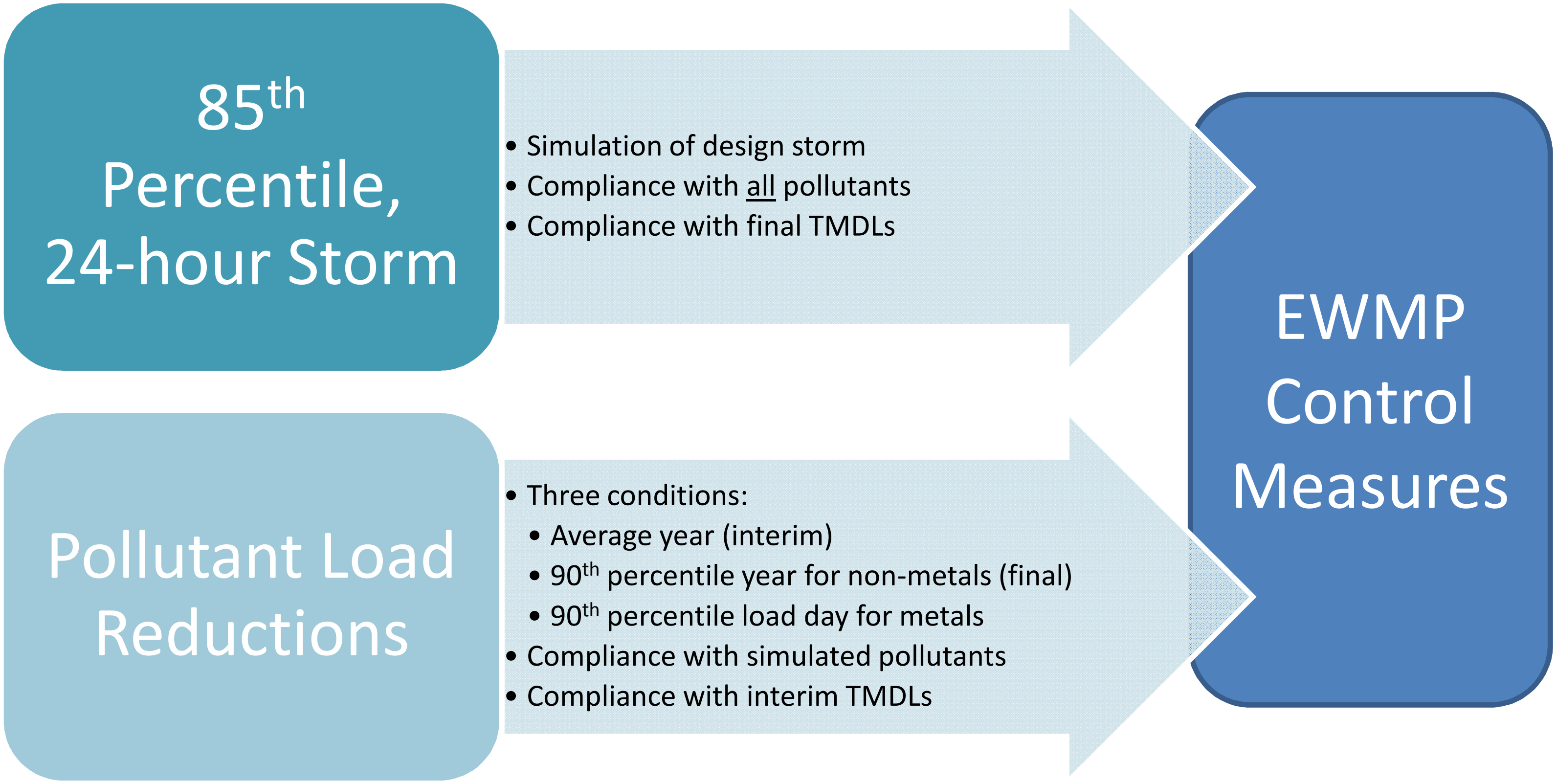
Pollutant	Average Year	90th Percentile Daily Load
Metals	2006 - 2007	Copper – 02/05/2009 Zinc – 11/08/2002
Pollutant	**Average Year**	**90th Percentile Year**
Fecal Coliforms	2006 - 2007	1994 - 1995

The average year and typical wet year (2002 -2003) loading results were used to prioritize the subbasins for BMP implementation. The flow conditions and loading results from the RAA for the average year and 90th percentile wet year are summarized in Tables 2.5 and 2.6. The loading for subbasin and hydrologic subunit (HSU) on a typical wet year (2003) are summarized on Figures 2.3 and 2.4 for zinc. Similar figures have been developed for copper and fecal coliform, and are shown in Appendix A.

The typical wet year load was normalized by area for each HSU and subbasin, and then categorized into high, medium, and low groups. The rankings are shown for zinc on Figures 2.5 and 2.6. For each subbasin/HSU, classifications were based on the modeled annual pollutant loads normalized by area, which were then ranked in order from high to low and grouped into quintiles. A score of 5 indicates that the subbasin pollutant loading was in the top 20th percentile (high pollutant loading); whereas a score of 1 represents a subbasin loading in the bottom 20th percentile (low pollutant loading). Basins with ranking score between 4 and 5 were ground into high pollutant category. Medium pollutant loading category includes basin with ranking score between 3 and 4 and basins with ranking score less than 3 were characterized as low pollutant loading. Zinc was selected as the focus because of the priority in addressing metal loads. The figures show that the subbasins between 190th Street and Dominguez Street are associated with higher pollutant loading rates per unit area when compared to other subbasins.

Table 2.5 Modeled Annual Average Load (2007)
Beach Cities EWMP
City of Torrance

Subbasin	Volume (ac-ft)	Copper (lb)	Lead (lb)	Zinc (lb)	Fecal Coliform (MPN)
2019	45.96	26	5	131	3.96E+14
2020	7.83	4	1	19	6.91E+13
2021	81.39	56	14	238	1.40E+15
2022	32.55	17	4	78	6.53E+14
2037	6.46	4	1	19	2.92E+13
2038	11.62	11	3	46	1.53E+14
2049	11.81	8	2	37	4.51E+13
2051	1.57	1	0	6	9.12E+12
2047	0.83	1	0	3	1.16E+13
2042	2.20	2	1	8	2.00E+13
2050	3.07	3	1	11	2.05E+13
2044	7.81	7	2	28	8.66E+13
2046	3.05	2	1	10	1.84E+13
2043	4.09	3	1	13	1.88E+13
2045	5.25	4	1	15	1.46E+13
2048	52.15	34	9	147	9.21E+13
DC-Torrance (Assessment Point)	**277.6**	182.78	45.65	808.80	3.04E+15



TWO TYPES OF NUMERIC GOALS AND EWMP COMPLIANCE PATHS

FIGURE 2.3

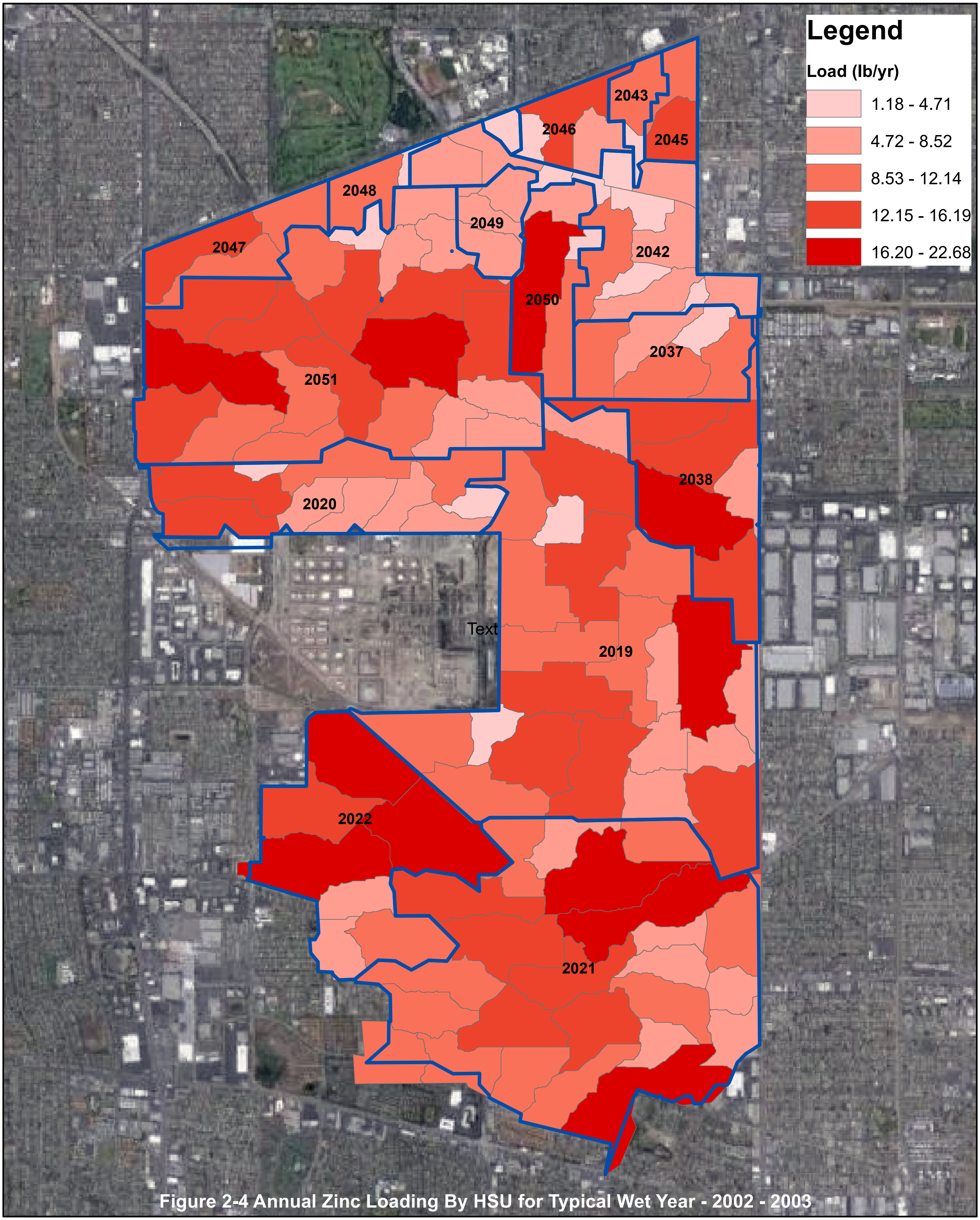


Figure 2-4 Annual Zinc Loading By HSU for Typical Wet Year - 2002 - 2003

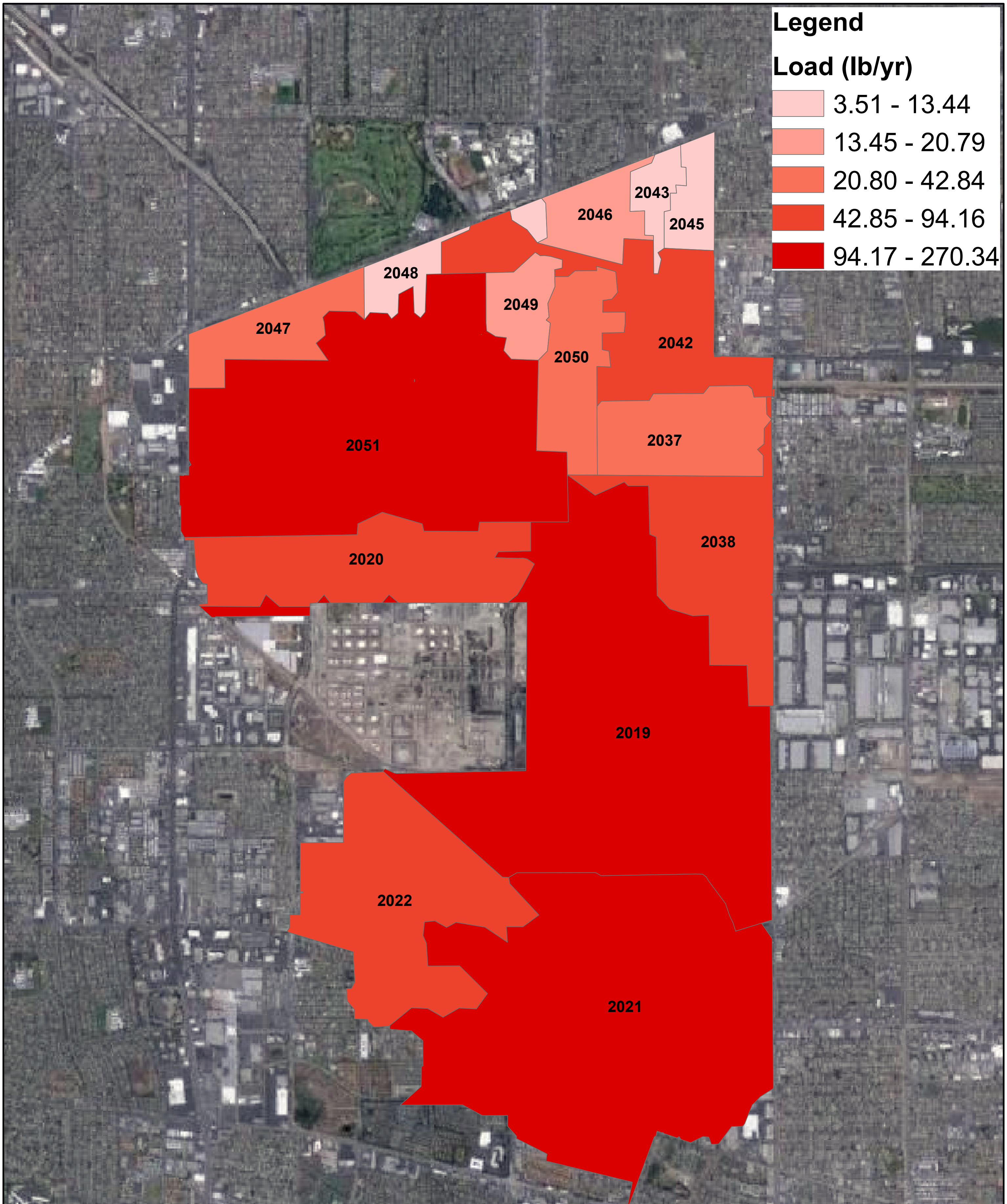


Figure 2.5 Annual Zinc Load by Subbasin for Typical Wet Year - 2002 - 2003

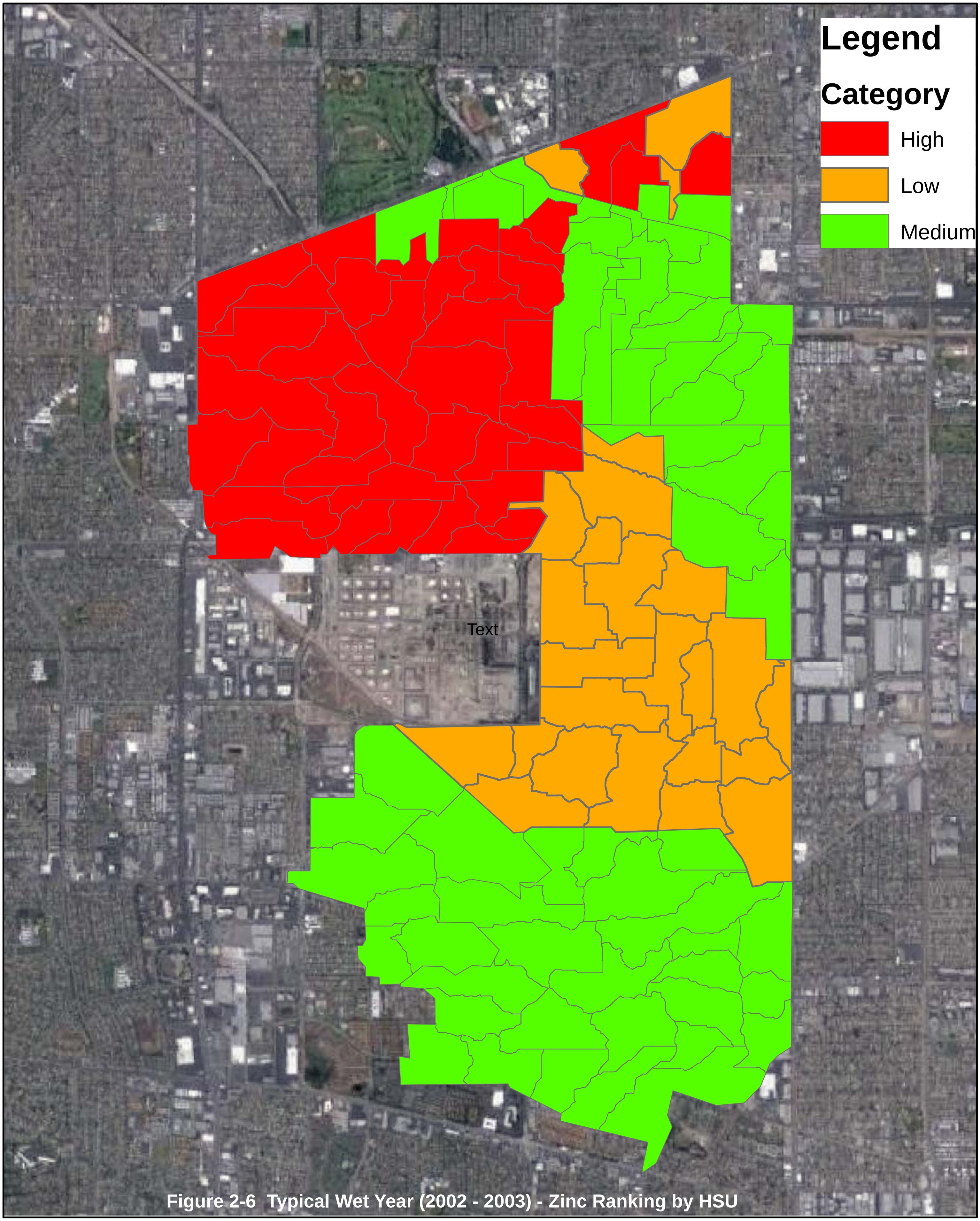


Figure 2-6 Typical Wet Year (2002 - 2003) - Zinc Ranking by HSU

Table 2.6 Summary Results of Critical Wet-weather (90th Percentile) Load Beach Cities EWMP City of Torrance						
Basin	90th Percentile –Day				90th Percentile Wet Year - 1995	
	Copper – 02/05/2009		Zinc – 11/08/2002			
	Volume (ac-ft)	Daily Load (lb)	Volume (ac-ft)	Daily Load (lb)	Volume (ac-ft)	Fecal Coliforms (MPN)
DC-Torrance (Assessment Point)	65.96	36.99	93.85	133.39	5333.24	6.27E+16

6.3.1 Fecal Coliform Baseline Loading –Exceedance Days

The 90th percentile wet day and dry day loading for fecal coliform was determined for the study area. The results were then compared against the applicable WQBELs, RWLs, and WQOs discussed earlier in this TM. During wet weather, the allowable load is a function of the volume of water in the channel and the fecal coliform target concentration.

The daily output concentrations from the model for the identified critical event days (1995) were compared against the applicable WQO value of 4,000 MPN/100 mL. The number of modeled exceedances for bacteria in DC-Torrance watershed is shown in Table 2.7.

Table 2.7 Modeled Bacteria Exeedance – Critical Wet-weather Conditions (1995) Beach Cities EWMP City of Torrance			
Subbasin	Total # of Critical Event Days	# of Fecal Coliform Exceedances	Fecal Coliform Exceeded (%)
DC-Torrance	210	81	38.6%

6.4 Determination of TMDL Reduction Objective

Numeric goals were calculated for each parameter based on the difference between the modeled load and calculated TMDL load for average and critical wet years. Modeled loads above the TMDL load were considered as a required reduction and subtracted from the model baseline load to develop an instream load reduction target.

6.4.1 Wet-Weather Required Reductions

The wet weather pollutant reduction targets for average and critical conditions are summarized in Table 2.8. For metals, the reductions are based on daily load and for bacteria, it is based on annual load. The determination of limiting pollutant considered implementation actions to control the pollutant – for example, Senate Bill 346 will result in significant reductions of copper loading from brake pads.

Target load reductions (TLRs) are the reduction of baseline loads needed to achieve allowable loads for the 90th percentile day. To determine whether pollutant reductions are necessary and the extent of those reductions, the baseline loads for critical wet conditions determined from the SWMM model were compared against the allowed loading. Comparisons of baseline loading versus allowed loading are shown Table 2.9.

Interim limits, which were effective as of March 2012, for the Dominguez Channel Toxics TMDL are based on the 95th percentile of historic monitoring data, therefore MS4 agencies are assumed to be in compliance with these limits as of the effective date. Based on this, reasonable assurance of compliance with these interim limits has been demonstrated.

Table 2.8 Wet-weather Pollutant Reduction Targets(1)
Beach Cities EWMP
City of Torrance

Study Area	Metals – 90th Percentile Load Day		
	Copper	**Lead**	**Zinc**
DC-Torrance	62%*	0%*	76%*
	Fecal Coliform – 90th Percentile Wet Year		
	53%		

Notes:

(1) The critical year reduction targets were provided by Geosyntec.

* Metals TLRs reflect daily LRs on the 90th percentile wet weather load days and bacteria (fecal coliform) TLRs reflect annual LRs on the 90th percentile wet weather year.

Table 2.9 Wet-weather Load Reduction
Beach Cities EWMP
City of Torrance

Study Area	Metals			
	90th Percentile Load Day	**Copper (lb)**	**Lead (lb)**	**Zinc (lb)**
DC-Torrance	Copper – 02/05/2009 Zinc – 11/08/2008	22.93	0	101.38
	Fecal Coliform (MPNx10^14)			
	1995	332.3		

* Metals TLRs reflect daily LRs on the 90th percentile wet weather load days and bacteria (fecal coliform) TLRs reflect annual LRs on the 90th percentile wet weather year.

6.5 Dry-Weather Pollutant Reduction Targets

For dry weather, bacteria are the limiting pollutant (not zinc). That is bacteria are the only Category 1 or 2 WBPC. Reductions of bacteria during EWMP implementation will drive reductions of other the pollutants. This is based on qualitative analysis.

7.0 QUALITATIVE EVALUATION OF NONSTRUCTURAL AND DISTRIBUTED STRUCTURAL BMPS (CATCH BASIN FILTERS)

As shown in the previous sections, a number of nonstructural and distributed structural BMP (catch basin filters) options are needed to meet TMDL and the permit requirements. The evaluation uses identified implementation of catch basin filters and nonstructural projects to determine the set of actions that will most likely be implemented in an effort to achieve the TMDL and Permit requirements. As the implementation is an adaptive management process, the precise suite of actions and the timing may be changed to use resources more cost effectively. The adaptive management approach will allow changes in the number and type of catch basin filters and nonstructural BMPs to ensure cost effective measures are being implemented. Flexibility in the schedule and makeup of the Implementation Plan are key to adaptive management.

The qualitative analysis is based on the reductions from both nonstructural and catch basin filters that work together to reduce the concentration and load of pollutants. Generally nonstructural BMPs consist of pollution prevention activities and source control activities that reduce the amount of the constituent entering the MS4 system, ultimately reducing the concentration in stormwater. Nonstructural activities also encourage the effective use of water, aiming to reduce dry-weather flows. In this way, nonstructural activities reduce the constituent load entering catch basin filters located downstream of the sources.

7.1 Nonstructural BMPs

Non-structural BMPs committed by the Beach Cities' WMG will result in 5 percent reduction in metals and fecal coliform load. The nonstructural BMPs committed by the City are summarized in Table 2.10. The table lists the new nonstructural BMPs, enhancements to existing nonstructural BMPs, and the TMDL pollutants and flow conditions addressed. The City has committed to implement nonstructural BMPs in the DC-Torrance Watershed.

Table 2.10 Summary of Nonstructural BMPs to Support TMDL Implementation Beach Cities EWMP City of Torrance				
	Condition		Pollutants Addressed	
Nonstructural BMP	Wet Weather	Dry Weather	Bacteria	Metals
Enhancements to Existing BMPs				
Smart gardening program enhancements	√	√	◗	◗
TMDL-specific stormwater training	√	√	◗	◗
Enhancement of commercial and industrial facility inspection	√	√	◗	◗
Enhancement escalation procedures	√	√	◗	●
Improved street sweeping technology	√		◗	◗
New BMP				
Reduction of irrigation return flow	√	√	●	●
√ - applicable; ◗ - partially effective; ● - effective				

7.2 Distributed Structural BMPs - Catch Basin Filters

Roads represent a major source of TMDL pollutant loads, and therefore treating road runoff is considered a key strategy for multi-pollutant TMDL implementation. Because of the number and spatial distribution of catch basins in the DC-Torrance Watershed, they represent an excellent opportunity for treating pollutants in addition to trash. Implementing catch basin inserts throughout the DC-Torrance Watershed is highly applicable because of the high density of catch basins. The City will install about 200 catch basin filters in the DC-Torrance watershed. Catch basin filters were not evaluated quantitatively. Effectiveness of catch basin inserts to meet the study objectives was based on literature review documenting significant removal of heavy metals and experiences from nearby Cities.

Fact sheets and literature available on commercially available catch basin filters suggested that the proposed catch basin filters were effective at capturing and removing pollutants from stormwater runoff including sediments, heavy metals, and oil and grease. One of the literatures summarized the pollutant removal efficiencies provided by Grate Inlet Skimmer Box/Round Curb Inlet Basket (Schematic included in Appendix B). It included numeric pollutant reductions from various studies or independent tests between 1998 and 2007. The study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 was an independent test conducted to assess the pollutant removal efficiency of the Grate Inlet Skimmer Box/Round Curb Inlet Basket. This study in 2005 concluded a 99% reduction in Lead. Other studies include the field test conducted by the City of El Monte in 2002 that concluded that the Grate Inlet Skimmer Box/Round Curb Inlet Basket were effective in removing 95% of Zinc and Copper each and 87% of Lead concentrations. In addition, we also referred to the independent performance assessment conducted by the City of Los Angeles in 2005 to evaluate the performance of storm drain inlet filter devices at removing oil and grease and associated pollutants from stormwater. The study aimed at evaluating the performance (at various stages of their useable lives) of four (4) different catch basin filters currently used by the City of Los Angeles in removing and retaining used motor oil and associated pollutants from urban runoff. This study tested the performance of five (5) different types of catch basin filters at removing sediments, trash, oil and grease, and metals for a flow rate ranging between 10 and 25 gallons per minute. It involved four (4) sampling events and five study sites. The key summary points indicated that qualitatively, the results of the study found that all of the units were moderately effective at removing oil and grease, suspended solids, and heavy metals. Furthermore, the study indicated that for most insert types, inspection and maintenance should occur before and after each rain event during wet weather and monthly during dry weather to maintain their performance integrity and to minimize leaching of previously captured pollutants.

A more recent independent test conducted in 2013-2014 by the City of Lake Forest suggested that the catch basin filters were effective in a heavy metal removal of 75%. The product tested was the Ultra Filter Sock Heavy Metal Drain Filter.

Based on literature review documenting the removal efficiencies demonstrated by the catch basin filters, the proposed catch basin inserts would meet the TLRs set forth by the Dominguez Channel Toxics TMDL with 75% as the estimated target load reduction for a flow rate ranging between 10 to 25 gallons per minute.

In addition, the City of Torrance is in the process of developing the Green Street Program and the ordinances to implement Green Street design features as part of street redevelopment. While implementing redevelopment of arterial streets, the City of Torrance would assess opportunities for Green Street design features to facilitate treatment through filtration or infiltration. Green Street elements may include infiltration trench that provides water quality treatment, reduction in peak flow discharges, and potential groundwater recharge. Other Green Street elements that may be considered include bioretention/biofiltration practices to achieve water quality treatment through filtration by vegetation and soils to remove pollutants with perforated underdrain to convey the treated runoff. The City of Torrance is committed to developing the Green Street Ordinance established and in effect by July 2015 as required by the MS4 Permit.

For bacteria, a combination of non-structural BMPs including Public Education and Outreach, reduction of irrigation return flows, and future development and implementation of Green Street design features would assist with meeting the TLRs for bacteria. In addition, the study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 indicated Fecal Coliform (bacteria) removal efficiency of 33% by the Grate Inlet Skimmer Box/Round Curb Inlet Basket.

7.3 Wet Weather

The interim and final targets are presented in total acre-feet per year that requires treatment through structural BMPs. Based on literature review documenting the removal efficiencies demonstrated by the catch basin inserts, it can be justified that the City's proposal to implement catch basin inserts to meet the TLRs set forth by the Dominguez Channel Toxics TMDL would be realistic and achievable.

Table 2.11 summarizes the catch basin filters identified through the RAA to address the TMDL implementation.

Table 2.11 Summary of Structural BMPs to Support TMDL Implementation
Beach Cities EWMP
City of Torrance

Structural BMP	Condition		TMDL Pollutant Addressed	
	Wet Weather	Dry Weather	Bacteria	Metals
Catch Basin Filters Distributed BMPs				
Catch basin Filters	√	√	●	●
Green Street Elements	√	√	●	●
√ - applicable; ○ - not effective; ● - effective				

7.4 Dry Weather

Although clearly defined definitions exist for wet periods, definitions for dry periods are less clearly defined. Wet weather periods are either defined in terms of rainfall or instream flow. For bacteria, a wet day is one with a rainfall total greater than 0.1 inches plus the three subsequent days, while metals criteria define wet days as those with instream flow above the 90th percentile. One seemingly intuitive way of defining a dry period is simply to use the "non-wet" days represented as the inverse of wet days. However, summary of model results indicate some residual influence of wet weather among the "non-wet" days. This presents some challenges for estimating loads and evaluating dry weather compliance because BMP planning would be better served by choosing design conditions that are more influenced by natural background baseflow and/or anthropogenic activities such as point source discharges or dry weather runoff from irrigation (instead of post-rain event interflow).

Dry weather reductions are attained through a combination of non-structural practices including flow reduction source controls as discussed in the EWMP.

The dry weather load reduction will focus on non-structural source control and pollution prevention measures that are designed to reduce the amount of pollutants and understand the effect of pollutants entering runoff though education, enforcement and behavioral modification programs. The City plans to continue and extend the dry weather flow diversion program to the

Dominguez Channel. This program will reduce runoff and pollutant loads by diverting non-storm water discharges to the sanitary sewer system and/or vegetated areas for infiltration.

8.0 POLLUTANT REDUCTION PLAN

Fact sheets and literature available on commercially available catch basin filters were reviewed and the results were discussed in earlier sections.

The Pollutant Reduction Plan is considered an "initial" scenario because over time, through adaptive management, the responsible agencies will likely "shift" among different types of BMPs (e.g., increase implementation of green streets and reduce implementation of regional BMPs) or substitute alterative BMPs altogether (e.g., implement dry wells instead of green streets). These shifts will be supported by analyses to show the substituted BMPs provide an equivalent target load reduction as the replaced BMPs.

Table 2.12 shows the qualitative analyses were performed to evaluate the ability of BMPs to meet load reduction targets associated with WLAs.

Table 2.12 Pollutant Reduction After Implementing catch Basin BMPs
Beach Cities EWMP
City of Torrance

Pollutants	Existing Load	Target Load Reduction (%)	Nonstructural BMP	Distributed Structural BMPs (Catch Basin Inserts)	Structural + Nonstructural BMPs
Zinc 90th Percentile Load Day - 11/08/2002					
Copper (lb/d)	36.99	62%	5%	75%	80%
Zinc (lb/d)	133.39	76%	5%	75%	80%
Critical Wet Year - 1995					
Fecal Coliform (MPN/yr) x10^14	627	53%	5%	33%	38% plus filtration/infiltration opportunities through potential Green Street Implementation in future.

No TMDL developed for fecal coliform. Target Load Reduction calculated based on REC-1 standard and high-flow suspension days.

Note:

The City of Torrance is following the adaptive management approach that would allow them to monitor the performances of proposed distributed structural BMPs (catch basin filters) and non-structural best management practices with respect to meeting the established TLR requirements.

Table 2.12 Pollutant Reduction After Implementing catch Basin BMPs Beach Cities EWMP City of Torrance					
Pollutants	Existing Load	Target Load Reduction (%)	Nonstructural BMP	Distributed Structural BMPs (Catch Basin Inserts)	Structural + Nonstructural BMPs
In addition, the City of Torrance is kick-starting building the Green Street Program and the ordinances to consider implementation of Green Street design features as part of street redevelopment within the City of Torrance. While implementing redevelopment of arterial streets, the City would assess opportunities for Green Street design with measures for treatment through filtration or infiltration. Green Street elements may include infiltration trench that provides water quality treatment, reduction in peak flow discharges, and potential groundwater recharge. Other Green Street elements that may be considered include bioretention/biofiltration practices to achieve water quality treatment through filtration by vegetation and soils to remove pollutants with perforated underdrain to convey the treated runoff. The City of Torrance is committed to developing the Green Street Ordinance established and in effect by July 2015 as required by the MS4 Permit. Based on the monitoring results, the City of Torrance would consider additional control measures if the required TLRs were not met or other improvements to existing best management practices were found necessary. This would allow changes in the number and type of best management practices selected for implementation. Through adaptive management and based on the future monitoring results, the implementation schedules may be modified to reflect the increased knowledge of the watershed. Actual schedule for Implementation of BMPs will occur as funding becomes available.					

8.1 Implementation Schedules

The estimated implementation schedules for the nonstructural and catch basin filters that are being considered by the City of Torrance to comply with WLAs and the Permit requirements are discussed below. The schedules presented herein are sufficient for long-term planning. Through adaptive management and based on the future monitoring results, the implementation schedules may be modified to reflect the increased knowledge of the watershed. Actual schedule for Implementation of BMPs will occur as funding becomes available.

8.1.1 TMDL Schedule

The TMDL implementation schedule consists of a phased approach, with interim WLAs to be met by March 23, 2012, and full compliance by March 23, 2032. Interim milestones for metals have been assumed to be met. Interim limits, which were effective as of March 2012, for the Dominguez Channel Toxics TMDL are based on the 95th percentile of historic monitoring data, therefore MS4 agencies are assumed to be in compliance with these limits as of the effective date.

For bacteria, no TMDL has been developed for fecal coliform. Reduction was estimated based on the Ballona Creek Bacteria TMDL. For bacteria, a combination of non-structural BMPs including Public Education and Outreach, reduction of irrigation return flows, and future development and implementation of Green Street design features would assist with meeting the TLRs for bacteria. In addition, the study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 indicated Fecal Coliform (bacteria) removal efficiency of 33% by the Grate Inlet Skimmer Box/Round Curb Inlet Basket.

8.1.2 Nonstructural BMP Schedules

An estimated schedule for the nonstructural BMPs is summarized in Table 2.13. The schedule accounts for the planning and design of the nonstructural BMP programs and the long-term implementation of the programs.

8.1.3 Distributed Structural BMPs (Catch Basin Filters) Schedules

Catch basin inserts were identified as part of the RAA analysis that the City of Torrance would consider implementing as part of the EWMP process. The City of Torrance is committed to implementing catch basin filters to meet the TLR and an estimated schedule for implementation has been presented in Table 2.14.

9.0 CONCLUSIONS

The City has completed a Reasonable Assurance Analysis (RAA) for TMDL pollutants and those pollutants that may reasonably be expected to exceed ambient water quality standards in receiving waters during wet weather conditions. Facilitating the RAA is the model recommended by Los Angeles County: *Loading Simulation Program in* C++ *(LSPC).* Based on qualitative analysis of proposed BMPs, the City is expected to meet the Dominguez Channel Toxics TMDL and the bacteria target load reductions.

10.0 REFERENCES

1. *Storm Water Management Model, Version 4: User's Manual*. U.S. EPA, 1988.
2. *Storm Water Management Model, Version 5: User's Manual*, U.S. EPA, 2008.
3. Guidance for Performing Reasonable Assurance Analysis in a watershed management program, including an enhanced Watershed Management Program, Los Angeles Regional Water Quality Control Board, March 2014
4. BASINS Information and User's Guidance, U.S. EPA, 2001
5. Stormwater Quality Master Plan, City of Torrance, CA, 2011
6. System for Urban Stormwater Treatment and Analysis IntegratioN (SUSTAIN) User's Manual Version 1.2, U.S. EPA, 2012
7. P8 Urban Catchment User's Manual, IEP, Inc.
8. Phosphorus Removal by Urban Runoff Detention Basins, Athayde et. al, 1983
9. Beach Cities EWMP Update dated February 2015, prepared by Geosyntec Consultants.

10. Los Angeles Regional Water Quality Control Board (LARWQCB) Basin Plan Chapter 3 titled Water Quality Objectives, dated May 2, 2013 Section on In Waters Designated for Non-contact Water Recreation (REC-2)
11. Removal Efficiencies of Grate Inlet Skimmer Box/Round Curb Inlet Basket as per Longo Toyota – Independent Field Test conducted in 2002 by the City of El Monte.
12. Optimization of Stormwater Filtration at the Urban/Watershed Interface, Department of Environmental Health, Independent Test conducted by the University of California, Irvine, in 2005.
13. The California Integrated Waste Management Board Catch Basin Insert Study Final Report, May 2005.
14. The City of lake Forest, Ultra Filter Sock Heavy Metal Drain Filter, Independent test, conducted by Environmental Chemistry lab, 2013-2014.

Table 2.13 **Proposed Implementation Schedule for Nonstructural BMPs**
Beach Cities EWMP
City of Torrance

Structural Project	Duration (months)	Timeline				
		2014	2015	2016	2017	2018
Catch Basin Cleanouts						
Purchase Advanced cleaning Technology (steam cleaning), as needed						
Focus on Problem Areas	3 – 6					
Increase Frequency of Cleanouts	Ongoing					
Catch Basin Inserts						
Install Catch Basin Inserts in Implementation Area	Ongoing					
Downspout Disconnection Program						
Planning & Assessment	8 – 12					
Implementation	24					
Fats, Oils and Grease Outreach						
Focus on Residents in TMDL Implementation Area	8 – 12					
Continuation of Existing FOG Outreach	Ongoing					
Green Waste Outreach						
Planning & Assessment	8 – 12					
Implementation	24					
Illicit Connection Removal						
Survey System in TMDL Implementation Area	24					
Implementation	24 – 36					

Table 2.13 Proposed Implementation Schedule for Nonstructural BMPs Beach Cities EWMP City of Torrance						
	Duration	Timeline				
Structural Project	(months)	2014	2015	2016	2017	2018
Impervious Cover Reduction						
Assess Feasibility of Reducing Existing Impervious cover	8 – 12					
Implementation, if appropriate	24					
Industrial/Commercial Facilities Control Program						
Nutrients and Toxics Specific Training	3 – 6					
Outreach to Facilities to Improve Onsite Source Control Activities	8 – 12					
Continuation of Existing I/C Facilities Program	Ongoing					
Pet Waste Outreach						
Planning & Assessment	8 – 12					
Implementation of Pet Waste Bag Dispenser Stations in TMDL Implementation Area	8 – 12					
Focus on TMDL Implementation Area Resident Outreach	24					
Continuation of Existing Pet waste Outreach	Ongoing					
Post Construction Requirements						
Specialized Nutrient, Toxics and Runoff Reduction Training for Staff	3 – 6					
Require Implementation of BMPs that Effectively Remove Nutrients and Toxics for Redevelopment Projects in County Islands	Ongoing					

Table 2.13 Proposed Implementation Schedule for Nonstructural BMPs
Beach Cities EWMP
City of Torrance

Structural Project	Duration (months)	Timeline				
		2014	2015	2016	2017	2018
Sewer System Maintenance						
Specialized Training for Staff	3 – 6					
Focus maintenance in County Islands	8 – 12					
Smart Gardening Program						
Planning & Assessment	8 – 12					
Implementation	Ongoing					
Street and Parking Lot Sweeping						
Planning & Assessment	8 – 12					
Upgrade/Purchase More Effective Street Sweepers, as needed	3 – 6					
Conduct Residential Outreach	8 – 12					
Increase Frequency of Sweeping	Ongoing					

Table 2.14 Implementation Schedule for Distributed Structural BMPs (Catch Basin Inserts) Beach Cities EWMP City of Torrance									
	Timeline								
Structural Project	2015	2017	2019	2021	2023	2025	2027	2029	2031
Catch Basin Inserts									
Green Street Elements									

Note:

Catch Basin Inserts are the distributed structural BMPs identified to be considered by the City of Torrance for implementation. The City has committed to the implementation of catch basin inserts to meet TLR requirements.

Based on literature review documenting the removal efficiencies demonstrated by the catch basin inserts, we justify that our proposal to implement catch basin inserts to meet the TLRs set forth by the Dominguez Channel Toxics TMDL would be realistic and achievable.

In addition, the City of Torrance is kick-starting developing the Green Street Program and the ordinances to consider implementation of Green Street design features as part of street redevelopment within the City of Torrance. While implementing redevelopment of arterial streets, the City would assess opportunities for Green Street with measures for treatment through filtration or infiltration. Green Street elements may include infiltration trench that provides water quality treatment, reduction in peak flow discharges, and potential groundwater recharge. Other Green Street elements that may be considered include bioretention/biofiltration practices to achieve water quality treatment through filtration by vegetation and soils to remove pollutants with perforated underdrain to convey the treated runoff. The City of Torrance is committed to developing the Green Street Ordinance established and in effect by July 2015 as required by the MS4 Permit.

For bacteria, a combination of non-structural BMPs including Public Education and Outreach, reduction of irrigation return flows, and future development and implementation of Green Street design features would assist with meeting the TLRs for bacteria. In addition, the study on Optimization of Stormwater Filtration at the Urban/Watershed Interface conducted by the University of Irvine, California, Department of Environmental Health in 2005 indicated Fecal Coliform (bacteria) removal efficiency of 33% by the Grate Inlet Skimmer Box/Round Curb Inlet Basket.

APPENDIX A – SUMMARY OF LOAD ESTIMATION

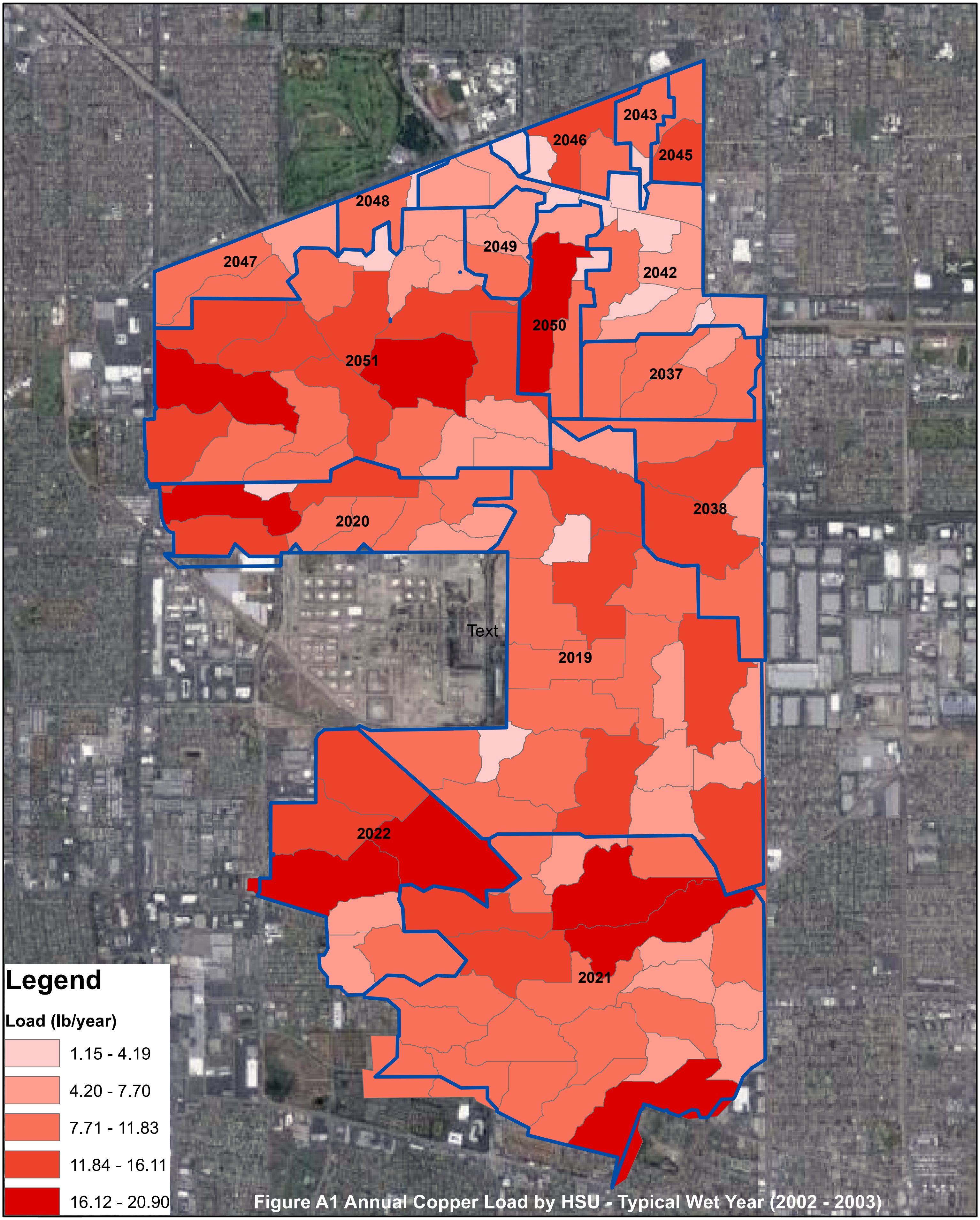


Figure A1 Annual Copper Load by HSU - Typical Wet Year (2002 - 2003)

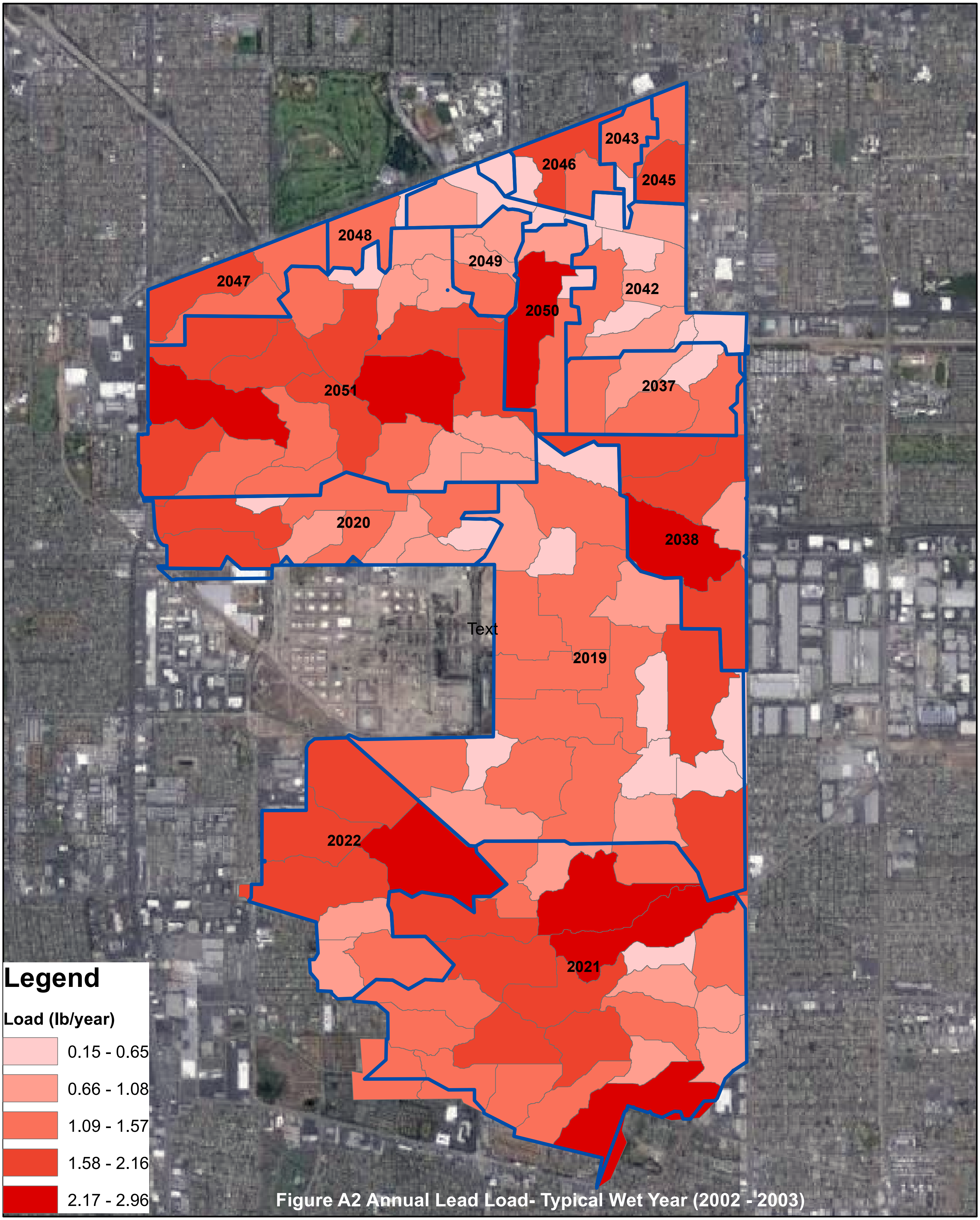


Figure A2 Annual Lead Load- Typical Wet Year (2002 - 2003)

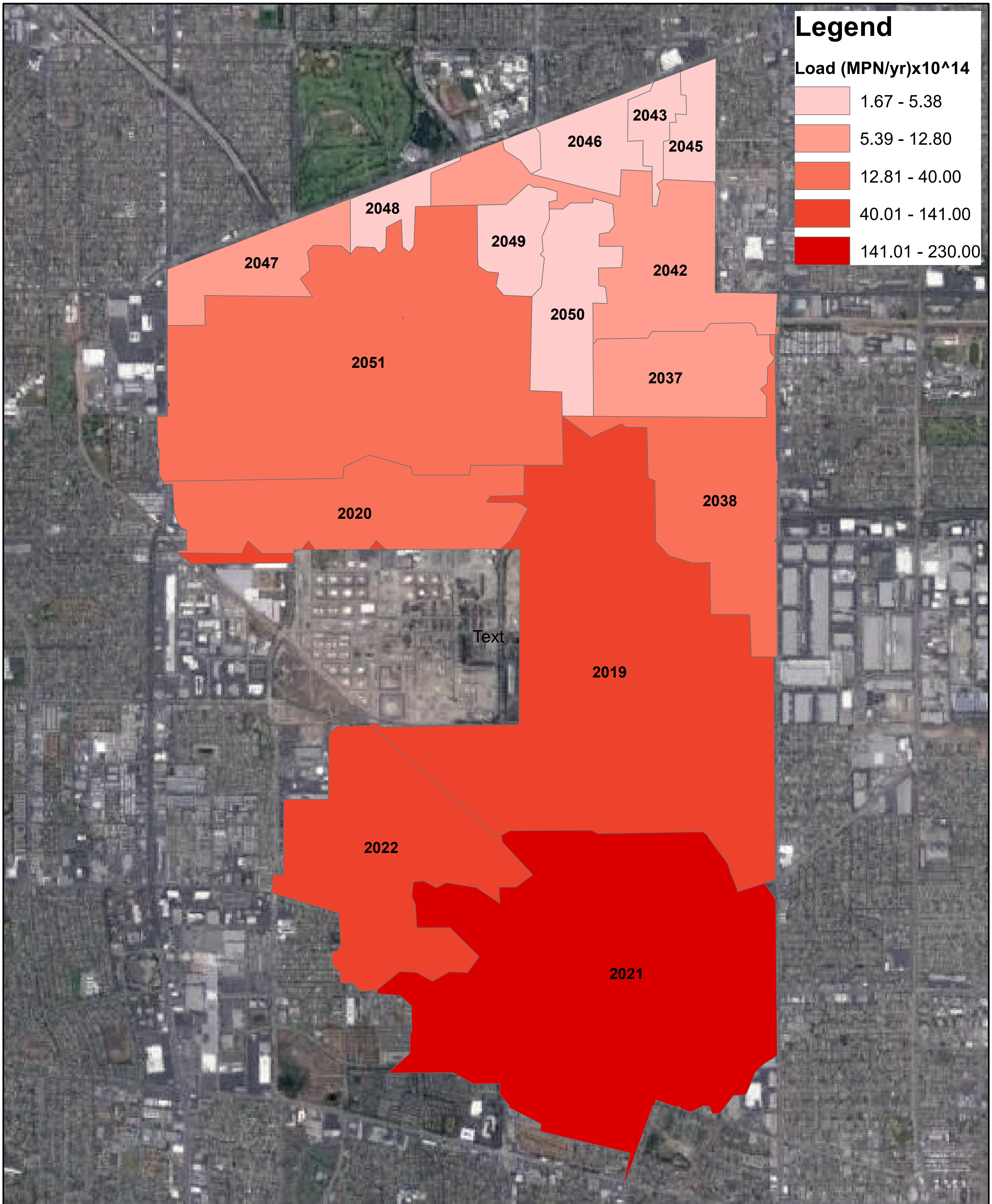


Figure A3 Annual Fecal Coliform Load - Critical Wet-weather Conditions (1995)

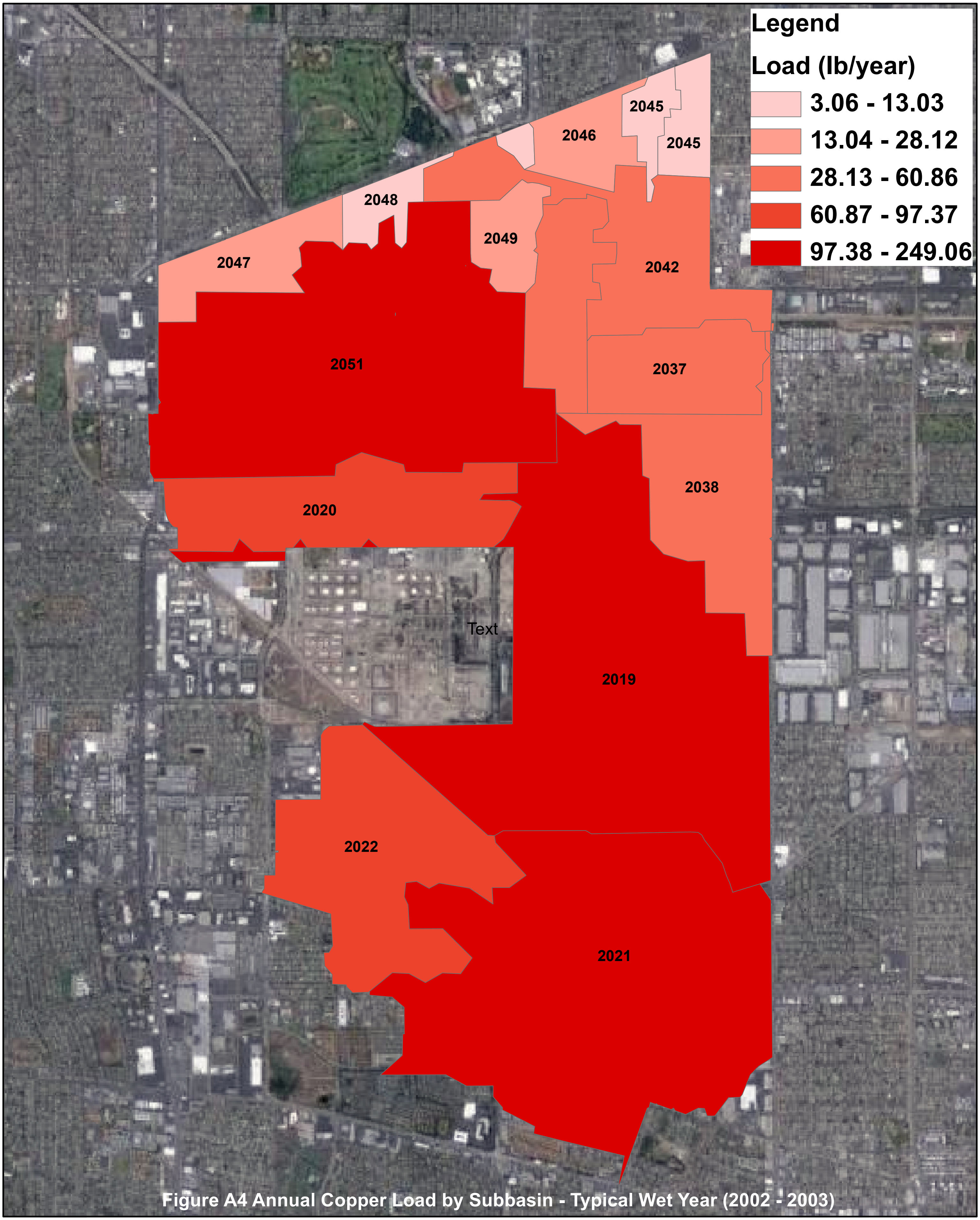


Figure A4 Annual Copper Load by Subbasin - Typical Wet Year (2002 - 2003)

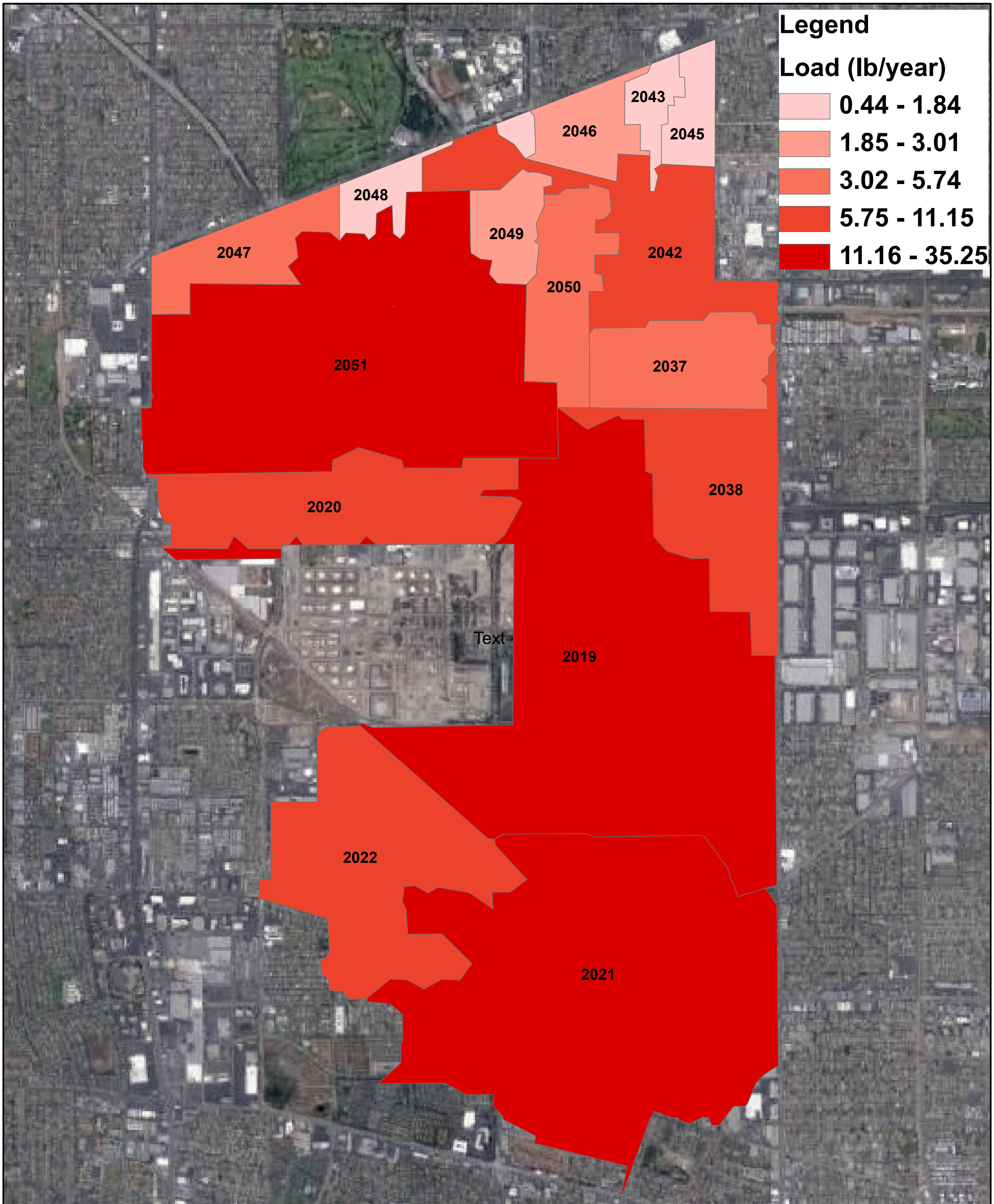


Figure A5 Annual Lead Load by Subbasin - Typical Wet Year (2002 - 2003)

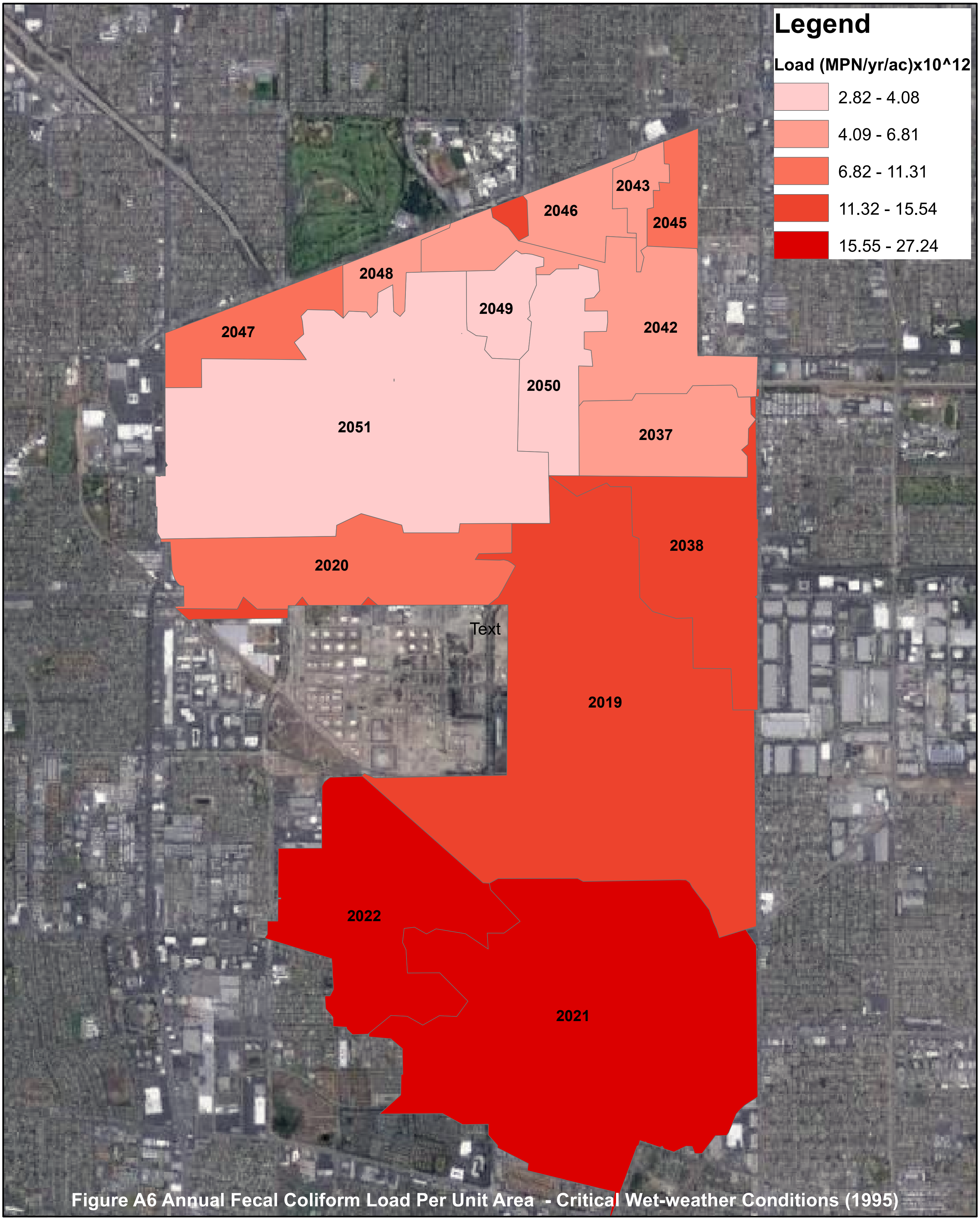


Figure A6 Annual Fecal Coliform Load Per Unit Area - Critical Wet-weather Conditions (1995)

APPENDIX B – CHARACTERISTICS CATCH BASIN INSERTS LITERATURE AND REFERENCES

ARB Contractors

3/24/2014-JTH

Test Results

	Laboratory Test	Date Sample	Date Report	Tech	Conductance uMHOS	Ph ph Units	TSS mg/L	Oil & Grease mg/L
1	Enviro-Chem	10/9/13	10/21/13	Coyne	609	6.33	322	4.05
2	Enviro-Chem	2/27/14	3/7/14	Coyne	153	7.28	332	2.34
3								
4								
5								
6								

Bench Mark	up to 200	6.5-8.5	up to 100	up to 15
Test-Method	SM 2510B	SM 4500-H+B	SM 2540D	EPA 413.2

Catchbasinfilter.com
Southern California

UltraTech International, Inc.

Heavy Metal Drain Filter - Ultra-Filter Sock®

Heavy Metal Drain Filter is a density polyethylene woven geo - textile sock with media type.

ULTRA-FILTER SOCK ®

Part#	Description	Dimensions in (mm)	Weight lbs. (kg)
9453	Activated Carbon	108 x 7 x 4 (2,743 x 178 x 102)	40.0 (18.0)
9455	Sorb 44	108 x 7 x 4 (2,743 x 178 x 102)	15.0 (7.0)
9457	Sediment Removal	108 x 7 x 4 (2,743 x 178 x 102)	40.0 (18.0)
9456	Phos Filter	108 x 7 x 4 (2,743 x 178 x 102)	66.0 (30.0)
9454	Heavy Metal Removal	108 x 7 x 4 (2,743 x 178 x 102)	35.0 (16.0)

* Multiple Ultra-Filter Socks can be used in a “treatment train” if the potential for more than one contaminant or a large quantity of a single contaminant is present.

Media Specifications

Media Type	Capacity Information
Activated Carbon	Each Filter Sock is filled with granular activated carbon. This media is an excellent polishing filter, due to its immense surface area and the wide range of components it is capable of absorbing. Helps with removing odors. Dry Filter Sock Weight of approximately 36 lbs
Heavy Metal Removal Media	Each Filter Sock can remove up to 1145 grams of heavy metals • Removal rates up to 50% per Filter Sock • See Heavy Metal Removal Data Sheet for more information • Dry Filter Sock Weight is approximately 32.5 lbs
Sorb 44	Each Filter Sock can absorb up to 5.33 gallons (20 liters) of hydrocarbon • Dry Filter Sock Weight is approximately 9 lbs
PhosFilter	Each Filter Sock can remove up to 26 lbs of phosphorus with up to 95% efficiency • Dry Filter Sock Weight is approximately 50 lbs
Sediment Removal Media	Recycled rubber material keeps unit in place and allows for maximum water flow • Dry Filter Sock Weight is approximately 40 lbs

* Note – All information is based on a standard 9-foot long Ultra-Filter Sock

Manufacturer: UltraTech International, Inc. All data provided by manufacturer
Authorized Distributor: Catchbasinfilter.com John Commercial Services.

Catchbasinfilter.com
Southern California

Heavy Metal Removal Media Data

List of Filterable Metals
Rubidium, Lithium, Potassium, Caesium, Ammonium, Sodium, Calcium, Silver, Cadmium, ***Lead***, ***Zinc***, Barium, Strontium, ***Copper***, Mercury, Magnesium, Iron, Cobalt, Aluminum, Chromium

Experimental Results
Percent Reduction (assumes 1" of head pressure and 15 second exposure time)

Initial Metal Concentration (ppm)	Percent Removal
4.0	30%
.04	50%

Saturation Point
The saturation point of the Heavy Metal Removal Media is 0.07 mg heavy metal/g of Media
This translates to 31.8 g of heavy metal/lb of Media

*Capacity of Different UltraTech Products**

Part Number	Description	Capacity (grams of Metal removed)
9397	Ultra-Drainguard, Heavy Metal Model	190
9460	Ultra-HydroKleen Media Filter 285	285
9302	Ultra-Downspout Guard (Standard)	475
9301	Ultra-Downspout Guard (Large)	715
9454	Ultra-Filter Sock (9-foot length)	1145

* - Actual results may vary based on initial metal concentration and site flow conditions

Solid Waste Recovery Efficiency +80.0% (Removal of solid particulate @ greater than .05 or 1 millimeter in diameter)
Total Suspended Solids (TSS) capture ++80% w debris catch over outlet.
Filter Test Results Per 22" of Media @ 100% Fill Rate = +80% Oil/Grease HydroCarbons & 60% Total Phosphorus (TP)

1) All flow thru test data completed by independent field test 1/31/2007 Filter Used: UltraTech Heavy metal Filter 9454 diameter 9' Filter Sock Tube 100% Fill Media.
2) Capacity: 4'x 8"
3) Final performance will vary based on open CB inlet drain type, design, grade, outlet, CFM, dimensions, solid waste type, maintenance, filter configuration. Results will vary by site installation.

Manufacturer: UltraTech International, Inc. All data provided by manufacturer
Authorized Distributor: Catchbasinfilter.com John Commercial Services.

Recommended Filter Replacement every 6 months as necessary.

CIWMB CATCH BASIN INSERT STUDY
FINAL REPORT

USED OIL RESEARCH, TESTING, AND DEMONSTRATION GRANT

Third Cycle

Grant Number URD3-02-0005

Prepared for:

The California Integrated Waste Management Board

Prepared by:

GeoSyntec Consultants
Portland, Oregon

University of California
Los Angeles

May 24, 2005

ACKNOWLEDGEMENTS

The California Integrated Waste Management Board partially funded this study through the Used Oil Research, Testing and Demonstration Grant to evaluate the performance of catch basin insert technology and methods in removing oil & grease and coarse sediments in the City of Los Angeles. The project benefited greatly from the assistance provided by the City of Los Angeles' contribution of staff time and costs in locating and providing the catch basins.

GeoSyntec Consultants and the University of California, Los Angeles (UCLA) performed the research reported herein. The Principal Investigators of this study were Eric W. Strecker of GeoSyntec Consultants and Professor Michael K. Stenstrom of UCLA. GeoSyntec staff that provided significant contributions to the project and final report includes Marc Leisenring, Dan Pankani, Chad Bird, and Andi Thayumanavan. UCLA research staff that provided significant contributions to this study includes Dr. Sim Lin Lau, Dr. Younghan Han, Simon Ha, Min-mo Chung, and Joo-Hyun Khang.

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1 INTRODUCTION

Used motor oil and other oils and greases entering storm drains represent a significant source of pollution to the waters of California, especially in highly urbanized areas, such as the City of Los Angeles. Increasingly, pollutants associated with used motor oil, such as heavy metals and petroleum hydrocarbons, have been identified as primary constituents contributing to the decline of surface water quality in California over the past several decades. Motor oil, including crankcase, transmission, gearbox, and differential lubricating oil, that leaks from automobiles or is disposed of improperly often ends up in storm drains and eventually receiving waters.

Although the use of inlet and catch basin filters has become a significant component of many agencies' non-point pollution control strategies to control oil and grease discharges, only limited third-party performance monitoring and testing has been conducted to quantitatively assess the ability of these technologies to remove oil and grease from stormwater as well as the associated other pollutants. Even fewer studies are available that assess changes in performance as filters are exposed to field conditions and no studies were found that assess the ability of inserts to retain used motor oil after an illegal dumping activity.

The City of Los Angeles has installed several types of oil-absorbent catch basin/inlet inserts in their storm drain system in partial fulfillment of the requirements of NPDES Permit No. CAS004001. These inserts have been installed according to the design requirements of the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP). However, the effectiveness and long-term performance of many of these inserts at removing and retaining oil and grease, as well as other pollutants is relatively unknown (i.e. limited to vendor reported or claimed performance estimates, which often report percent removals when new or were assessed in only limited studies). Furthermore, the methods used to define performance often vary significantly between vendors, as well as in independent third-party studies. Therefore, the transferability and compatibility of available performance data is extremely limited.

1.1 PROJECT PURPOSE AND GOALS

The purpose of this study was to provide an independent performance assessment of storm drain inlet filter devices at removing oil and grease and associated pollutants from stormwater. The first goal of the study was to assess the stormwater quality issues of oil and grease in the City of Los Angeles and provide a thorough literature review of catch basin insert technologies and methods for evaluating performance as it relates to the removal of oil and grease from urban runoff. The second goal was to evaluate the performance (at various stages of their useable lives) of four (4) different catch basin filters currently used by the City of Los Angeles in removing and retaining used motor oil and associated pollutants from urban runoff, as well as from illicit and accidental dumping activities.

1.2 DOCUMENT ORGANIZATION

After this introductory section, this document is organized into four main sections: Section 2 - Literature Review, Section 3 - Methodology, Section 4 - Results and Discussion, and Section 5 - Summary and Conclusions. Section 2 briefly assesses the current stormwater quality issues of oil and grease in the City of Los Angeles and reviews various catch basin insert technologies and available performance studies. Section 3 outlines the methodologies for evaluating catch basin insert performance for both the field and laboratory components of the study. Section 4 discusses the performance implications of the field observations and summarizes the results of the laboratory tests. Finally, Section 5 summarizes the overall study and provides recommendations for future research.

In addition to the main text, Appendix A includes detailed maps identifying the location of the catch basins used in the study, Appendix B includes the field inspection photos and notes, and Appendix C provides the extraction method used for the laboratory oil and grease tests.

2 LITERATURE REVIEW

The following subsections provide a brief background of the issues regarding oil and grease in stormwater runoff in urban areas in general, and the Los Angeles area in particular (Section 2.1); a literature review of studies that have evaluated the performance of catch basin inserts at removing oil and grease (Section 2.2); expected ranges of stormwater runoff concentrations, as well as the expected level of treatment of catch basin inserts for oil and grease and total petroleum hydrocarbons (TPH) (Section 2.3).

2.1 BACKGROUND AND IDENTIFICATION OF RESEARCH NEEDS

Oil, grease, and hydrocarbons in urban stormwater runoff originate primarily from leaking vehicles, car maintenance activities, illegal dumping of oil, auto accidents, and spills. Heavy metals in urban stormwater originate primarily from roadway construction materials, deteriorating building surfaces, burning of fossil fuels, and engine wear and leaks and brake pad and tire wear. These pollutants are of environmental concern because nature cannot rapidly degrade or assimilate them. So, even if runoff contains low concentrations of the pollutants, they can accumulate in the environment and have acute and chronic toxic effects on aquatic organisms.[1]

A study conducted by the Pelegrin Research Group in 1997 found that 15% of the residents in Los Angeles County who change their own oil (~20% of the residents) participate in improper disposal, with 1% (of the 20%) disposing of it by dumping directly onto the street, gutter, or storm drain.[2] With an L.A. County population close to 10 million people and assuming 4 gallons of used oil per year are disposed of by people who engage in illegal storm drain disposal, these people are may be contributing about 80,000 gallons of oil per year, directly to the Los Angeles County storm drain system. Leaks from automobiles are likely contributing much more than this, as it was estimated that approximately 64 million gallons of the oil sold in California in the 2000/2001 fiscal year either leaked out of, or was burned in engines.[3] With nearly 30% of the State's population living in Los Angeles, approximately 19 million gallons of this leaked or burned oil likely occurred in L.A. County.

Motor oil that leaks from automobiles is dispersed; resulting in generally low stormwater concentrations, and therefore, the acute environmental impacts of leaked oil is likely less than environmental impacts of illegal dumping activities. For instance, stormwater monitoring by the County of Los Angeles has shown that the land uses associated with the highest average concentrations of oil and grease are commercial (3.3 mg/L) and transportation (3.1 mg/L).[4] In another stormwater characterization study in the City of Santa Monica, average oil and grease

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[1] Bosworth, N. 1999. Tertiary Treatment of Urban Stormwater. University of Newcastle. http://www.stormwater-resources.com/library.htm
[2] Pelegrin Research Group (1997). "Los Angeles County Stormwater Segmentation Study-Resident Population." Prepared for the Los Angeles County of Public Works.
[3] California Integrated Waste Management Board (2002). "California's Used Oil Recycling Program." Publication Number 332-97-015.
[4] Los Angeles County Department of Public Works (2002). "Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report" [Online] http://ladpw.org/wmd/npdes/IntTC.cfm.

concentrations were reported as 5.9 mg/L and 8.2 mg/L for commercial and transportation land uses, respectively.[5]

These data represent storm event averages, or more precisely, averages of mean storm event concentrations (multiple grab samples were taken throughout the duration of individual storms, but they were not necessarily flow- or time-weighted composites). However, these data mask the "first flush" phenomenon that can occur during the beginning of storms and/or any illegal oil dumping activities. For many pollutants, approximately 30% of the mass is released during the first 20% of the storm.[6] Therefore, oil and grease concentrations at the beginning of a storm could potentially be much higher than the average storm event concentrations. These data represent storm event averages, or more precisely, averages of mean storm event concentrations

Oil, grease, and hydrocarbons interfere with plant photosynthesis and with reproduction, respiration, and growth and development of aquatic organisms. These chemicals can accumulate in sediments and tissues of fish and other aquatic organisms, potentially causing cancer, mutations, and even death. Furthermore dissolved oxygen levels may become depleted through the degradation of hydrocarbons.[7]

Dissolved metals, that can be associated with motor oils can cause short and long-term toxic effects on aquatic organisms. They can bioaccumulate in animal tissue and affect reproduction rates and life spans of aquatic organisms. Metals deposit in sediments where they negatively impact benthic organisms and their predators.

Oil and grease in stormwater runoff can be free-floating, suspended, or emulsified or can sorb to trash, debris, and particles. Between 83-98% of total hydrocarbons in stormwater runoff are bound to particulate matter, and most of these particles are settleable. Most stormwater studies only report free-floating oil concentrations, which typically range from 2-35 mg/L. Free-floating oil and grease can be removed by sorbent materials, such as those found in catch basin inserts.[8]

In highly urbanized environments, such as the City of Los Angeles, where available space for many traditional Best Management Practices (BMPs) is limited (for example retention ponds, constructed wetlands, or infiltration basins), proprietary devices, such as catch basin filters are often used to capture oil and grease. The manufacturer usually provides some quantitative and/or qualitative measure of the effectiveness of these types of devices at removing pollutants. Inconsistent testing and reporting protocols and the absence of self-imposed testing quality control have generated concerns over the reliability of available performance data. These

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[5] Woodward-Clyde (1998). "Santa Monica Bay Area Municipal Stormwater/Urban Runoff Pilot Project – Evaluation of Potential Catchbasin Retrofits." *Prepared for Santa Monica Cities Consortium c/o City of Santa Monica.*

[6] Ma, S., S. Khan, Y. Li, L. Kim, S. Ha, S. Lau, M. Kayhanian, and M. Stenstrom (2002). "First Flush Phenomena for Highways: How it can be meaningfully defined." *Proc. Ninth Inter. Conf. on Urban Drainage*, E. Strecker and W. Huber, eds., Lloyd Center, Doubletree Hotel, Portland, Oregon, Sept. 8-13, 2002.

[7] Bosworth, N. 1999. Tertiary Treatment of Urban Stormwater. University of Newcastle. http://www.stormwater-resources.com/library.htm

[8] Environmental Protection Agency (EPA). 2002. Storm Water Technology Fact Sheet. Publication # 832-F-02-020. September.

concerns have prompted some agencies to prepare protocols for the verification of proprietary stormwater treatment devices.[9,10,11]

Adoption of these protocols is increasing; however, currently there are few data available on the wide variety of devices currently employed throughout California. (Currently the only stormwater treatment technology certified by the CalCert Program is the AquaShield™ Filtration System, Model SD-100 and the performance claim states the product "removes 92% of oil and diesel fuel in water when influent concentrations are between 1,000 to 2,000 mg/l."[12] These influent concentrations are nearly 3 orders of magnitude greater than typical stormwater concentrations of oil and grease). Independent or "third-party" testing of these devices and detailed effluent quality characterization, can improve estimates of the quality of stormwater reaching receiving water bodies from drainages receiving this type of treatment. Also, an improved understanding of the potential water quality and spill (and intentional dumping) mitigation functionality of catch basin filters, the amount of motor oil captured in the storm drain filters can be estimated. This will help improve the understanding of the fate (mass balance) of motor oil sold in California and the effectiveness of catch basin filter treatment technologies.

Typically in practice, catch basin filters have two intended primary functions: (1) to reduce loading resulting from high concentration flows (typically associated with low flow rates) from spills, significant leaks, and improper disposal to storm or surface drains; and (2) to reduce loading from typical urban stormwater discharges (typically relatively lower concentration at much higher flow rates). An initial review of third party stormwater treatment technology evaluations conducted to-date has shown highly variable results in the performance of filter media at removing oil and grease from stormwater and mitigating high concentration, lower flow discharges. This report will review and report on laboratory and field studies conducted on the effectiveness of catch basin inserts in removing oil, grease, hydrocarbons, and heavy metals from urban runoff.

2.2 CATCH BASIN INSERT PERFORMANCE STUDIES

Several catch basin insert studies have been performed by various third-party researchers and insert manufacturers and vendors. Due to the wide variety of insert configurations, insert types, and site-specific conditions, more studies are still needed to adequately assess the ability of this technology to reduce the amount of oil and grease reaching receiving streams. Also, few studies (if any) have specifically evaluated the ability of catch basin inserts to retain used motor oil that has been illegally dumped directly into the storm drain.

The following studies all determined pollutant removal efficiencies by comparing inlet and outlet concentrations.

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[9] Washington Department of Ecology (2002). "Stormwater Treatment Facility Performance Evaluation Guidance Document." *Washington Department of Ecology*

[10] Bachhuber, James, Steven Corsi, and Roger Bannerman (2002). "ETV Verification Protocol Stormwater Source Area Treatment Technologies, Draft 4.1.' *U.S. EPA Environmental Technology Verification Program.*

[11] CalCert (2001). "Stormwater Best Management Practice Demonstration Tier II Protocol for Interstate Reciprocity." *Endorsed by the States of California, Massachusetts, New Jersey, Pennsylvania, and Virginia* [Online Available, April 2002] http://www.calepa.ca.gov/CalCert/documents/Stormwater.pdf

[12] California Environmental Technology Certification Program (2000). "Evaluation of the AquaShield™ Filtration System." [Online] http://www.calepa.ca.gov/CalCert/CertifiedTech

2.2.1 INTERAGENCY CATCH BASIN INSERT COMMITTEE (ICBIC) LAB STUDY

In a catch basin insert study conducted in Seattle, Washington, oil and grease removals were studied to evaluate changes in removal rates over-time.[13] The study consisted of testing four (4) proprietary filter media in a laboratory (before and after being field conditioned), using influent oil and grease concentrations of 20-90 mg/L at a flow rate of 5-10 gpm. Field conditioning included placing each filter in field catch basins that serviced approximately the same drainage areas and land uses (i.e. parking lots), until approximately 0.75" of rainfall occurred. After field conditioning, the filters were taken to the laboratory to be tested again. The field sites included a vehicle maintenance shop yard, an arterial road, a park-and-ride lot, and an industrial storage yard. Drainage areas ranged from 0.11 to 0.34 acres.

Results of the study showed a significant decline in oil and grease removal rates from when the filters were new, to after two (2) field-laboratory test sequences. Negative removal rates during some of the tests indicated release of oil and grease from the filter media, which indicated the filter had exceeded its holding capacity and, in fact, washout/leaching was occurring. Furthermore, few of the filters were able to produce effluent concentrations below 10 mg/L, even when the filters were new, at the influent concentrations tested. Table 2-1 summarizes the results of this study.

New inserts removed 20 to 90% of petroleum hydrocarbons from water containing 34 to 85 mg/L of oil. For most of the devices tested, performance declined rapidly with use. During the first test, the inserts were removed from the field after two-inches of rain. This test showed that new inserts were able to remove oil and grease by 30 to 90%. After two-inches of rain, the removal efficiency dropped to less than 30%. During the second test, the inserts were removed from the field after 0.5 to 0.75-inches of rainfall. New inserts removed 21 to 85% of oil and grease during this second test. The Stormwater Services devices maintained a removal efficiency of approximately 50%, even after three field tests. In contrast, the Enviro-Drain's removal efficiency was 50 to 60% when in new condition. One Aqua-Net device's removal efficiency increased from 21 to 82% with use, while the other device maintained a removal efficiency of around 35%. None of the devices removed copper, lead, or zinc. Inserts captured between 0 to 41-pounds of sediment during a 120-day period.

For all but one insert, field observations indicated that stormwater could enter the catch basin without passing through the insert. Instead, the water flows between the pavement and the outer edge of the grate frame and then beneath the frame of the insert. Maintenance frequencies depended on site conditions such as oil and grease loading rates. Because accumulation of sediment can clog the filter and prevent further absorption, the authors recommended maintenance ranging from after every rainfall event to after every five-inches of cumulative rain. Because wood-fiber can become saturated and decompose, these types of filters would need to be replaced after a month or two.

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[13] Interagency Catch Basin Insert Committee (1995). "Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater runoff from Developed Sites." Collaborative research team consisting of King County Surface Water Management Division and Department of Metropolitan Services, Snohomish County Surface Water Management Division, Seattle Drainage and Wastewater Utility, and the Port of Seattle.

Table 2-1. Summary of oil and grease removal efficiency of catch basin inserts tested by the Interagency Catch Basin Insert Committee (1995)

Vendor	Device	Media Type	Test Interval	Influent (mg/L)	% Removal New	% Removal Used
All	All		2" rain	35	30-90	<35
Aqua-Net Gullywasher	AN-A	Basket, AbW Wood-fiber	2" rain	35	60	NA
All	All		2" rain	67, 85	21-85	NA
Aqua-Net Gullywasher	AN-AW	Basket, AbW Wood-fiber	0.75" rain	67, 85	21	82
Aqua-Net Gullywasher	AN-AS	Basket, Supersorb Wood-fiber	0.75" rain	67, 85	35	35
Environmental Services Enviro-drain	ED-SAA	Two trays, course screen AbW Wood-fiber	0.75" rain	67, 85	50-60	NA
Stormwater Service	SS-2O SS-3	Sock with polypropylene strips	0.75" rain	67, 85	50	50

NA - not available

2.2.2 SANTA CLARA VALLEY PARKING LOT STUDY

Woodward-Clyde (1996)[14] tested the performance of catch basin inserts manufactured by Aqua-Net, Inc.; Enviro-Drain, Inc.; and Stormwater Services during two (2) storm events. The Aqua-Net Gullywasher consisted of two baskets, with Absorbent W (a natural wood fiber cellulose) pillows between the two baskets. A bag filled with PetroLOK (a polymer and activated carbon absorbent) was placed around the outside basket.

The Enviro-Drain device has three stacked trays, with the middle and bottom trays containing Absorbent W. The Stormwater Services Stream Guard Type II consists of a boot filled with polypropylene strips that directs water into a polypropylene bag. Drainage basin areas draining to the inserts ranged from 0.77 to 2.5-acres.

During the first storm, sediment, leaves, and/or pine needles were observed to cause considerable clogging and bypass of the filter inserts, which limited the performance of the filters. The top tray of the Enviro-Drain and the outer filter of the Gullywasher were easily clogged and the bag of the Stream Guard broke during one storm. The inserts were effective at removing total petroleum hydrocarbons (TPH), but no significant reduction in TSS concentrations were observed. The authors suggested that since the post-filter samples were pumped out of the bottom of a funnel, surface oils might not have been captured. The Enviro-Drain and the Stream Guard removed an average of 90% and 85% of hydrocarbons with influent concentrations of 9.1 and 4.8 mg/L, respectively. Gullywasher only removed an average of 30% of hydrocarbons with an average influent concentration of 1.2 mg/L.

The Aqua-Net gullywasher removed an average of 59.58% hydrocarbons. The authors proposed that the Gullywasher would work better without the additional PetroLOK. No discernible removal of chromium, copper, lead, nickel, or zinc was found.

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[14] Woodward-Clyde. 1996. Parking Lot Monitoring Report. Prepared for the Santa Clara Valley Non-point Source Pollution Control Program. June 11.

2.2.3 SACRAMENTO PARKING LOT STUDY

Larry Walker Associates (1998)[15] studied the performance of Fossil Filter manufactured by KriStar Enterprises, Inc., in a one-acre parking lot during three (3) separate storm events. The Fossil Filter is a ring-shaped filter filled with alumina silicate. The filter removed 50% of total petroleum hydrocarbons, 28% of copper, 33% of lead, and 13% of zinc (although for two storms, the zinc concentration increased).

Water bypassed the filter for flows exceeding 0.05 in/hr per watershed acre. It was observed that 60% to 70% of the flow bypassed the filter. In addition, when the grading at the inlet was uneven, bypass flow would occur because the water would not flow evenly through the filter. During a storm in January, it rained 0.56" in 1.5 hours. Samples were not collected at this time, but the insert was full and water with lines of oil and grease was observed flowing into the bypass. The filter media had to be replaced before each storm event due to debris accumulation.

2.2.4 SANTA MONICA BAY STUDY

A full-scale laboratory study conducted as part of the Santa Monica Bay Municipal Stormwater/Urban Runoff Pilot Project evaluated the oil removal efficiencies of three (3) different types of proprietary catch basin filter media. Using an influent free oil (i.e. well mixed, but not emulsified) concentration of 25 mg/L at a flow rate of 15 gpm, the study showed significant removals (69-91%) for all of the media types (when new), during the 90-minute test period.

The study included both full scale and bench scale tests to evaluate the performance of OARS polymer (Abtech), compost, polypropylene, and alumina silicate (Perlite, X sorb) in removing free oil and grease. Oil and grease removal efficiencies averaged 84% for OARS, 81.33% for Perlite (aluminum silicate), 91.5% for Xsorb (aluminum silicate), 50.33% for compost, and 85.25% for polypropylene. No sorbent was effective at removing emulsified oil and grease. The authors concluded that sorbent breakthrough time depends on the mass of oil applied (concentration and flow) and the mass and packing density of the sorbent.

A laboratory study by Lau et al. (2001)[16] showed that metal boxes containing OARS sorbent removed an average of 34.5% of polycyclic aromatic hydrocarbons from water containing 50 ug/L of hydrocarbons. Polypropylene insert devices (DrainPac by United Stormwater) removed an average of 65% of the polycyclic aromatic hydrocarbons. The OARS device removed an average of 71% of oil and grease. The DrainPac had an average oil and grease removal efficiency of 67%.

Lau et al. (2001) also performed a field study to determine the effectiveness of polypropylene and OARS polymer inserts in commercial (1.24 acres) and residential (2.97 acres) areas. Over a six-hour period the OARS sorbent efficiency declined linearly from 85% to 40%, and the polypropylene sorbent efficiency declined linearly from 85% to 50%. The oil and grease concentrations were 19.02 mg/L for the first two hours, 14.0 mg/L for the next two hours, and 10.91 mg/L for the last two hours. Flow bypassing the inserts gradually increased as the inserts became more clogged.

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[15] Larry Walker Associates. 1998. NDMP Inlet/In-line Control Measure Study Report 1997-98. Prepared for County of Sacramento, City of Sacramento, City of Folsom, and City of Galt. June.
[16] Lau, S.L., E. Khan, and M.K. Stenstrom. 2001. Catch Basin Inserts to Reduce Pollution from Stormwater. Water Science and Technology. 44(7): 23-34.

To prevent debris accumulation in the inserts during the dry season, Lau et al (2001) covered two catch basins with plywood and two with wire screen, leaving a 2.5 cm gap at the bottom to allow runoff to enter the basin. These covers prevented 95% of trash and debris from entering the catch basin. Street sweepers were able to remove the material that accumulated at the bottom of the covers without damaging the covers.

2.2.5 CITY OF LOS ANGELES STUDY

During the 1999-2000 and 2000-2001 wet seasons, the City of Los Angeles Stormwater Management Division studied the performance of five (5) different types of catch basin inserts at removing sediments, trash, oil and grease, and metals.[17] Due to a limited number of sampling events (4) and study sites (5), the results of this study were inadequate for a statistically valid assessment of the performance of the inserts studies. However, qualitatively the results of the study found that all of the units were moderately effective at removing oil and grease, suspended solids, and heavy metals. Furthermore, the study indicated that for most insert types, inspection and maintenance should occur before and after each rain event during wet weather and monthly during dry weather to maintain their performance integrity and to minimize leaching of previously captured pollutants.

The study included evaluating the performance of AbTech's Ultra Urban Filter, the Fossil Filter, Remedial Solutions Models CD-300 and SD-100, and United Storm Water's DrainPac Storm Drain Filter. The Ultra Urban Filter is a galvanized steel basket packed with Smart Sponge (synthetic polymers). The Fossil Filter is a fiberglass trough with 4" thick Fossil Rock (an absorbent) between two stainless steel screens. Both Remedial Solution devices are stainless steel with a sediment removal basin and three stacked filtering baskets containing 100% reclaimed material. The DrainPac is a non-woven filter cloth liner filled with polypropylene.

The Fossil Filter was maintained monthly, but was clogged during the first half-hour of light rain. The Remedial Solution devices were maintained weekly during which the filter media were replaced five times during nine months. At a sanitation yard site, the filter collected a total of 16 pounds of plastic, 24 pounds of paper, 7 pounds of grass, and 24 pounds of sediment. At a maintenance yard site, the filter collected a total of 108 pounds of oily sediment and 4 pounds of debris. During three rain events, all the runoff was bypassing the filter due to a gap between the filter and the catch basin opening. No data was collected from the above three filters due to the excessive clogging.

The DrainPac had one cleaning during which 400 pounds of trash, debris, and sediment containing 1,480 mg/kg of oil and grease (the CA limit is 1000 mg/kg for nonhazardous waste disposal) was removed from the device. Due to clogging, data from only one storm event was collected, during which the DrainPac removed 52% of the oil and grease.

During all storm events the AbTech device was filled almost completely with trash and sediment. It captured 302 pounds of sediment and trash. The 8.2% removal of oil and grease was contributed to the large amount of runoff bypassing the filter. Alternatively, the sponge may not have effectively captured pollutants or may have reached its sorption capacity. Oil and grease removal did not increase during the third event, which occurred three days after a cleaning (two maintenances were performed during the study, one occurring after the third rain event).

[17] City of Los Angeles, Stormwater Management Division (2001). "Catch Basin Insert Pilot Study Report and Addendum."

Zinc concentrations increased 45%, which was contributed to leaching by the zinc-coated galvanized steel basket.

2.2.6 CALIFORNIA EPA STUDY

The California EPA (2000)[18] evaluated the AquaShield Filtration System Model SD-100. The AquaShield is a stainless steel structure containing recycled cellulose fibers packed in a nylon mesh bag. The influent concentrations of oil and grease were very high compared to the 2 to 35 mg/L found in stormwater runoff. The concentrations ranged from 1,022 to 2,192 mg/L with an average of 1,477 mg/L. This system removed 92% of the oil and grease.

2.2.7 KING COUNTY STUDY

The Model 3001 StreamGuard™ Insert is designed for oil and grease removal in areas such as parking lots, construction sites, marinas, industrial sites, and vehicle washing facilities. King County Surface Water Management Division of Washington State performed independent testing of this technology and found removal efficiencies of oil and grease at 88% for a StreamGuard installation in a park-and-ride lot. Sea-Tac International Airport installations were also monitored and removal efficiencies were approximately 80% for Total Suspended Solids and 94% for oil and grease.[19]

2.2.8 UNIVERSITY OF CALIFORNIA LOS ANGELES STUDY

Strenstrom et al (2002)[20] performed a series of experiments to evaluate the removal efficiencies of various Kristar (Fossil Filter) catch basin inserts. The target pollutants were oil and grease and suspended solids. The experiments were conducted in a full-scale catch basin located in a laboratory in UCLA. They tested two different types of inserts, namely Flo-Gard™ and Flo-Gard™ High Capacity. Oil and grease influent concentrations were varied from 16 mg/L to 36 mg/L and Total Suspended Solids influent concentrations were varied 65 mg/L to 100 mg/L. Automobile crank case oil and graded fine sand were used to simulate oil and TSS respectively.

They observed oil removal efficiencies of 70% to 80% and sand removal efficiencies of almost 100% for particles 30-mesh (589 to 833 mm) and larger, 20% for particles 60-mesh (250 to 420 mm) and nearly zero for smaller particles.

2.2.9 ROUGE RIVER WATERSHED STUDY

Alsaigh et al (1999)[21] presents the performance of four catch basin insert technologies monitored for a 19 Month period. The devices were installed at two gas station sites in the Cites of Livonia and Westland, Michigan. The devices are the Gullywasher™, the Hydro-Cartridge®, the StreamGuard™ and the Grate Inlet Skimmer Box. Parameters of interest included capital cost,

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[18] California Environmental Protection Agency (EPA). 2000. Evaluation of the AquaShield Filtration System (Model SD-100, Series 576). Environmental Technology Certification Program. January.
[19] New England Environmental Protection Agency(EPA NE) (2003) "Streamguard™ Catch Basin Inserts" http://www.epa.gov/region1/assistance/ceitts/stormwater/techs/streamguardinsert.html
[20] Stenstrom M. K., Lau S. (February, 2002) "Oil and Grease and Particle Removal by KriStar Flo-Gard and Flo-Gard High Capacity Stormdrain Inserts" 12pp http://stormdrainfilters.com/flogard.doc
[21] Alsaigh, R., Boerma, J., Ploof, A. Regenmorter, L. (April 1999) "Evaluation of On-Line Media Filters in the Rouge River Watershed". Task Product Memorandum Nonpoint Work Plan No. URBSW5, Task No.3. Wayne County, MI: 51pp

operations and maintenance costs, and pollutant removal efficiencies. They rank the devices as follows:

- The Gullywasher™ was found to be the most efficient at removing sediment;
- The Hydro-Cartridge® was most efficient in terms of oil removal 9,700(mg/Kg captured /1,000 gallons filtered);
- The Hydro-Cartridge® and the StreamGuard™ were the easiest to maintain;
- The StreamGuard™ had the lowest initial capital cost; and
- The Hydro-Cartridge® had the cheapest replacement inserts.

Table 2-2 presents a summary of insert performance with respect to sediment and oil and grease removal in addition to capital cost.

Table 2-2. Removal efficiency and capital cost summary.

Device	Average Sediment captured / Gallons Filtered (lbs/1,000 gallons)	Average Oil Captured / Gallons Filtered ((mg/Kg)/1,000 gallons)	COST			
			Structure	Media	Approx. Media Replacement Interval	Est. First Year Capital Cost
Hydro-Cartridge	0.19	9,700	$700 - $800	$9	3 months	$736 - $836
StreamGuard	1.11	5,000	n/a	$40-$80	2 months	$240 - $480
Gullywasher	6.60	2,100	$440	$60	3 months	$680
Grate Inlet Skimmer Box	0.39	700	$475	$25	3 months	$575

The authors concluded that all four (4) filters performed well and that filter performance is heavily dependent on site conditions and project objectives.

2.2.10 AbTech Ultra-Urban Filter - Vendor Studies

Summarized below are summaries of several studies by AbTech that evaluate the performance of their Ultra-Urban Filter. [22]

Tucson, AZ

This study included laboratory experiments to determine the effectiveness of the Ultra-Urban Filter, a galvanized steel basket containing Smart Sponge, in removing motor oil and diesel fuel. A 50-50 mixture of motor oil and diesel fuel with a concentration of 28 mg/L was run through the filter. Studies were run with and without debris (leaves, rocks, and twigs) and sediment. The filter removed an average of 83% of the oil and grease. Performance did not decline with the addition of debris and sediment.

Santa Monica, CA

In this study, an Ultra-Urban Filter that had been installed in a residential area for two months during the Santa Monica Bay Municipal/Urban Runoff Pilot Project was evaluated. A 28 to 32 mg/L mixture of motor oil and diesel fuel was run through the filter. The concentration of oil and grease was reduced by an average of 91%.

[22] AbTech. 2003. Detailed Technical Field Test Results: The Ultra-Urban Filter with Smart Sponge. http://www.abtechindustries.com/Test%20Results%20Menu.htm

Seattle, WA

Minton (2002)[23] performed laboratory studies to determine the efficiency of AbTech's Ultra-Urban Filter in removing motor and diesel oil. A new unit's removal efficiency averaged 81%, when the influent concentration was between 10 to 30 mg/L. Performance of the device gradually dropped by 10 to 20% during the 120-minute tests. A device that had been in the field removed 78 to 96% of the 30 mg/L oil and grease.

Springfield, MA

Astro Environmental, LLC (2003)[24] performed field studies of AbTech's Ultra-Urban Filter. The influent contained either 250 mg/L of oil, grease, and vegetable oil or 100 mg/L of motor oil and diesel. The filters removed an average of 95.88% of the oil and grease. An average of 94% of total petroleum hydrocarbons were removed during two tests. The filters also removed 99% of 50 mg/L lead, zinc, and copper. This study suggested vacuuming out the filters prior to the winter season, since one filter accumulated greater than 95-pounds of debris during the fall season.

2.3 EXPECTED HYDROCARBON RUNOFF CONCENTRATIONS AND TREATMENT LEVELS

The Los Angeles County Department of Public Works (LACDPW) has monitored and characterized stormwater runoff since 1994 as part of the requirements of their NPDES Municipal Separate Storm Sewer (MS4) Permit[25]. The first two years of monitoring was done under the 1990 permit, while current monitoring efforts fall under the 2001 Municipal Storm Water Permit adopted on December 13, 2001.

The objectives of the County's monitoring program are: (1) to assess compliance with the NPDES Permit; (2) to measure and improve the effectiveness of the stormwater quality management plans (SQMPs); (3) to assess urban runoff water quality impacts to receiving waters; (4) to characterize stormwater discharges; (5) to identify sources of contaminants; and (6) to evaluate the long-term trends in receiving water quality. The monitoring program was expanded under the 1996 permit to include the Mass Emission, Land Use, and Critical Source Monitoring Programs and new pilot studies such as "Wide Channel" and "Low Flow" analyses. The 2001 permit eliminated the Land Use and the Critical Source components to focus on core monitoring, regional monitoring, and three special studies.

The mean and median TSS, oil and grease, TPH, and dissolved and total metals concentrations obtained from the 1994-2000 monitoring efforts are summarized in Table 2-3. Note that transportation and commercial land uses yield the highest concentrations of petroleum hydrocarbons in urban stormwater runoff in the City of Los Angeles and commercial, transportation, and light industrial land uses all yield high copper and zinc concentrations.

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[23] Minton, G.R. 2002. Technical Review of the AbTech Ultra-Urban Filter. Resource Planning Associates.
[24] Astro Environmental, LLC. 2003. Field Test Results of AbTech Industries Ultra-Urban Filter. http://www.abtechindustries.com/Test%20Results%20Menu.htm.
[25] California Regional Water Quality Control Board, Los Angeles Region (2001). "NPDES Permit No. CAS004001 - Waste Discharge Requirements for Municipal Storm Water and Urban Runoff Discharges Within the County of Los Angeles, and the Incorporated Cities Therein, Except the City of Long Beach."
Los Angeles County Department of Public Works (LACDPW). (August, 2002). "Los Angeles County 2001-2002 Storm Water Quality Monitoring Report" 26pp.

However, the range of oil and grease concentrations from each of the land use types are well below the influent concentrations typically used in catch basin insert studies (~10 to 40 mg/l).

Table 2-3. Summary of 1994-2000 land use results for TPH, oil and grease, and metals.

Land Use Type	Constituent	Units	No. of Samples	No. of Non-Detects	Percent Detects	Mean	Median	CV
Commercial	TSS	mg/L	29	0	100	66	53	0.65
	TPH	mg/l	8	2	75	3.1	2.9	0.63
	Oil and Grease	mg/l	8	1	88	3.3	2.9	0.51
	Dissolved Copper	ug/l	24	3	88	14	11	0.84
	Total Copper	ug/l	24	0	100	39	22	1.57
	Dissolved Lead	ug/l	24	20	17	S.I.D.	S.I.D.	S.I.D.
	Total Lead	ug/l	24	15	38	18	2.5	2.80
	Dissolved Zinc	ug/l	40	4	90	152	130	0.66
	Total Zinc	ug/l	40	0	100	241	192	0.71
Light Industrial	TSS	mg/L	41	0	100	240	129	1.36
	TPH	mg/l	5	1	80	1.7	1.4	0.68
	Oil and Grease	mg/l	5	1	80	1.7	1.4	0.68
	Dissolved Copper	ug/l	37	5	86	20	14	1.07
	Total Copper	ug/l	37	0	100	32	21	1.03
	Dissolved Lead	ug/l	37	32	14	S.I.D.	S.I.D.	S.I.D.
	Total Lead	ug/l	37	18	51	17	5.1	1.88
	Dissolved Zinc	ug/l	51	3	94	407	303	1.18
	Total Zinc	ug/l	51	0	100	639	366	1.53
High Density Single Family Residential	TSS	mg/L	30	0	100	95	61	1.16
	TPH	mg/l	3	0	100	1.3	1.2	0.23
	Oil and Grease	mg/l	3	0	100	1.3	1.2	0.23
	Dissolved Copper	ug/l	32	15	53	8.5	6.7	0.95
	Total Copper	ug/l	32	2	94	15	11	0.57
	Dissolved Lead	ug/l	32	28	13	S.I.D.	S.I.D.	S.I.D.
	Total Lead	ug/l	32	14	56	10	5.4	1.03
	Dissolved Zinc	ug/l	38	30	21	44	25	1.42
	Total Zinc	ug/l	38	13	66	79	66	0.75
Transportation	TSS	mg/L	61	0	100	78	50	1.30
	TPH	mg/l	4	0	100	3.1	2.8	0.47
	Oil and Grease	mg/l	4	0	100	3.1	2.8	0.47
	Dissolved Copper	ug/l	54	0	100	33	27	0.63
	Total Copper	ug/l	54	0	100	56	39	1.15
	Dissolved Lead	ug/l	54	48	11	S.I.D.	S.I.D.	S.I.D.
	Total Lead	ug/l	54	29	46	10	2.5	1.57
	Dissolved Zinc	ug/l	65	5	92	192	152	0.74
	Total Zinc	ug/l	65	0	100	291	218	0.99

Note: The detection limit for TSS is 2.0 mg/L, for both TPH and oil and grease is 1 mg/l, for total and dissolved copper and lead is 5 ug/L, and for total and dissolved zinc is 50 ug/L. S.I.D. = Statistically Invalid Data, not enough data above detection limit collected.

A review of the literature pertinent to the evaluation of catch basin insert efficiencies shows that a good number of the available studies use percent removals as a criterion for evaluating insert performance. A major limitation to this approach is that percent removals can be manipulated by increasing or lowering influent concentrations.

Examples of other methods that have been used to assess BMP evaluation studies include: summation of loads, regression of loads, mean concentration, efficiency of individual storm loads, reference watersheds, and before and after studies (GeoSyntec Consultants, 2002) [26].

One of the most useful methods of evaluating BMP performance is the Effluent Probability Method. For this method, the influent and effluent are first checked to see whether they are statistically significantly different. Then side-by-side cumulative distribution functions of influent and effluent quality (or standard parallel probability plots) are generated to evaluate the nature of the difference. Nonparametric approaches are recommended to estimate the magnitude of the difference, if the influent and effluent concentrations appear to arise from different distributions. As more studies adopt this approach to reporting BMP efficiencies, more data will be available to support values that can be used to estimate reasonable expected effluent concentrations from BMPs such as catch basin inserts. Since the reasonable expected removals for BMPs provided in this section are based on a review of previous studies, we are limited to the use of percent removals.

Among the reviewed studies, catch basin insert efficiencies varied significantly. Vendor publications report oil and grease removal efficiencies of 81% to 99% for new inserts. Third party laboratory studies report removal efficiencies of greater than 50% for oil and grease, and greater than 34% for hydrocarbons. Nearly all of the third-party field studies reported clogging and bypass of the filters, which reduces the filter efficiency. In the worst case, excessive clogging resulted in only an 8.2% removal of oil and grease (which was likely not statistically significant). Unfortunately, nearly all of the studies (third-party or otherwise) used influent oil and grease concentrations that were well above the expected concentrations in urban runoff in the Los Angeles area (i.e., greater than 3 standard deviations above the L.A. County data shown in Table 2-3). Furthermore, the achieved effluent oil and grease concentrations for the studies that actually reported them were typically above or near the expected influent levels. Based on these issues, the expected effluent concentrations from catch basin inserts during stormwater runoff events cannot be adequately assessed. However, the studies do suggest that catch basin inserts will not reliably reduce oil and grease concentrations below about 5-10 mg/l.

As discussed above in Section 2.1, the low oil and grease concentrations typically observed in urban runoff caused by primarily dispersed sources, likely represent less of a threat to receiving waters than the illegal dumping of used oil directly into the storm drain system. Therefore, the ability of catch basin inserts to remove oil from stormwater may not be as important as their ability to retain previously captured oil from illegal dumping activities during high-flow conditions. However, since no studies were found that evaluated the mass of used oil retained following an illegal dumping activity, it is not possible to assess the ability of catch basin inserts to effectively hold oil and grease until maintenance is performed.

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[26] GeoSyntec Consultants (April 2002). "A Guidance Manual for Meeting the National Stormwater BMP Database Requirements." ASCE / EPA

3 RESEARCH METHODOLOGY

An integral part of this Catch Basin Insert Performance Study was the selection of catch basin sites and inserts compatible with those sites. This study included the selection of 24 cumulative pollutant capture sites and 12 field-to-laboratory sites. The purpose of the cumulative pollutant capture sites was to assess long-term performance and maintenance requirements, as well as characterize bulk pollutants captured during the study period. The purpose of the field-to-laboratory sites was to numerically evaluate changes in pollutant removals after being exposed to field conditions. The results from both sites were used to qualitatively and quantitatively compare the performance of the four (4) different types of filters tested. The following paragraphs describe the site and catch basin insert selection methodology, the monitoring and testing plan, and the design and construction of the insert testing apparatus.

3.1 STUDY SITE SELECTION

Site selection was an important component of this project because one of the objectives was to evaluate insert performance after being exposed to dry weather conditions and wet weather urban runoff from high oil and grease source areas. These areas have a high potential for receiving significant amounts of motor oil and other petroleum products into drains via illicit dumping and improper vehicle maintenance. The City of Los Angles staff provided an initial map of 52 candidate catch basin sites located in areas believed to be high oil and grease source areas. The suitability of these candidate sites were investigated as part of the second phase of the study. Approximate drainage areas, dominant land uses, catch basin dimensions, and other site constraints were evaluated. Other factors considered for the final site selection included representativeness, personnel safety, ease of access, and security. The following paragraphs describe each of these factors in more detail.

3.1.1 REPRESENTATIVENESS

Sites chosen for catch basin filter performance comparison were selected based on similar sized drainage areas (gross approximation), land use types, and relative proximity to one another. Sites were located in areas that represent highly-developed urban areas of the City of Los Angeles. Drainage areas with known active or planned construction were intentionally avoided.

3.1.2 SAFETY

Site safety is the number one concern for any field investigation. An attempt was made to avoid sites having excessive traffic and high speed limits. For the safety of the monitoring crews who were accessing the sites, only well lit areas with moderate traffic and speed limits below 55 mph were chosen. Areas with excessive pedestrian traffic were also avoided for the general safety of the public and the site crew.

3.1.3 EASE OF ACCESS

This was a low priority; however, whenever possible, sites were chosen that were closer to the UCLA laboratory rather than those that are further away. Also sites that had structures that are easily accessible are favored. For instance, catch basins that were only accessible through a heavy drop inlet grate that required two or more people to lift were avoided.

3.1.4 SECURITY

Vandalism was as issue that was taken into account in the site selection process. Although hard to predict, situations that present opportunities for vandalism were avoided where ever possible.

The catch basin inserts were contained and no equipment was ever left on-site, so the potential for vandalism was low. Nonetheless, well lit open areas were chosen to discourage vandals and criminals alike from interfering with the inserts, the activities of the monitoring crews, or the results of the study. All field monitoring was done in broad daylight.

3.2 CATCH BASIN INSERT SELECTION

The initial list of candidate catch basin inserts consisted of products from nine (9) different vendors with a variety of design configurations and media types. Based on cost, ease of installation and maintenance, number and quality of existing evaluation studies, and the target pollutants, these nine candidate inserts were narrowed down during repeated project team discussions to the following four (4) vendors: Drainworks DrainPac, Suntree Curb Inlet Basket, Kristar FloGard-Plus, and Hydro Compliance Hydro-Kleen. All of these inserts were available in a variety of sizes and configurations, but some designs were more compatible with some individual catch basins than others. The descriptions of the selected catch basin inserts in the manufacturers' words are provided in the next section.

3.2.1 DRAINWORKS INC. – DRAINPAC

The DrainPac™ is a flexible storm drain catchment and filtration liner designed to filter pollutants, debris, and solids prior to discharge into storm drain systems. The DrainPac™ is available in four (4) styles: grate top, curb, and round configurations, as well as new styles designed for outfall, or "end of pipe" applications and drop-in drain applications. Each insert is equipped with a choice of two (2) overflow systems, the hydraulic bypass and the new uninhibited bypass, both of which accommodate heavy rains and potential flooding. A picture of the curb inlet DrainPac™ system is shown in Figure 3-1.

According to the manufacturer, the DrainPac™ can handle flow rates of up to 150 gpm/sq. ft and hold up to 7100 pounds of material. Tests performed at UCLA (not in this study) show removal efficiencies for the DrainPac™ System at 99% for TSS, and 51% to 88% for PAHs. Typical cost for the DrainPac™ System range from about $1000 for a 21-foot wide curb inlet to about $500 for a 4- to 7-foot wide curb inlet. The manufacturer recommends that maintenance be performed at least twice per year (once before the wet season and once after the wet season). Quarterly inspections during dry periods and monthly inspections during wet periods are also recommended. The cost of a yearly maintenance service agreement with the manufacturer is $225 per unit.

Figure 3-1. DrainPac™ catch basin insert.

A full description and a complete list of applications are available at the manufacturer's web site: http://www.drainpac.com/index1.htm.

3.2.2 SUNTREE TECHNOLOGIES INC. – CURB INLET BASKET

The Curb Inlet Basket is a multi-stage, removable filtration basket that was designed to capture everything from hydrocarbons to sediment, grass clippings, and human trash. It is made of durable fiberglass with stainless steel filter screens, backed by heavy-duty aluminum grating. The Curb Inlet Basket telescopes to change size, so that it can fit almost any catch basin. However, custom-shaped units are available from the manufacturer. A picture of the Curb Inlet Basket is show in Figure 3-2.

The cost of the Curb Inlet Basket ranges from $695 to $795. Pricing for custom units can be obtained from the manufacturer[27]. The maintenance of the Curb Inlet Basket can be performed by hand, without the need for heavy equipment. Maintenance entails removing the inlet access cover, lifting out the basket by hand or with a manhole puller and dumping out the contents. The basket is placed back into the catch basin and the sorbent boom is replaced. The manufacturer recommends quarterly maintenance of the basket to remove sediment and debris, along with semi-annual replacement of the sorbent boom. Performance evaluation of the Grate Inlet Skimmer Box System performed by the Reedy Creek Improvement District and Walt Disney Imagineering, reported removal efficiencies of 74% for total suspended solids and 54% for oil and grease.

A full description and a complete list of applications for the Curb Inlet Basket are available at the manufacturer's web site: http://www.suntreetech.com/ .

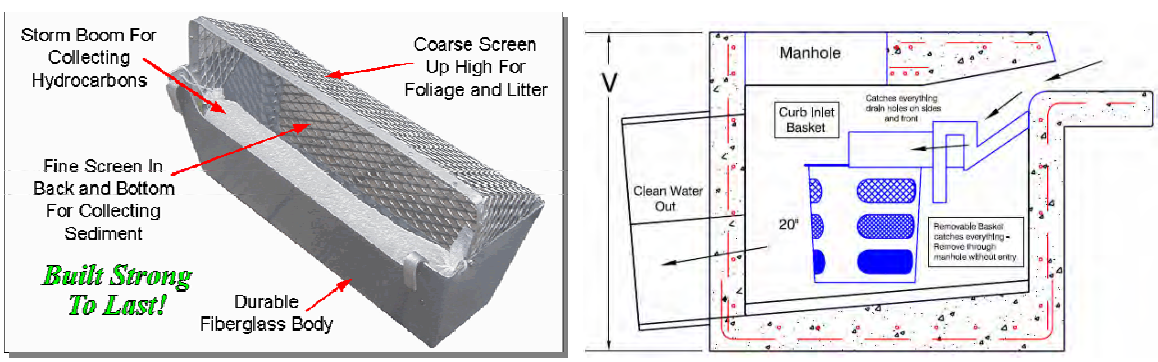


Figure 3-2. Curb Inlet Basket functional details and installed configuration.

3.2.3 KRISTAR ENTERPRISES INC. – FLOGARD+PLUS™

The FLOGARD+PLUS™ is a multipurpose catch basin insert designed to capture sediment, debris, trash, and oils/grease from low (first flush) flows. A high-flow bypass screen allows flows to bypass the device while retaining sediment and larger floatables (debris & trash), and allows sustained maximum design flows under extreme weather conditions. The system is designed for use in areas with low to higher than normal sediment, trash, and debris; and moderately high

[27] August 2003 Catalog. Sun Tree Technologies Inc.

levels of petroleum hydrocarbons such as parking lots, as well as public and private streets.

The cost of the FloGard Plus System ranges from $350 for a 2-foot curb opening installation to about $2,200 for a 15-foot curb opening installation. UCLA conducted tests (not this study) to determine the removal efficiency of the fossil filter FloGard System in October 2000. Oil and grease removal efficiencies were found to range from 70% to 90%. The manufacturer recommends at least three (3) inspections per year, and more in high exposure areas. Maintenance entails removing the device from the inlet and dumping the contents into an approved drum for disposal. Cleaning can also be accomplished with a vacuum truck. Maintenance costs for a curb inlet installation with a 7-foot curb opening ranges from $250 to $375 per annum.

A full description and a complete list of applications for the FloGard Plus System are available at the manufacturer's web site: http://www.kristar.com/fosys.html.

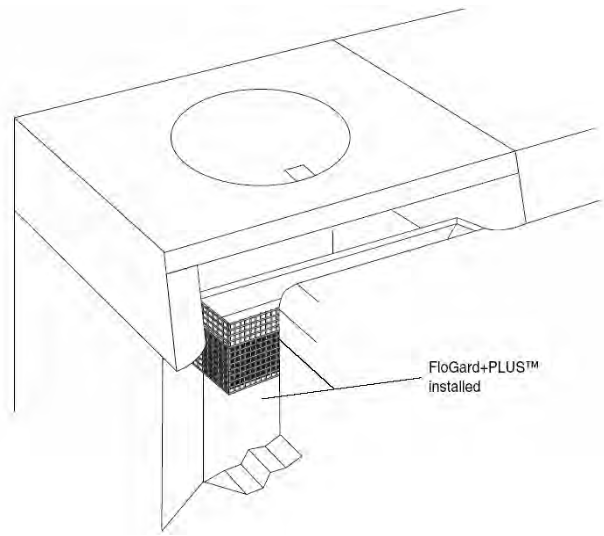


Figure 3-3. FloGard Plus catch basin insert.

3.2.4 HYDRO COMPLIANCE MANAGEMENT INC. – HYDRO-KLEEN

The patented Hydro-Kleen Filtration System is a stormwater compliance technology for use with stormwater catch basins and drains to trap hydrocarbons, metals, sediments, and other contaminants contained in stormwater and other surface runoff. The multi-media filtration system contains design features that effectively filter out hydrocarbons and other contaminants, while alleviating concerns with water flow.

Flows enter the unit and are directed into a pre-settling sedimentation chamber that collects heavy sediments and debris passing through the grate. Water then passes through transition inlets at the top of the sediment chamber into the filtration chamber. The primary media, Sorb-44, traps hydrocarbons through adsorption to a hydrophobic cellulose material. The secondary media is a special blend of activated carbon (AC-10) that removes most remaining hydrocarbons, as well as a variety of other organics, and metals and other contaminants from the runoff. Water then passes through the bottom of the treatment chamber into the catch basin. The system can fit both circular and rectangular catch basin grates. An illustration of the Hydro-Kleen Filtration System is shown in Figure 3-4.

According to the manufacturer, typical cost of a 24-inch square unit is $1150, while a 2-foot by 4-foot unit costs about $2,300. Maintenance costs are typically $300 per year. Maintenance is straightforward and can be accomplished by vacuuming sediment loadings from the sedimentation chamber and replacing the filters. It is recommended that filters be changed every 4 to 6 months, depending on the application. Disposal of the spent media in a typical application may be accomplished through placement into lined landfills, as the filter media is non-leaching. Third part analytical test results obtained from the manufacturer show removal efficiencies of 83% to 95% for BTEX and almost 70% for total suspended solids.

A few examples of current applications of this Hydro-Kleen System include installations by American Airlines, Alcoa, Federal Express, Ford Motor Company, General Motors, Kroger, Seven Eleven, and the US Army. A full description and a complete list of applications are available at the manufacturer's web site: http://www.hydrocompliance.com/.

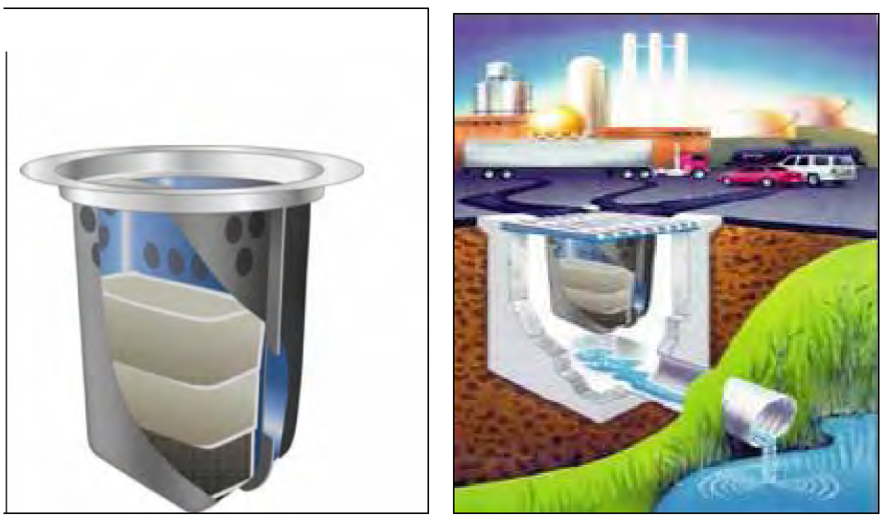


Figure 3-4. Hydro-Kleen Stormwater Filtration System.

3.3 SUMMARY OF THE MONITORING AND TESTING PROCEDURES

As discussed above, four different catch basin insert technologies were selected for this study: DrainPac, Curb Inlet Basket, FloGard-Plus, and Hydro-Kleen. The performance of these inserts was evaluated in two parts: at field-to-laboratory (FL) sites and at cumulative pollutant capture (CPC) sites. The FL sites were used to evaluate the performance of the inserts by performing a series of laboratory tests on them before and after being exposed to field conditions. The CPC sites were used to evaluate the long-term performance of the insert technologies through periodic field inspections during the wet and dry seasons and then collecting the inserts for pollutant capture analyses at the end of the evaluation period or at the end of their useful lives (determined by the inspection team).

A monitoring plan was prepared that outlined the field inspection activities and the laboratory testing procedures. Some elements of the monitoring plan were modified during the course of the study due to circumstances beyond control that caused delays in getting project tasks completed. For instance, the fire disaster that occurred in southern California during the summer of 2003 left a significant amount of ash covering the area and it was decided that the "first flush" event would not likely represent typical conditions so the project team decided to install and begin conditioning the catch basin inserts during the middle rather than at the beginning of the wet season (2003-2004). Also, the catch basin insert testing apparatus at UCLA had to be relocated because of ongoing construction activities. After it was moved, the apparatus needed to be repaired due to leakage, which caused delays in the laboratory testing. Consequently, the study occurred in two phases: cumulative pollutant capture phase (Feb. 2004 - Oct. 2004) and field-to-laboratory phase (Nov. 2004 - May 2005).

During the course of these two phases of the study, one insert at a CPC site and three inserts at FL sites were replaced by the City of Los Angeles with an alternative insert system without the knowledge of the research team. This alternative system is shown in Figure 3-5 and consists of a screen that covers the entire bottom of the catch basin. Notice that this design provides no oil absorption, but has ample capacity for capturing bulk solids. The loss of the inserts was unfortunate and reduced the number of inserts available for the study.

Figure 3-5. Alternative catch basin insert system installed by the City of Los Angeles.

The following subsections briefly summarize the insert monitoring and testing activities.

3.3.1 FIELD INSPECTIONS

Field inspection of the cumulative capture sites were conducted to:

- Ensure that all inserts were functioning properly
- Detect and eliminate unnatural conditions such as excessive clogging or blockage from oversized objects
- Detect and replace missing, damaged, or defective inserts
- Document the condition of inserts through visual observation, photographs, and field notes

Inserts were installed at all sites between October and November 2003. Field inspections began after in February 2004 and continued through October 2004. Sites designated as FL sites were inspected as if they were CPC sites and were generally inspected at the same frequency as the CPC sites. Field inspections occurred on 2/4/04, 2/27/04, 3/23/04, 6/30/04, 10/21-22/04, and 3/24/05.

Field procedures included inspecting both the drainage structure and the installed insert and noting any observations that required correction such as damaged structures, missing or damaged inserts, blocked inlets, etc. Photographs of the inside of the structure were taken to document any debris that had bypassed the insert as well as debris that had been collected inside the insert structure. Photographs of the installed inlets looking through curb openings were also taken.

During the routine inspections, if any of the insert media appeared to have reached their maximum capacity (e.g., standing water in the insert) or was damaged beyond repair, it was noted, photographed and retrieved for laboratory analysis.

3.3.2 LABORATORY TESTING

The primary objectives of the laboratory tests were to:

- Quantitatively evaluate changes in pollutant removal rates of 4 different types of catch basin filters after being exposed to field conditions.
- Evaluate the quantity of used motor oil captured by catch basin inserts when new and weathered and the potential for captured oil, and associated pollutants, to leach from catch basin inserts.
- Estimate the performance of each proprietary filter tested with respect to the removal and retention of used motor oil and make statistically valid performance comparisons.

Laboratory tests began during the 2004-2005 wet season after new inserts were installed in all of the FL sites. All laboratory testing was performed at UCLA using an apparatus built by Professor Michael Stenstrom (see Section 3.4). Two categories of laboratory tests were conducted including: New Filter Performance Tests and Used Filter Performance Tests.

A large stock of the used motor oil was created for use throughout the study. The total and particulate heavy metals concentrations were measured in the oil stock to determine if the catch basin insert may impact metals removal and if sampling of suspended solids and total metals should be measured in the effluent from the catch basin during the washout experiment.

New Filter Performance Tests. Four unused catch basin insert types from four different manufacturers for controlling gross spills were tested. The tests were conducted by pouring 1 quart of used motor oil directly into each catch basin insert type. The amount that drained through the insert was captured and the volume was measured. The test was continued until the insert ceased to drip measurable amounts of motor oil. Following the drainage period, the catch basin insert was placed in the insert testing flume and exposed to a design flow rate (20 to 25 GPM). Oil and grease washout was monitored over the next 90 minutes taking a total of six grab samples, including at the beginning of flow and then every 18 minutes. Each grab sample was then analyzed for total oil and grease. The extracts of the oil and grease measurements were combined and analyzed for PAHs.

In addition to the spill tests, one example of each insert type was laboratory tested with a sustained flow of introduced pollutants. The test was conducted for 60 minutes at 20 to 25 GPM using tap water dosed with oil and grease and glass beads to simulate sand and clay. Commercially available glass beads (McMaster Carr, Los Angeles, CA) used for “sand blasting” were used for testing. These beads are provided in several sizes. Four grades of beads were mixed to create the fraction shown in Table 3-1. Ten grab samples, one each 6 minutes, were collected for oil and grease analyses. The suspended solids removal was measured by capturing all the particles that passed through the catch basin insert during the 60 minute test, screening into the same size fractions as used initially, dried and weighed. The influent sand concentration was approximately 200 mg/L and the influent oil and grease concentration was approximately 20 mg/L. To understand the potential removal of heavy metals and PAHs contained in the oil and grease that might be removed by adsorption, the concentrations of both were measured in the used oil. These concentrations can be multiplied by the oil and grease concentrations or removals to estimate the impact of the inserts on removals of metals and PAHs.

Table 3-1. Target particle size percentiles by mass for artificial stormwater TSS concentrations.

Percentile by Mass	Diameter Range	Approximate Target Concentration Range
25%	Passing 40 mesh (430 µm) but retained on 60 mesh (250 µm)	~ 50 mg/L
25%	Passing 60 mesh (250 µm) but retained on 120 mesh (125 µm)	~50 mg/L
25%	Passing 100mesh (150 µm) but retained on 170 mesh (90 µm)	~ 50 mg/L
25%	Passing 170 mesh (90 µm) but retained on 325 mesh (45 µm).	~ 50 mg/L

Used Filter Performance Tests. The UCLA Team placed twelve new inserts into designated catch basins prior to the 2004-2005 rainy season (~early October). At the middle of the 2004-2005 wet season, the field-to-laboratory inserts (9 total) were collected and transported by the Team to the UCLA laboratory (3 inserts were inadvertently removed by the City of Los Angeles in their experimental program). Each insert was placed in the flume and a fine solids capture screen was placed below the insert. After removing large debris such as plastic bags, newspapers, and leaves, it was hydraulically tested starting at a flow rate of 5 GPM. If the insert was not clogged by fine sediment, the flow rate was gradually increased to the flume's maximum capacity (60 gpm) or until the insert bypassed. Depth of water in the insert was recorded as a function of flow rate and the flow rate at which bypass occurred was noted. During this hydraulic capacity testing, fine solids that had been captured by the inserts while out in the field that washed out were collected, but no solids removed from the insert while it bypassed flows were collected. These collected solids were characterized by weighing and sieving.

After completing the capacity testing, the continuous flow testing was begun. The flow was set to the maximum possible without bypassing up to 25 gpm maximum. Grab samples were collected through the 60 minutes to create a composite sample for oil and grease analysis. Solids removal was quantified by collecting solids in a 325 mesh (45 µm) screen below the insert. This was the same screen used in the capacity testing, although it was cleaned to avoid mixing the two types of solids. The solids retained by the fine screen, were weighed and sieved into the four size fractions as shown in Table 3-1.

After all tests were completed, spill tests were performed on the used inserts using the same procedure described for the new filter tests to evaluate any changes in retention capacity after the filters had been used.

3.4 DESIGN AND CONSTRUCTION OF TESTING APPARATUS

The design of the UCLA testing apparatus is based on a curb and gutter flume design used for previous catch basin insert studies conducted by Professor Stenstrom, together in some cases with GeoSyntec staff and is intended to simulate the influent hydraulics of a curb inlet catch basin. A plan view schematic of the testing apparatus is shown in Figure 3-6 and a profile view schematic is shown in Figure 3-7.

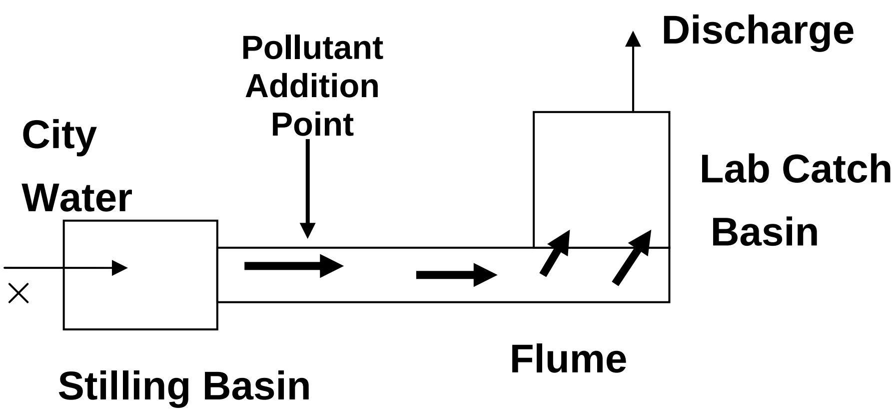


Figure 3-6. Laboratory testing apparatus schematic (plan view).

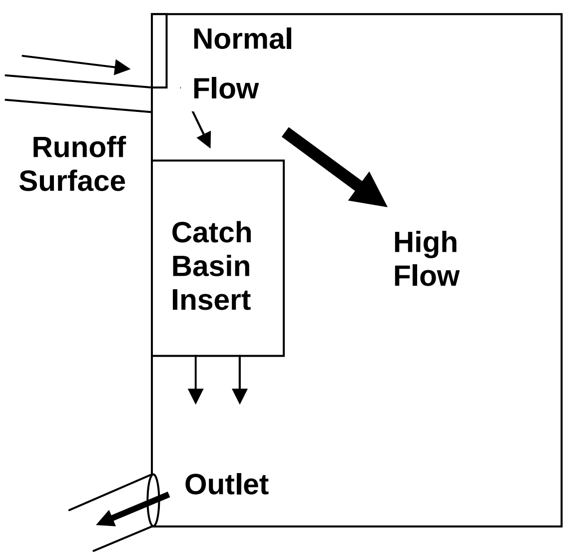


Figure 3-7. Curb inlet schematic (profile view).

As mentioned above, the UCLA testing apparatus was moved from its previous location and needed to be repaired due to leaks and needed to be modified to accommodate the inserts tested in this study. A new stilling basin tank was also installed.

Pictures of the testing apparatus in its new location are shown in below. Figure 3-8 shows a full view of the apparatus prior to and after being upgraded. Figure 3-9 shows the inlet configuration, the new stilling basin, and the catch basin outlet.

Figure 3-8. Testing apparatus prior to upgrade (left) and after upgrade (right).

Figure 3-9. Testing apparatus stilling basin (left) and synthetic catch basin (right).

3.5 PRECIPITATION DURING THE STUDY PERIOD

The sites received runoff from several storm events during both phases of the study, but the amount of rainfall that occurred during the field-to-laboratory phase (2004-2005 wet season) was much greater than during the cumulative capture phase (02/2004 - 10/2004). Figure 3-10 provides daily rainfall totals for 2004 and Figure 3-11 provides daily rainfall totals for 2005 through April for the Downtown Los Angeles USC Campus rain gage. These data are used to qualitatively relate observed conditions to the amount of rainfall between observations.

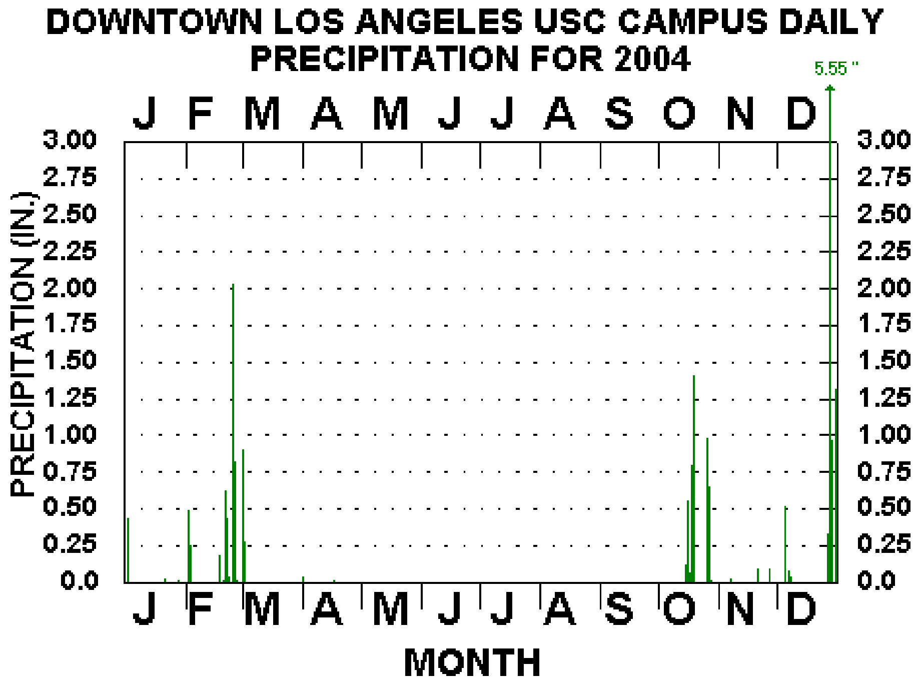


Figure 3-10. 2004 precipitation record for the Downtown USC Campus rain gage.
Source: http://home.att.net/~station_climo/

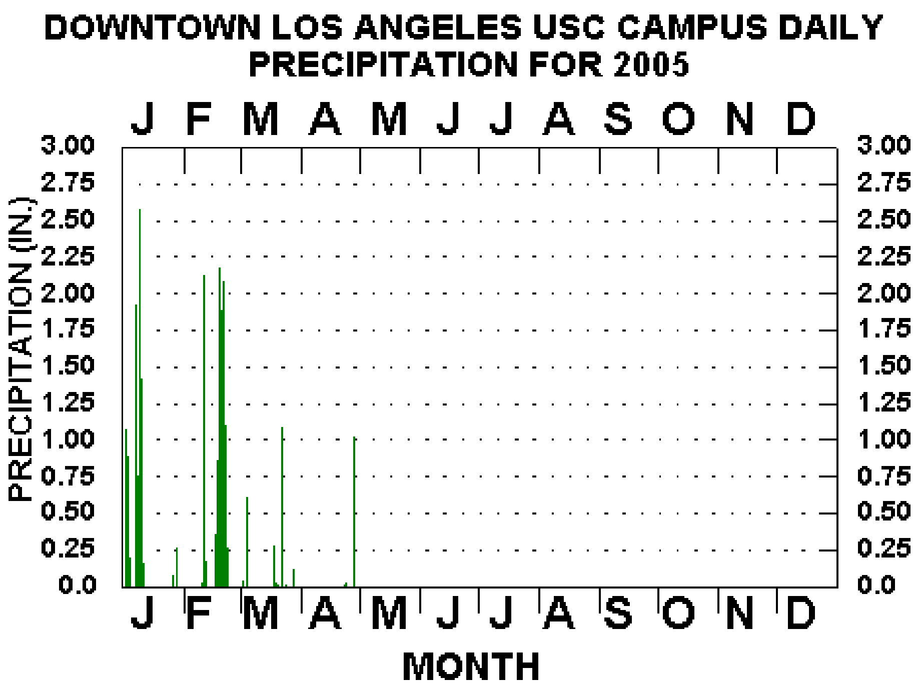


Figure 3-11. 2005 precipitation record for the Downtown USC Campus rain gage.
Source: http://home.att.net/~station_climo/

4 RESULTS AND DISCUSSION

The following subsections discuss the results of the field inspections and the laboratory analyses. The cumulative pollutant capture part of the study was based on the field inspections of both the CPC sites and the FL sites.

4.1 FIELD INSPECTIONS

The performance of four catch basin inserts selected for this study was evaluated at twenty-four (24) CPC sites and twelve (12) FL sites during the study period 2003-2005. Location maps of all of sites are provided in Appendix A. Figure A1 includes the locations of all of the CPC sites and Figure A2 includes the locations of all of the FL sites. Figures A3 and A4 are aerial photographs of the FL sites grouped into east and west sites, respectively.

One of the most consistent observations made during field surveys is that almost all inserts installed in the field were quickly overwhelmed with trash and debris, which causes stormwater bypass and resulting in limited contact with the absorptive media. While the capture trash and debris may provide some pollutant retention, without significant stormwater/media contact the ability of these devices to remove oil and grease, as well as other pollutants, is severely limited. No significant attempt was made to maintain the CPC sites; instead the accumulation of trash and debris was simply observed and the inserts were retired shortly after they reached their holding capacity. All field survey photos and observations made during the inspection of CPC and FL sites are provided in Appendix B. As mentioned earlier, the FL sites were treated as CPC sites during the inspections. However some of the FL inserts had not yet been installed by the vendor during the initial field inspections, so there are fewer observations of these sites than the CPC sites provided in Appendix B. Representative photographs and field observations that provide a qualitative indication of the performance of each type of insert selected for this study are provided below. Since these sites have different drainage areas, land use types, and catch basin configurations, the following observations are not meant to be representative of the overall performance of each insert type and should not be construed as a comparative analysis.

The subsections below present some an example site and resulting observations for each of the catch basin insert types. All field notes and photos are provided in Appendix B.

4.1.1 DRAINPAC AT WASHINGTON AND VERMONT

A DrainPac catch basin insert was installed at the southeast corner of Washington Blvd. and Vermont Ave. in January, 2004. This site receives runoff from primarily commercial, multi-family residential, and transportation land uses. Figure 4-1 shows the location of the catch basin in relation to the City of Los Angeles' storm drain system including the direction of surface runoff. Figure 4-2 is an aerial photo of the site showing the surrounding land use activities and Figure 4-3 shows two ground-level photographs taken from the site.

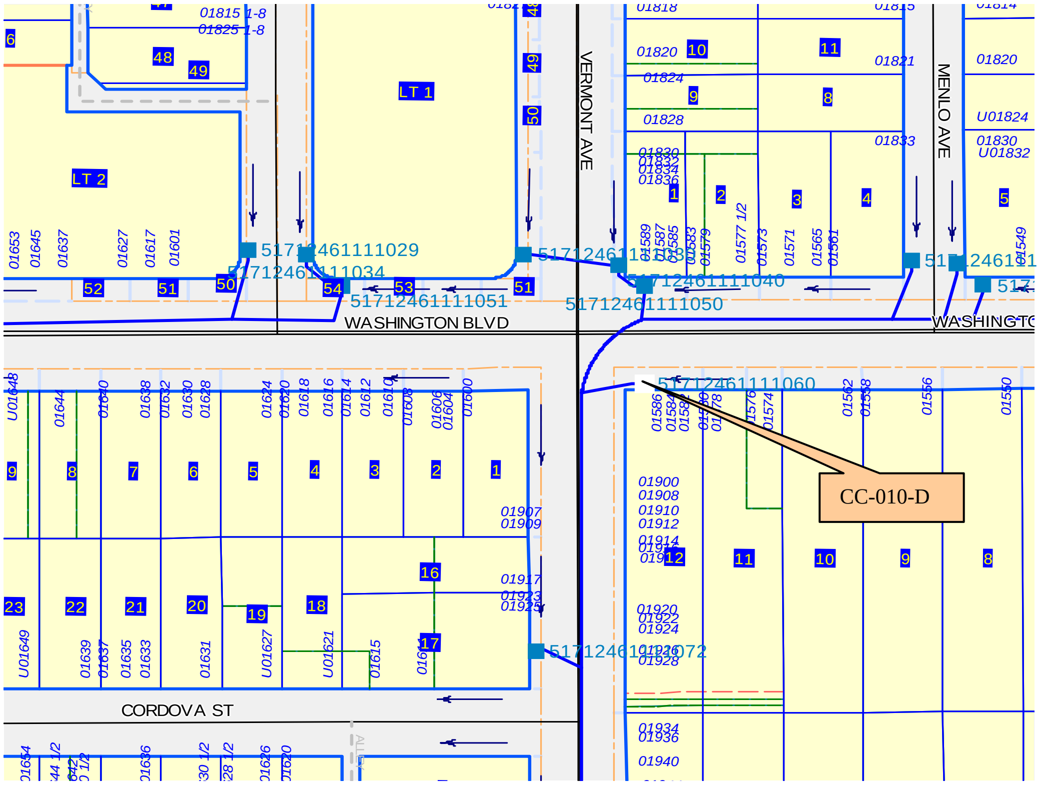


Figure 4-1. Map showing the location of CC-001-D site installed with DrainPac insert.

Figure 4-2. Aerial photo of site CC-010-D.
(Source: http://terraserver.microsoft.com).

Figure 4-3. CC-010-D site photos upstream (left) and to the intersection of Vermont and Washington (right).

The initial site visit (10-24-03) before the installation of the DrainPac indicated that the site was located at a busy intersection with very high trash loading (Figure 4-4a). The first inspection after the installation of the insert was made on 02-04-04 during a small storm event (~0.75"; see Figure 3-10). Although the insert appeared to be operating at full hydraulic capacity, the inflow was still being processed by the insert (Figure 4-4b). The next visit (02-27-04) occurred in less than a month after a relatively large storm event (>2"). The site examination indicated that some flow bypass had occurred with trash and debris settling at the edge of the insert (Figure 4-4c). Also, standing water indicated the insert was beginning to clog. The site was completely overwhelmed with trash during the fourth visit (03-23-04; Figure 4-4d) and since only one storm (>1") occurred since the previous visit, most of the trash was likely due to wind rather than runoff. The next inspection on 06-30-04 the insert appeared to be completely buried with wind-blown trash (Figure 4-4e). During the last inspection of the site (10-21-04) the insert was retired and captured debris were collected for laboratory tests (Figure 4-4f).

Figure 4-4. Field inspection photos of DrainPac catch basin insert at the intersection of Washington Blvd. and Vermont Ave.

4.1.2 CURB-INLET BASKET AT PORTLAND AND 23RD

The study site CC-008-C located at the intersection of 23rd and Portland St. was installed with a Curb-Inlet Basket. This site receives runoff from high density single family residential land uses. Figure 4-5 shows the location of the catch basin in relation to the City of Los Angeles' storm drain system including the direction of surface runoff. Figure 4-6 is an aerial photo of the site showing the surrounding land use activities and Figure 4-7 shows two ground-level photographs taken from the site.

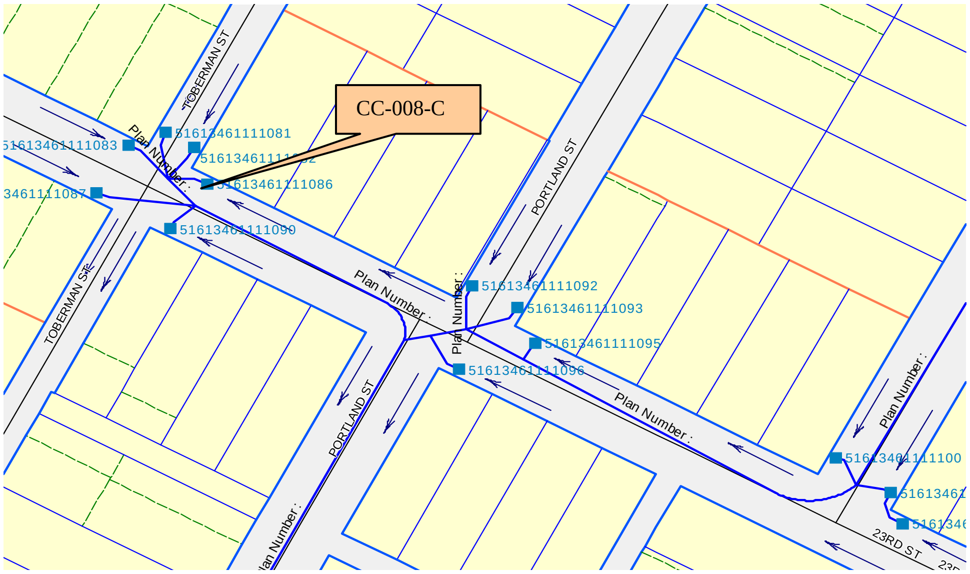


Figure 4-5. Map showing the location of CC-008-C site installed with a Curb-Inlet Basket.

Figure 4-6. Aerial photo of site CC-008-C.
(Source: http://terraserver.microsoft.com).

Figure 4-7. CC-008-C site photos upstream (left) and to the intersection of 23rd and Portland (right).

The initial site survey was completed on 12-10-03 before the installation of the insert. Excessive leafy debris from nearby deciduous trees appears to comprise a significant proportion of the material delivered to this catch basin (Figure 4-8a). The first visit (02-04-04) after insert installation was performed just after one storm event (~0.75"). Some trash and debris along with a notable accumulation of coarse sediment were collected by the insert (Figure 4-8b). However, the insert still had plenty of capacity at this time. During the next visit in less than two months after installation (03-23-04) the insert had accumulated a significant amount of trash, but was still functioning with limited signs of bypass (Figure 4-8c). The site survey conducted on 6-30-04 showed that the insert had reached its full capacity and was overflowing with wind-blown trash and debris (Figure 4-8d). The final site inspection was performed on 10-21-04 after a few inches of rainfall (see Figure 3-10). There was less trash in the insert than the previous visit and the media boom at the lip of the insert was missing its adsorptive material indicating that the insert was cleaned by Los Angeles County maintenance staff prior to the wet season. Since the absorptive media was missing, this insert was retired during this final visit (Figure 4-8e and Figure 4-8f).

Figure 4-8. Field inspection photos showing the condition of Curb-Inlet Basket at the intersection of 23rd St. and Portland (east side).

4.1.3 FloGard-Plus at 18th and Flower

The site CC-007-F installed with a FloGard Plus unit is located at the intersection of 18th and Flower Street. This site receives runoff from retail and commercial land uses. However, the close proximity of the I-10 freeway may impact the deposition of airborne debris and particulates. Figure 4-9 shows the location of the catch basin in relation to the City of Los Angeles' storm drain system including the direction of surface runoff. Figure 4-10 is an aerial photo of the site showing the surrounding land use activities and Figure 4-11 shows two ground-level photographs taken from the site.

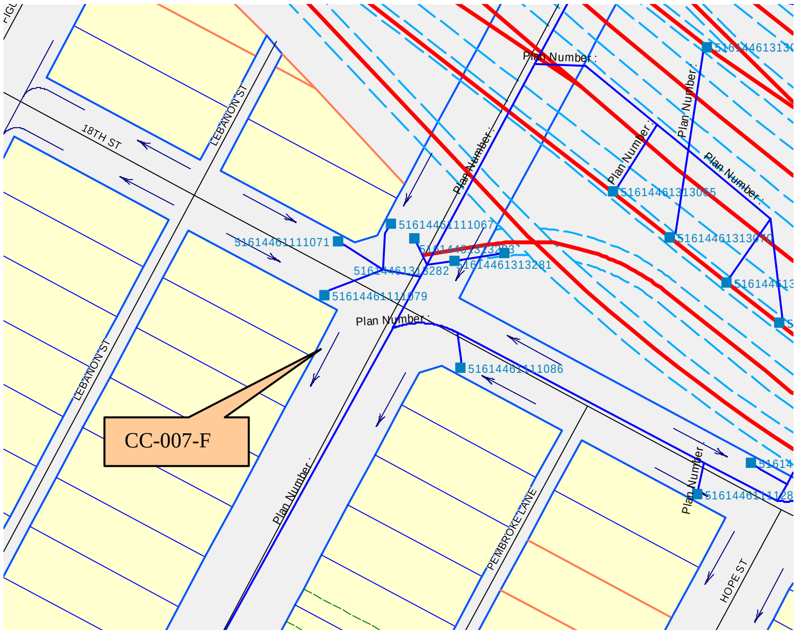


Figure 4-9. Map showing the location of CC-007-F site installed with a FloGard Plus insert.

Figure 4-10. Aerial photo of site CC-007-F.
(Source: http://terraserver.microsoft.com).

Figure 4-11. CC-010-D site photos upstream (left) and to the intersection of 18th and Flower (right).

The initial site visit was conducted on 12-10-03 before the installation of the FloGard Plus. The catch basin appeared to be a shallow unit with relatively low trash loading (Figure 4-12a). However, the first inspection (02-04-04) after installation of the FloGard Plus showed standing water in the unit from the approximately 0.75 inches of rainfall that occurred the night and morning before, indicating the unit may have already begun to clog. The adsorbent boom with amorphous alumina silicate was seen floating in the standing water (Figure 4-12b). The second inspection (02-27-04) of the insert showed slightly more capture of debris and trash and the standing water had drained (Figure 4-12c) even though more rainfall had occurred. During the third inspection, which occurred within a month of installation (03-23-04), the insert was nearly at its volumetric capacity (Figure 4-12d). During the next inspection (06-30-04) the insert showed that the insert reached its capacity and was overflowing with trash. As with the other inserts, the majority of the trash appeared to have been transported by wind rather than runoff (Figure 4-12e). The last inspection was conducted on 10-21-04. Some of the trash appeared to have bypassed after a rain event and some has consolidated in the insert. The insert was retired after this visit and the captured debris was collected for laboratory sieve analysis (Figure 4-12f).

Figure 4-12. Field inspection photos showing the condition of FloGard Plus at the intersection of 18th St. and Flower St. (southwest corner).

4.1.4 HYDRO-KLEEN AT WASHINGTON AND CATALINA

The location of this field survey site, CC-001-H with the Hydro-Kleen insert is near the intersection of Washington and Catalina Streets. This site receives runoff from primarily commercial land uses (auto dealers and repair shops) and transportation (Washington Blvd.). Figure 4-13 shows the location of the catch basin in relation to the City of Los Angeles' storm drain system including the direction of surface runoff. Figure 4-14 is an aerial photo of the site showing the surrounding land use activities and Figure 4-15 shows two ground-level photographs taken from the site.

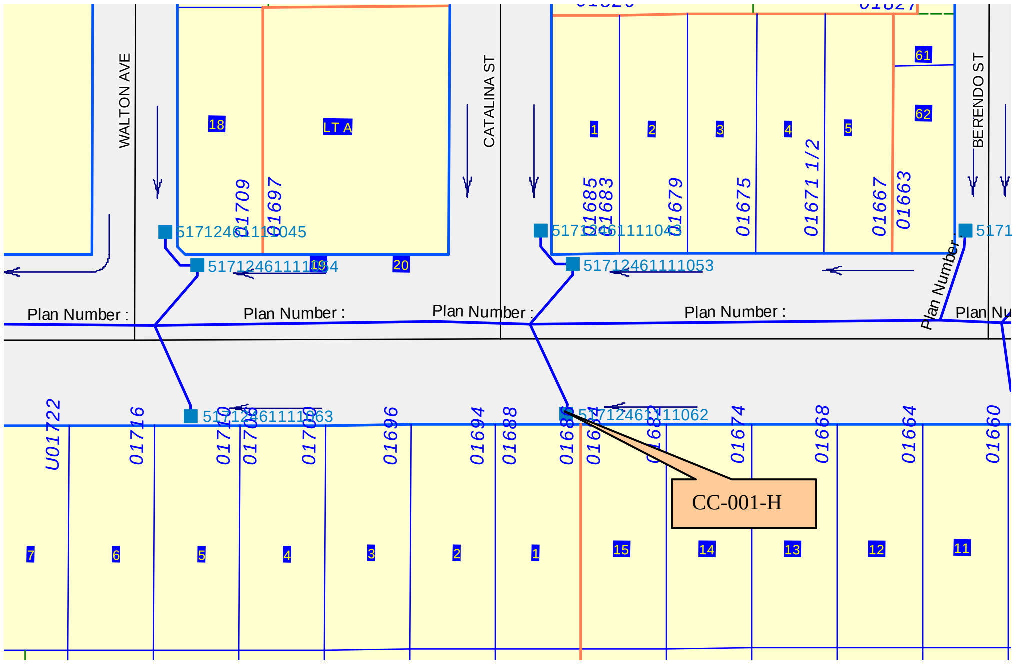


Figure 4-13: Map showing the location of CC-001-H site installed with a Hydro-Kleen insert.

Figure 4-14. Aerial photo of site CC-001-H. (Source: http://terraserver.microsoft.com).

Figure 4-15. CC-001-H Site Photos Upstream (left) and Downstream (right).

The initial site survey before the installation of the Hydro-Kleen insert occurred on 12/11/03. Examination of the site showed evidence of high trash loadings and a missing catch basin lid (Figure 4-16a). The first inspection after installation of the insert occurred on 02-27-04. Although there was evidence of bypass (Figure 4-16b), the insert appeared to be in good working condition even after a few storms, including an event greater than 2 inches. The missing concrete cover had been replaced prior to the installation of the insert. During the second inspection, it was noticed that the insert was capturing significant amounts of trash (Figure 4-16c). The third inspection was completed after another few months (06-30-04) and although the insert has captured more trash than the last visit it still appeared to be in good working condition (Figure 4-16d). The final inspection was conducted approximately three months later (10-22-04) and the insert had reached its volumetric capacity. There was a significant amount of oily sediment and debris on the curb indicating blockage of the insert. The insert was retired and the captured contents were collected for laboratory analysis (Figure 4-16e and Figure 4-16f).

Figure 4-16. Field inspection photos showing the condition of Hydro-Kleen at the intersection of Washington and Walton.

4.1.5 SUMMARY OF FIELD INSPECTIONS

The field inspections revealed that nearly all of the inserts were quickly overwhelmed with trash after just a couple months and a few inches of rain (3-4 storms). Observations of material hanging over the edge of the inserts and silt build-up on the outside of several of the inserts indicated that flow bypass was common. While these devices are designed to bypass to ensure the road does not flood during large runoff events, bypass was observed at several of the sites during an average size storm event (~0.75 inches). Bypass occurred due to low flow capacity (presumably due to clogging), as well as improper installation. For example, Figure 4-17 shows a HydroKleen insert bypassing a significant proportion of the inflow during this April 4th, 2004 site visit after only one month in the field. Figure 4-18 shows an improperly installed FloGard that created a lip near the inlet that caused the flow to bypass the insert. In contrast, Figure 4-19 shows two properly installed inserts near capacity, but processing the flow.

Figure 4-17. Relatively low-intensity storm showing bypass (FL-006-H, 2/4/04).

Figure 4-18. Improper installation of insert that caused bypass (CC-003-F, 2/4/04).

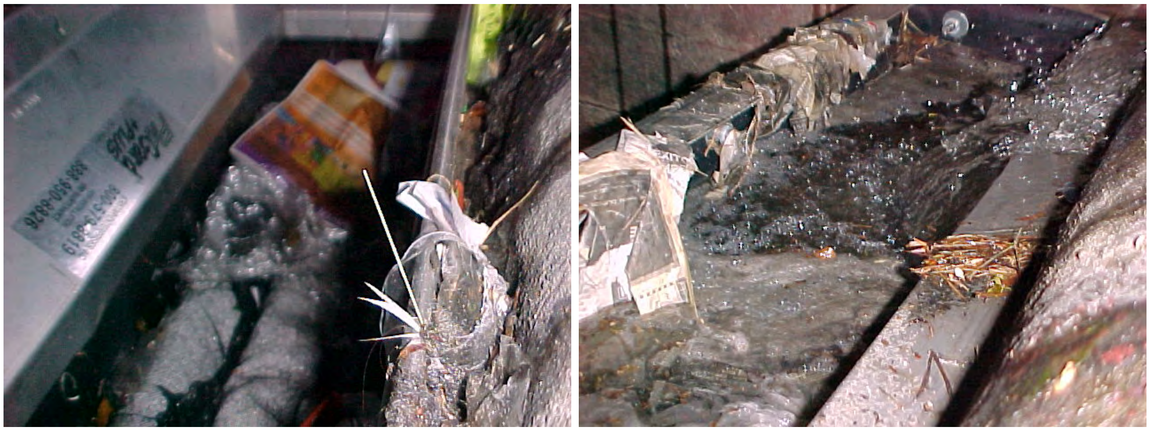


Figure 4-19. Two inserts operating properly during the 2/4/04 event: CC007-F (left) and CC009-D (right).

Two of the sites had screens installed at the curb inlet (FL003-F and CC004-H) as shown in Figure 4-20. These curb inlet screens blocked much of the trash and debris from entering the curb inlet. Consequently, the inserts installed at these locations appeared to show significantly less trash and debris accumulation. While no data yet to support, it is presumed that these simple inlet screens can improve long-term oil retention of any catch basin insert type by reducing the tendency for blinding the absorbent media.

Figure 4-20. Curb inlet screens installed at two sites: FL003-F (left) and CC004-H (right).

In summary, DrainPac appeared to have the largest capacity for trash and debris and was still able to process high flows. HydroKleen, which appears to have the most effective filtration system, has limited trash holding capacity and tends to bypass at relatively low flows (this is investigated further in the laboratory tests in the preceding section). The absorbent materials in both the Curb Inlet and the FloGard inserts were frequently observed to be missing, damaged, or hanging on the outside of the insert. Also, the "sausage" style absorbents in these two devices are such that not all of the flow through the insert will necessarily contact the media, which inevitably affects the absorbent effectiveness of these insert filters.

4.2 LABORATORY TESTS

As mentioned above, the laboratory tests consisted of two categories of tests: new filter tests and used filter tests. The used filter tests occurred after new inserts were conditioned in the field for approximately 4 months after installation in November 2004. The following paragraphs provide details of the testing procedures followed by the results of each test.

4.2.1 TESTING OF NEW FILTERS

Three tests were performed on new filters of each insert type: 1) spill tests, 2) particle capture tests and 3) oil and grease removal tests. All of these tests were conducted using the insert testing apparatus operating at a design flow rate of 20-25 gallons per minute.

4.2.1.1 Spill Tests

This test is designed to assess the ability of a catch basin insert device to capture a gross oil spill. This might occur if a person were to dump oil directly into the catch basin. Evidence of this activity has been observed over the years at many inlet/catch basins and educational activities such as stenciling storm drains have been practiced to teach the public that this is an unacceptable behavior.

In order to simulate a gross dump, 1 liter (~ 1 quart) of used motor oil was poured into each catch basin insert tested. The used motor oil was obtained from two sources and the entire volume was mixed to create a common source of used motor oil for all the tests used in the project.

The inserts were equipped with new media for these tests. Each insert was suspended on two saw horses above an oval shaped, galvanized tub. One liter of used motor oil was poured into the front of the insert and allowed to drip down the front of and then into the insert. The tests were performed at room temperature (18 to 21 ^{o}C) and the pouring was timed and completed over 2 minutes. Figure 4-21 illustrates the laboratory testing procedure for the spill tests.

For all tests on all of the insert types, the oil flowed through the insert and was seen exiting the bottom within 10 seconds of entering the top. The oil was allowed to drip from the insert into the tub. Dripping continued for approximately 10 minutes at which time no new drops formed. The tub was then emptied and the contents were measured. The recovered volume was compared to the original 1 liter and the amount of retained oil was recorded (Table 4-1).

The oil and insert were allowed to dry for two weeks in the laboratory at room temperature. This simulated drying in the field that might occur between an illegal dump and the following rainfall. The inserts were then placed in the catch basin insert flow testing apparatus and tested to determine how much oil would wash out of the inserts during a storm event. The flume was operated at approximately 25 gallon per minute (equivalent to about 0.1 inch/hour storm over a catchment that is about 50 percent impervious) and the entire flow was directed through the insert. Samples were collected for oil and grease analysis by collecting grab samples as the water exited the bottom of the insert.

Six grab samples were collected over 90 minutes. The first grab sample was collected as soon as water exited the bottom of the insert. Samples were analyzed for oil and grease using as solid phase extraction (SPE) procedure (see Appendix C).

Table 4-1. Volume of oil retained within each new insert.

Catch Basin Insert	Volume Retained (ml)
Kristar FloGard	120
Curb Inlet Basket	640
DrainPac	290
HydroKleen	980

Laboratory set up for testing oil spill capture efficiency

1-L of used motor oil

Pouring oil on HydroKleen

Pouring oil on Curb Inlet sorber

Figure 4-21: Laboratory set up for the evaluation of spill control by catch basin inserts.

The ability of each device to retain oil will depend upon the way the oil enters the front. Only the HydroKleen and DrainPac devices ensure that all the oil will be contacted by the oil absorber. However, the DrainPac has sorption surfaces on the bottom but there is too little sorbent to retain a full liter of used motor oil. The FloGard will have variable results depending on the positions of the oil sorber "sausages" and if they touch the oil and grease flow. The Curb Inlet device has good contact with the oil if the sorber is tightly attached to the leading edge. If the sorber is loose, oil could flow underneath it. Many of the Curb Inlet and FloGard inserts were observed to have loose, damaged, or missing sorbers after the first storm in the field.

Figure 4-22 show the oil and grease concentrations versus time from the flume test. The inserts were not effective in retaining the oil. The bulk of the oil flowed out in the first minute of operating. The first grab sample captured higher oil and grease concentration, but was not effective in capturing a representative sample. The oil was seen to flow out as immiscible packets of oil that did not mix with the water. After the test was complete, the sorbers in the inserts were physically examined. Oil could still be observed on the sorbers as dark spots, shinny areas and areas that felt "slick," but the bulk of the previously retained oil had washed away. The HydroKleen device could not be successfully operated at 25 gallons per minute. Flow was reduced to less than 15 gallons per minute to avoid bypassing.

The catch basin inserts, as configured are not effective in trapping at 1 liter oil spill. They initially retained 30 to 85% but released the oil when water was passed through at rates from 15 to 25 gallons per minute.

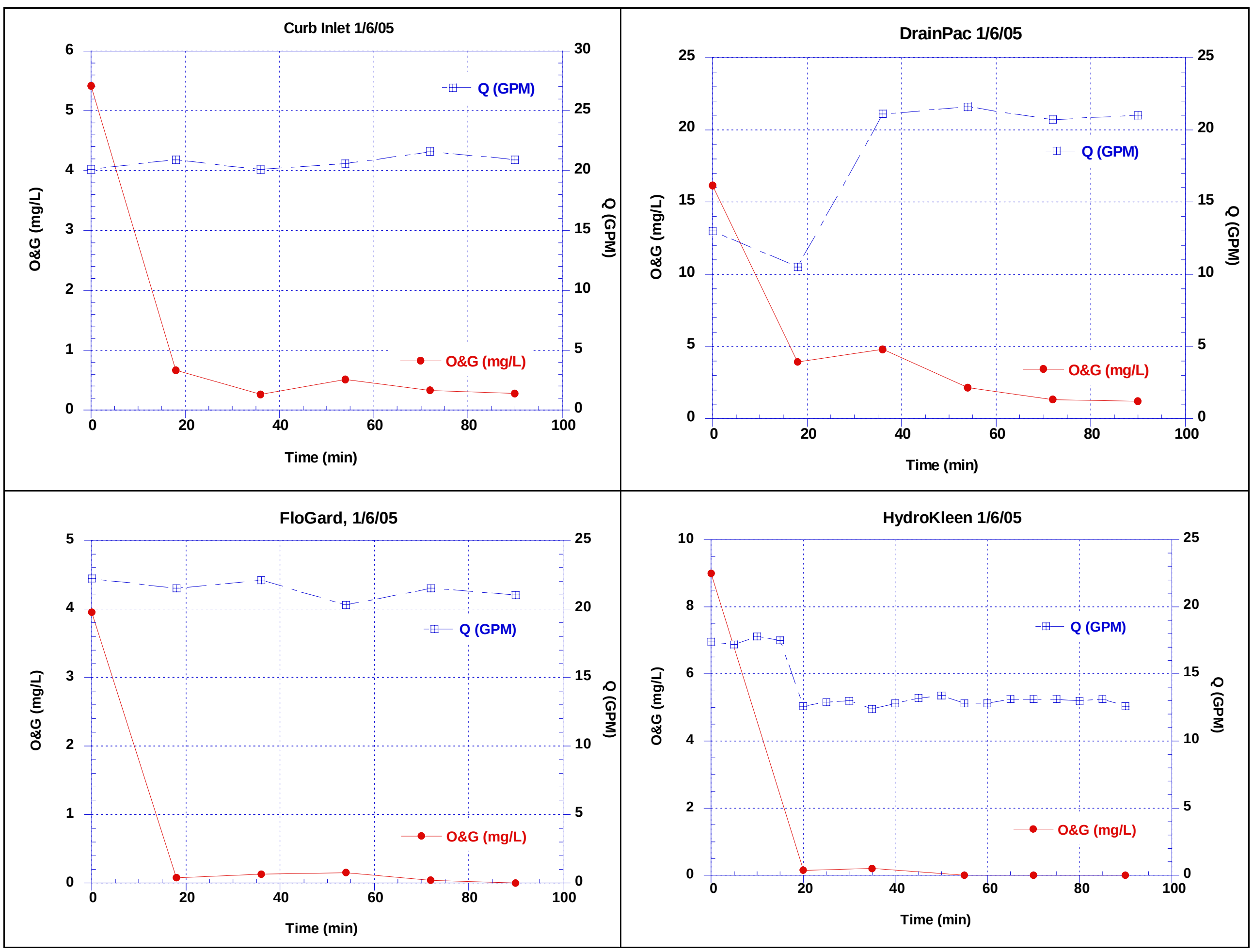


Figure 4-22 Oil & grease wash-out concentration versus time.

4.2.1.2 Particle Capture Tests

The purpose of the particle capture tests was to evaluate the sediment removal performance of the four insert types at removing various particle sizes. Four different particle sizes were used as shown in Table 4-2. To reduce the possibility particle size changing due to abrasion and to minimize oil sediment absorption, glass beads were used to simulate particulate solids. The glass beads were obtained from McMaster Carr in Los Angeles, CA in the four size fractions illustrated in Figure 4-23 and then sieved into the sizes shown in Table 4-2.

Table 4-2. Sieve sizes and corresponding grain sizes used in the particle capture tests.

Sieve Size	Grain Size
> #60	>250µm
> #100	>150µm
> #200	>75µm
Pan	<75µm

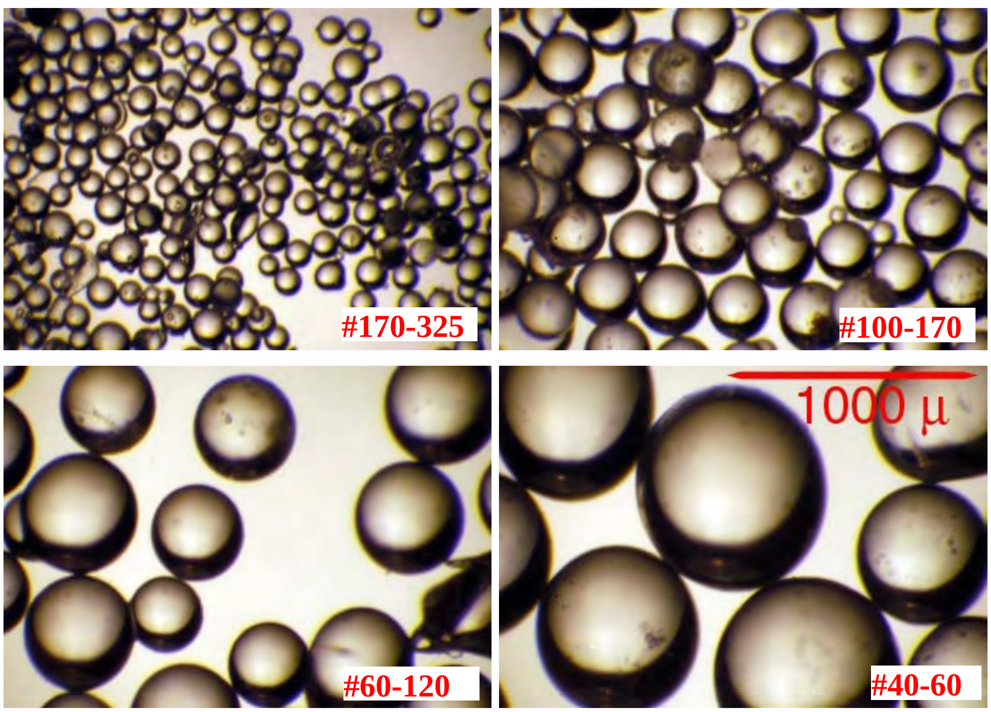


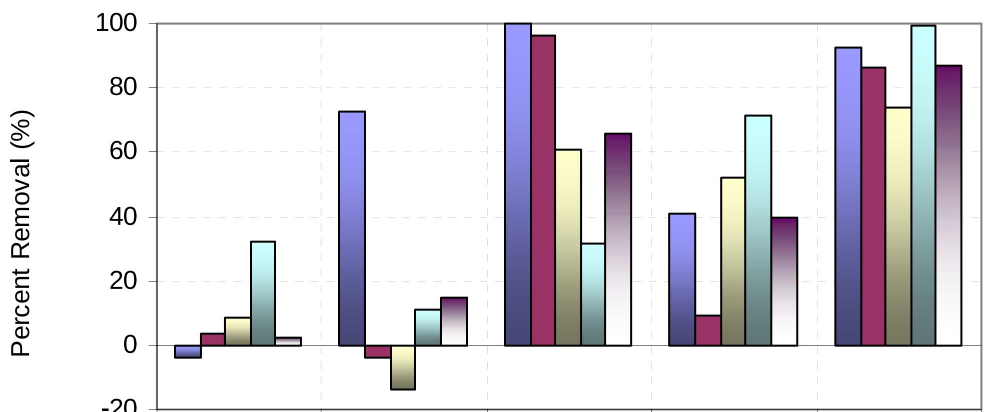
Figure 4-23. Glass blasting beads used for particulate solids removal tests.

Using the catch basin insert testing apparatus at a design flow rate between 20 and 25 gallons per minute, each insert type was tested to determine its particle capture efficiency. A known mass of particles from each size range was delivered to the influent stream. After flowing through the insert, the effluent was passed through a silk screen to capture all unfiltered particles. Table 4-3 shows the influent and effluent mass in each particle size range for each insert tested. A control test was conducted to evaluate the loss of particles in the system with no insert installed. Notice that significant losses were observed for the smallest particle sizes, and these occurred via splashing as the flow tumbles down the edge of the catch basin. They are shown as "removal" for the control. Losses occurred by the control was subtracted out of the device tests to account for splash losses. The precision of the tests is probably in the range of +/- 5 to 10%. The "negative" removals shown by the FloGard are within this precision.

Table 4-3. New filter effluent sediment loading by particle size.

Particle Size	Influent (grams)	Effluent (grams)				
		Control	FloGard	DrainPac	Curb Inlet	HydroKleen
>250 µm	266	276	72	0	151	19
150-250 µm	289	279	300	11	272	42
75 - 150 µm	309	283	352	130	160	88
<75 µm	269	182	240	244	102	2
Total	1134	1020	964	386	684	151

The percent removal for each insert type is shown in Figure 4-24. Notice that HydroKleen had the highest removals for most of the particle sizes. However, this insert could not be operated at the 25 gpm design flow rate without bypassing, so the test was conducted at 10 gpm. DrainPac had the next highest removals and was operated at the 25 gpm design flow rate. Curiously, the Curb Inlet Basket removed the smallest particle sizes better than the larger particles, but this is likely due primarily to losses in the testing apparatus since the control test showed about 32 % removal of particles less than 75 microns. FloGard appears to be moderately effective at removing particles greater than 250 microns, but ineffective at smaller sizes.



	Control	FloGard	Drain Pak	Curb Inlet	HydroKleen
>250µm	-3.7	72.7	100.0	41.2	92.5
150-250µm	3.4	-3.5	96.3	9.0	86.0
75-150µm	8.4	-13.7	61.1	52.4	73.7
<75µm	32.5	10.9	31.6	71.5	99.5
Total	2.4	15.0	66.0	39.7	86.7

Figure 4-24. New filter percent sediment mass removal by particle size.

It is important to understand the mechanism of particle removal. The DrainPac and FloGard devices acted as sieves and retained particles at the bottom of the device, and the entire volume of the device is available for particle retention. The Curb Inlet device retained the fine particles in the oil absorbent sausage. It has a screen in the bottom, but this screen is coarser than most of the particles used during the testing. The mass of particles that can be retained in the sausage is low, compared to the volume for particle retention in the DrainPac or FloGard devices. The particles in the sausage are not tightly retained and can be lost into the effluent if the sausage is flexed or moved about. In this regard, the solids removal test for the Curb Inlet device is not as realistic of a test as it is for the other inserts. The solids retained by the HydroKleen are removed by sedimentation in the first compartment. At high flow rate, the turbulence in this compartment was sufficient to resuspend the fine fraction so that it was discharged in the effluent.

A realistic appraisal of the test results suggests that particles removed by DrainPac and FloGard through sieving will be reliably retained. Particles retained by lodging in the sorbers or removed by sedimentation may be lost or resuspended during high flows and/or if the insert is physically moved or disturbed.

4.2.1.3 Oil & Grease Removal Efficiency

The effectiveness of each new insert at removing oil and grease from stormwater was evaluated by delivering a steady stream of used motor oil into the flume operating at 25 GPM and taking influent and effluent samples every 6 minutes for one hour. The influent samples were composited at the end of the experiment because these concentrations were not expected to vary substantially, but the effluent samples were analyzed independently to capture the variability in effluent quality. Table 4-4 shows the oil and grease influent and effluent concentrations for each insert type. Notice that HydroKleen shows the lowest oil and grease effluent concentrations, followed by DrainPac and Curb Inlet Basket, which were comparable. FloGard showed the highest effluent concentrations, but this device also received the highest influent concentration. To evaluate the performance in terms of percent removals, Figure 4-25 shows side-by-side box and whisker plots of the oil and grease reduction percentages. Notice that the 95% confidence intervals of the median percent removal for several of the inserts overlap indicating that the differences in performance are not statistically significant. FloGard does appear to have a lower performance than Curb Inlet and HydroKleen, but is not statistically different from DrainPac.

Table 4-4. New filter oil and grease effluent concentrations versus time.

	DrainPac	FloGard	Curb Inlet	HydroKleen
Influent (mg/L)	**26.3**	**33.5**	**30.1**	**19.5**
Time (min)	Effluent (mg/L)	Effluent (mg/L)	Effluent (mg/L)	Effluent (mg/L)
6	7.3	13.7	12.2	5.4
12	12.0	23.4	11.4	4.7
18	12.8	22.1	13.5	9.1
24	10.0	19.4	13.9	5.1
30	11.0	23.9	12.7	3.3
36	13.9	15.4	8.8	11.8
42	10.3	16.1	10.1	4.5
48	11.2	19.7	11.1	6.8
54	18.8	16.6	9.9	2.4

60	21.1	17.4	12.9	7.5
Median	**11.6**	**18.4**	**11.8**	**5.3**

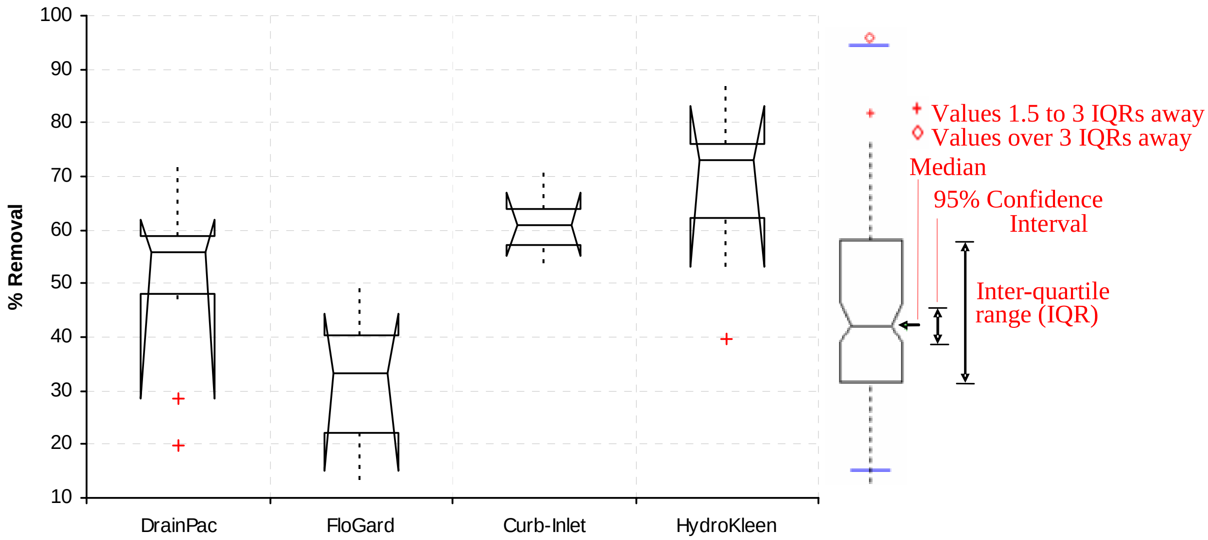


Figure 4-25. Box and whisker plots of oil and grease removal tests with new inserts.

The stock oil solution was analyzed for metals concentration to estimate the potential removals of metals if oil and grease were removed. Table 4-5 provides the metals concentrations in the oil stock solution and the calculated effluent metals concentrations based on the median oil and grease concentrations for each insert. Notice that the effluent metals concentrations are all extremely low; below most analytical method detection limits, with the possible exception of zinc.

Table 4-5. Metals concentrations in oil and the calculated metals removals for each insert type.

Metals	Conc. in Used Motor Oil	Calculated Metals Effluent Concentrations			
		DrainPac	FloGard	Curb Inlet	HydroKleen
	ug/g	ug/L	ug/L	ug/L	ug/L
Cr	0.53	0.006	0.010	0.006	0.003
Ni	1.72	0.020	0.032	0.020	0.009
Cu	21.16	0.245	0.390	0.250	0.112
Zn	501.83	5.821	9.249	5.922	2.645
As	0.03	0.000	0.001	0.000	0.000
Cd	0.04	0.001	0.001	0.001	0.000
Pb	3.36	0.039	0.062	0.040	0.018

4.2.2 Testing and Analysis of Used Filters

The used inserts were retrieved from the field and taken to the laboratory for final testing and analysis. The bulk solids captured by the CPC and FL inserts during the cumulative pollutant capture part of the study period was characterized by size and weight. Four tests were performed on the FL inserts after the field-to-laboratory portion of study, including flow rate tests, solids removal tests, oil and grease removal tests, and used oil spill tests. The following subsections describe the results of these tests and analyses.

4.2.2.1 Captured Bulk Solids Analysis

After the cumulative pollutant capture period of the study, material recovered from the inserts was characterized. The materials captured by all four types of inserts (Catch Basin Inlet, DrainPac, FloGard, and HydroKleen) at various sites were returned to the UCLA campus for analysis. Consisting of primarily coarse sediment, leaves, debris, and litter, the material captured by each insert was weighed wet and then a representative volume of the material was sampled, air dried, sieved into two size fractions using a 1-inch screen, and then weighed. Figure 4-26 includes photographs illustrating this solids analysis procedure.

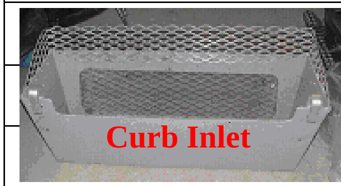
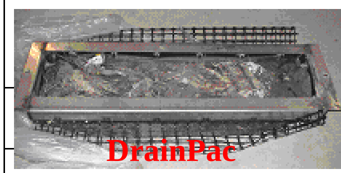
Figure 4-26. Photos of bulk solids screening process.

Table 4-6 summarizes the screening results for the CPC inserts and Table 4-7 summarizes the screening results for the FL inserts. Notice that the majority of the material mass was generally smaller than 1-inch. This result supports visual observations that much of the captured material appeared to consist of coarse sediment, degraded trash, and composted debris. Hence, the duration that material is left in an insert appears to have an affect on the particle size distribution of the captured bulk solids. Lead tire weights, cell phones, batteries and other potentially hazardous materials were also found in the retained material. Given the state of decay of the material, all the interesting spiders, worms and insects, and the fact that potentially hazardous material were accumulating in the inserts, it is concluded that if the inserts are allowed to stay in the field too long, they could likely become a nuisance and a potential public health hazard.

Table 4-6. Accumulated bulk solids screening analysis for CPC inserts.

Catch Basin No.	Total Sample Weight (kg)	Representative Sample Weight (kg)	Representative Sample Volume (L)	Date & Order	After Drying (kg)		Date & Order	% Solids
					1" Sieving	Passed		
CC-008-C	6.2	6.1	8.0	11/15_1	0.9	1.3	11/17_2	35.2
CC-007-C	8.0	7.8	12.0	11/15_2	0.8	3.9	11/17_1	60.3
CC-014-C	28.2	11.3	16.0	11/12_6	0.8	5.3	11/15_2	54.0
CC-014-C2	22.2	8.5	16.0	11/10_4	1.7	4.6	11/12_2	72.9
CC-004-C	17.0	11.8	16.0	11/10_8	1.1	7.8	11/12_4	75.0
CC-002-C	14.3	10.3	16.0	11/10_1	0.9	4.5	11/12_7	51.9
CC-009-D	19.8	13.4	16.0	11/12_5	1.1	7.5	11/15_1	64.2
CC-010-D	37.3	9.7	16.0	11/10_7	4.1	4.0	11/12_1	83.5
CC-009-F	28.4	13.3	16.0	11/12_2	0.3	6.8	11/15_6	53.4
CC-007-F	22.8	4.7	16.0	11/12_4	1.2	1.3	11/15_4	53.2
CC-013-F	29.9	6.2	16.0	11/10_6	1.6	2.9	11/12_3	71.8
CC-003-F	49.5	12.0	16.0	11/10_3	1.8	5.4	11/12_5	59.6
CC-011-F	86.0	30.5	32.0	11/10_2	2.3	23.6	11/12_6	84.6
CC-004-F	55.0	9.9	16.0	11/12_1	0.5	5.3	11/15_7	58.9
CC-003-H	14.8	11.9	16.0	11/8_1	2.3	5.1	11/10_1	62.2
CC-001-H	12.3	9.1	13.0	11/12_3	1.7	3.1	11/15_5	53.0
CC-003-H2	15.4	13.7	16.0	11/10_5	1.2	4.3	11/15_3	40.1

Table 4-7. Accumulated bulk solids screening analysis for FL inserts.

<table>
<tr><th rowspan="2">Insert Type</th><th rowspan="2">Catch Basin No.</th><th rowspan="2">Total Sample Weight (kg)</th><th rowspan="2">Total Sample Volume (L)</th><th rowspan="2">Date & Order</th><th colspan="2">Sieving (kg)</th></tr>
<tr><th>#1 Sieving</th><th>Passed</th></tr>
<tr><td rowspan="3"></td><td>FL-004-C</td><td>0.35</td><td>4.0</td><td>11/19_1</td><td>0.15</td><td>0.20</td></tr>
<tr><td>FL-003-C</td><td>0.60</td><td>6.0</td><td>11/19_2</td><td>0.15</td><td>0.45</td></tr>
<tr><td>FL-001-C</td><td>2.70</td><td>4.0</td><td>11/19_3</td><td>0.25</td><td>2.45</td></tr>
<tr><td rowspan="3"></td><td>FL-008-D</td><td>0.90</td><td>4.0</td><td>11/19_5</td><td>0.15</td><td>0.75</td></tr>
<tr><td>FL-003-D</td><td>1.20</td><td>5.0</td><td>11/19_6</td><td>0.25</td><td>0.95</td></tr>
<tr><td>FL-001-D</td><td>1.30</td><td>1.5</td><td>11/19_7</td><td>0.15</td><td>1.15</td></tr>
<tr><td rowspan="3"></td><td>FL-003-F</td><td>3.35</td><td>8.0</td><td>11/19_8</td><td>0.20</td><td>3.15</td></tr>
<tr><td>FL-001-F</td><td>5.25</td><td>8.0</td><td>11/19_9</td><td>1.05</td><td>4.20</td></tr>
<tr><td>FL-004-F</td><td>0.25</td><td>1.0</td><td>11/19_10</td><td>0.05</td><td>0.20</td></tr>
<tr><td rowspan="3"></td><td>FL-006-H</td><td>1.10</td><td>3.0</td><td>11/19_4</td><td>0.10</td><td>1.00</td></tr>
<tr><td>FL-008-H</td><td>0.25</td><td>0.5</td><td>11/19_11</td><td>0.05</td><td>0.20</td></tr>
<tr><td>FL-002-H</td><td>0.25</td><td>0.2</td><td>11/19_12</td><td>0.00</td><td>0.25</td></tr>
</table>

4.2.2.2 Flow Rate Tests

A problem reported with catch basin inserts in the past has been clogging and bypassing. This is to be expected since the fine screens or meshes in some of the devices can be overwhelmed, or "blinded" by debris, as well clogged by sediment. The volume of the insert can also fill with litter and trash so that there is little room for stormwater to accumulate to create sufficient pressure to flow through the screen. During this study, the captured material caused both blinding due to large items, such as plastic bags and newspaper, and clogging due to sediment. The sediment coats the screens at the bottom of the insert and appears as a moist mud layer when the insert is wet. After the insert dries out, the mud layer forms a largely impermeable barrier. Barriers such as this were noted in many of the used inserts. In the case of the HydroKleen, barriers were formed in the top of the second compartment, which prevented stormwater from passing through the sorbent pillows.

In order to evaluate clogging of the used inserts, a flow test was performed. The insert was subjected to low flow at first and the water level in the insert was allowed to stabilize. The depth of water in the insert was then measured. Next the flow was increased and the depth was remeasured. This process was continued until the maximum capacity of the flume was reached (60 GPM), or the insert bypassed. Figure 4-27 shows the results of several tests where the maximum flow rate achieved without bypass shown at the endpoint. (Note as mentioned above three inserts were replaced by the City of L.A. and were not available to test). All but two inserts bypassed at less than 60 GPM flow (equivalent of about 0.2 inches per hour over a catchment with 70% imperviousness). Both of the FloGards (FL001-F, FL003-F) passed more than 50 GPM before bypassing. One DrainPac (FL001-D) did not bypass at 60 GPM and the other (FL008-D) bypassed at 50 GPM. Three Curb Inlet Basket devices were tested. One bypassed at 20 GPM, another (FL003-C) at 50 GPM (FL001-C), and the final device (FL004-C) did not bypass. The oil sorbent sausage was missing from this particular insert; it was somehow lost during operation in the field or perhaps cleaned out by City maintenance personnel not familiar with project. The HydroKleen devices bypassed at 12 GPM (FL008-H) and 40 GPM (FL001-H).

It was noticed during the suspended solids testing (next subsection) that the hydraulic capacity was further reduced by the accumulation of glass beads.

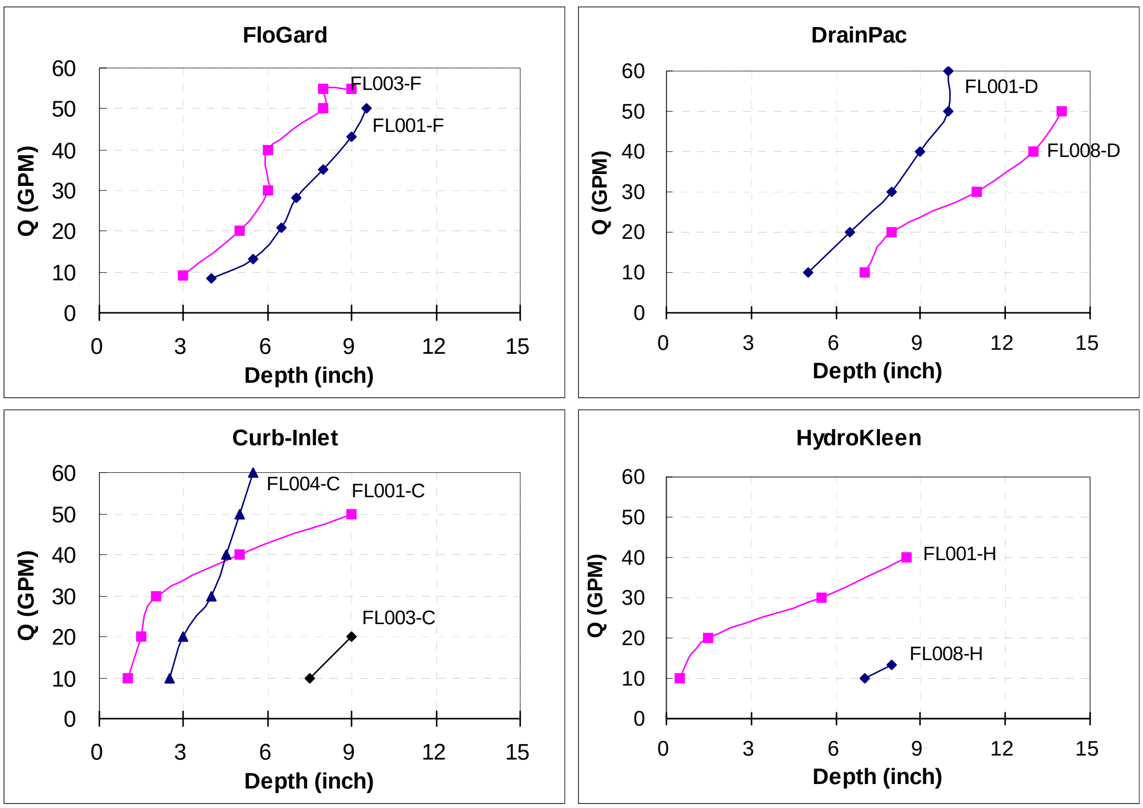


Figure 4-27. Used catch basin insert flow rate tests.

During the flow rate tests sediment particles that washed out of the used inserts were captured and sieved to evaluate the mass of retained particles released during a runoff event. Table 4-8 shows the mass of particles within each size range that were washed out from each insert. Notice that DrainPac and Curb Inlet tended to release the largest amount of particles. However, since the mass particles retained prior to the washout test was not known these results are only useful for a qualitative assessment of the ability of the insert to retain particles.

Table 4-8. Washout of particles from used inserts during the flow rate tests.

Particle Size (microns)	FloGard		DrainPac		Curb Inlet			HydroKleen	
	FL001-F	FL003-F	FL001-D	FL008-D	FL003-C	FL001-C	FL004-C	FL008-H	FL001-H
> 400	9.51 g	3.92 g	5.31 g	44.80 g	10.07 g	5.70 g	8.70 g	8.00 g	0.00 g
250-400	2.10 g	1.83 g	2.43 g	18.70 g	7.98 g	3.59 g	11.03 g	5.67 g	3.50 g
150-25-	2.07 g	1.92 g	1.80 g	18.70 g	6.66 g	2.43 g	12.80 g	4.40 g	0.00 g
75-150	2.58 g	2.55 g	2.76 g	10.32 g	6.40 g	2.62 g	18.20 g	3.42 g	0.00 g
< 75	2.05 g	1.33 g	0.16 g	3.50 g	0.00 g	1.06 g	0.00 g	0.00 g	0.00 g
Total	**18.31 g**	**11.55 g**	**12.46 g**	**96.02 g**	**31.11 g**	**15.40 g**	**50.73 g**	**21.49 g**	**3.50 g**

4.2.2.3 Solids Removal Tests

Suspended solids testing were performed on used inserts in the same manner as the new inserts. Figure 4-28 shows the removal efficiencies of the inserts recovered from the field. The removal rates were better than observed with new inserts likely due to the retained material retained in the filters from the field. This retained material acts as a pre-coat or dynamic membrane and improves removal efficiency at the expense of reduced flow capacity and increased bypass, as noted in the previous section. This improved performance/decreased capacity relationship is shown in Figure 4-28 for the Curb Inlet insert FL003-C and HydroKleen insert FL008-H, where the flow rate was reduced to 5 GPM to avoid bypass. Comparing only the inserts that were successfully tested at 25 GPM, FloGard and DrainPac appear to have the highest removals for the full range of particle sizes. However as mentioned previously for the new filter particulate capture tests, small particles are easily lost in the testing apparatus, so the results for these smaller particles likely over-predict the actual removals.

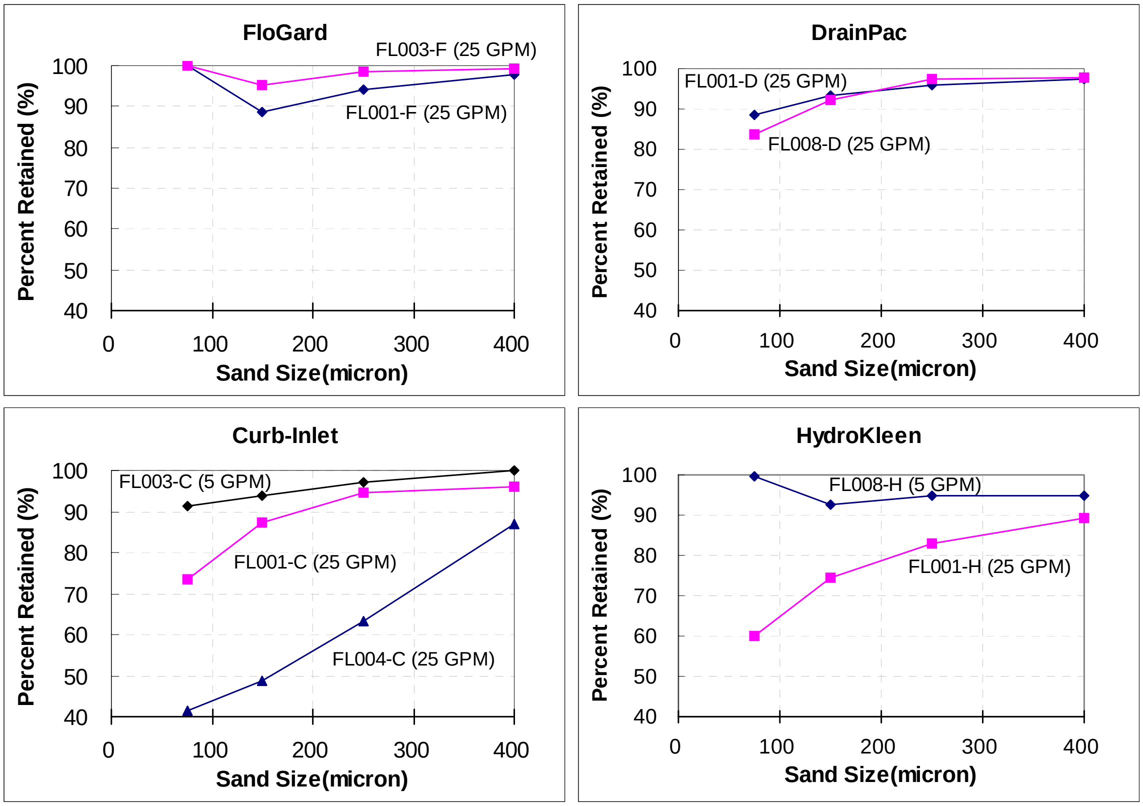


Figure 4-28. Used insert particulate solids removal test.

4.2.2.4 Oil & Grease Removal Tests

The tests were performed in the same way as the tests on the new inserts, except that the maximum flow rate without bypassing was used. Flume testing for oil and grease removal is limited to about 10 GPM minimum due to the oil addition pumps. Below 10 GPM, it is not possible to added motor oil at a low enough flow rate to produce 10 to 25 mg/L concentration range that was desired for the test. Testing at higher oil and grease concentrations would not be representative of the performance at lower concentrations. Consequently, only 6 of the 9 inserts recovered from the FL sites had acceptable flow rates for this test based upon the above testing (see Section 4.2.2.2). (Recall that 3 of the original 12 FL inserts had been removed by the City and were unavailable for the FL tests). Only one of the HydroKleen (FL008-H) units was tested at 10 GPM. The other units (one DrainPac, one Curb Inlet, and one HydroKleen) were not tested because the flow rates were too low.

Table 4-9 shows the oil and grease effluent concentrations for each 6 minute sample collected during the 1-hour test. All inserts were tested at 25 GPM except for HydroKleen, as discussed above, was tested at 10 GPM. As with the test while new, this insert had the lowest overall effluent quality. For the inserts tested at 25 GPM, DrainPac showed the lowest median effluent quality followed by FloGard. Curb Inlet had the highest median effluent quality.

Table 4-9. Used filter oil and grease effluent concentrations versus time.

	DrainPac	FloGard	FloGard	Curb Inlet	Curb Inlet	HydroKleen*
	FL003-D	FL003-F	FL001-F	FL004-C	FL001-C	FL008-H
Influent (mg/L)	**16.33**	**20.72**	**27.65**	**23.91**	**26.43**	**22.25**
Time (min)	Effluent (mg/L)	Effluent (mg/L)	Effluent (mg/L)	Effluent (mg/L)	Effluent (mg/L)	Effluent (mg/L)
6	3.74	5.94	8.7	15.54	23.72	1.02
12	3.12	7.4	9.52	17.36	18.84	1.46
18	4.52	7.72	14.08	14.12	14.84	3.04
24	9.4	7.02	15.86	14.7	25.66	3.68
30	6.66	6.88	10.2	21.66	24.9	6.2
36	8.52	7	6.46	18.36	16.34	5.28
42	7.68	6.6	13.44	15.04	13.94	6.74
48	5.48	8.6	12.78	16.1	19.82	9.38
54	7.02	8.96	9.78	16.92	13.34	7.06
60	4.32	9.92	7.5	12.04	14.3	5.98
Median	**6.1**	**7.2**	**10.0**	**15.8**	**17.6**	**5.6**

* Tested at 10 GPM.

To investigate whether the oil and grease removals are statistically different from one another, Figure 4-29 is a side-by-side box plot of the percent removals of the used inserts. Note that all inserts except for Curb Inlet have overlapping 95% confidence intervals about their median percent removals. The HydroKleen insert slightly outperforms FloGard insert FL003-F, but is not statistically different from FL001-F.

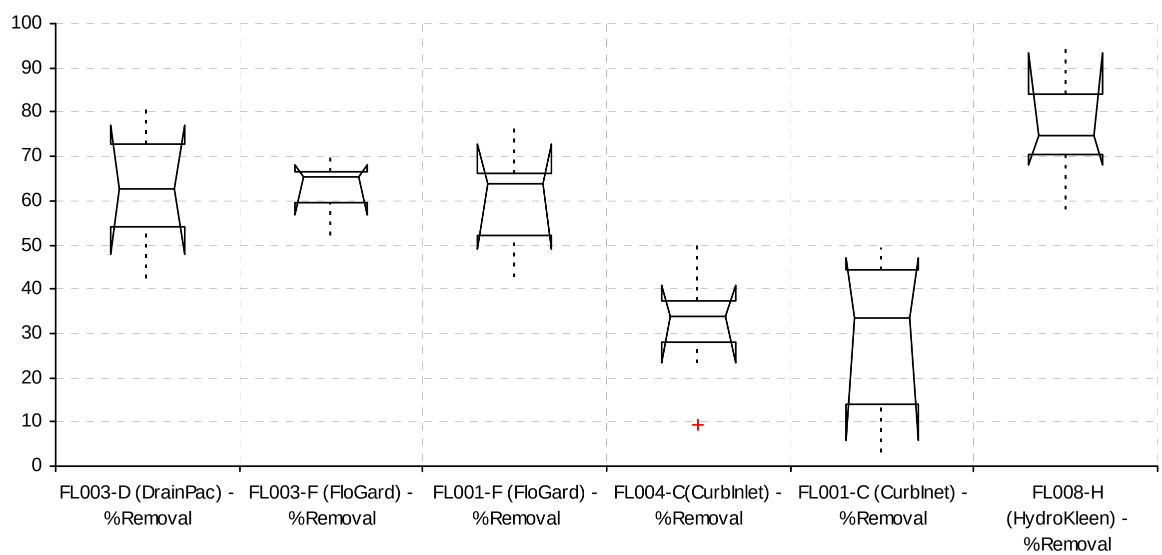


Figure 4-29. Box and whisker plots of oil and grease removal tests with used inserts.

Table 4-10 compares the median oil and grease effluent quality and percent removals for the new and used inserts. Note that the effluent quality is reduced for DrainPac and FloGard, but is slightly increased for Curb Inlet and HydroKleen. However, this difference is not significant due to the variability in the data. In general the removal efficiencies of the used inserts was greater than the new inserts because it is likely that the retained material from the field acts as a sorbent just as the captured material acted as a filter for the particulate solids removal test. However, the percent removals for Curb Inlet decreased. This reduction in performance for the Curb Inlet is likely due to loosely held absorbents after it has been used and is consistent with field observations that indicated the absorbent was easily disturbed causing limited contact with the inflow.

Table 4-10. Comparison of new and used insert oil & grease removal efficiency.

	Median Effluent Quality (mg/L)		Median Percent Removals (%)	
	New	**Used**	**New**	**Used**
DrainPac	11.6	6.1	56.0	62.8
FloGard	18.4	7.2 - 10	33.3	63.9 - 65.2
Curb Inlet	11.8	15.8 - 17.6	60.8	33.8 - 33.5
HydroKleen	5.3	5.6	72.9	74.7

4.2.2.5 Spill Tests on Used Inserts

After the completion of flow, suspended solids removal and oil and grease removal testing, a second series of spill tests was performed to assess how the oil retention capacity of the inserts are affected after they have been field conditioned. One liter of used motor oil was pored through each insert in the same way as performed on the new inserts (see Section 4.2.1.1). The only difference was the condition/age of the insert. In this case the inserts were used and contained removed solids from field testing as well as the glass beads from laboratory testing. The large litter had been removed prior to hydraulic testing. The volume of oil retained for a representative used insert of each type is shown in Table 4-11. For all inserts except the HydroKleen, more oil was retained by the used insert than the clean inserts. This likely is the results of the accumulation of solids and small liter retained in the insert act as sorbents. FloGard, which had the lowest retention capacity of all the inserts while new, showed the largest increase its oil retention capacity after it had been used. DrainPac had the highest retained percentage while used and HydroKleen had the highest retained percentage while new.

Table 4-11. Volume of oil retained within each used insert and the % increase compared to the new insert oil retention.

Catch Basin Insert	Volume Retained (ml)	% Increase from New
FloGard (FL003-F)	630	425%
Curb-Inlet (FL004-C)	460	59%
DrainPac (FL001-D)	730	152%
HydroKleen (FL008-H)	600	-39%

5 RESEARCH SYNOPSIS AND RECOMMENDATIONS

This research was performed to provide an independent performance assessment of storm drain inlet filter devices at removing oil and grease and bulk pollutants from stormwater in the City of Los Angeles. A review of literature found that several researchers have studied the pollutant removal effectiveness of catch basin inserts, but the large variety of devices, the different methods for evaluating performance, and the fact that the technology is continually evolving indicates that there are still data and knowledge gaps in this area of stormwater BMP research.

Four different catch basin insert technologies were selected for testing in this study: DrainPac, Curb Inlet Basket, FloGard, and HydroKleen. The selection was based on the number and quality of existing studies testing these devices, the budgetary and technical feasibility of testing them during the course of this study, and the perceived or advertised ability of these devices to remove and retain oil and grease from stormwater and illicit dumping activities. The performance of the selected inserts was subsequently evaluated in twenty-four CPC (cumulative pollutant capture) sites and twelve FL (field-to-laboratory) sites during the study period of 2003-2005. This was accomplished in two phases. In Phase I, the CPC sites were evaluated for long-term performance of the inserts through periodic field inspections and qualitative and quantitative assessment of accumulated pollutants during the wet and dry seasons. In Phase II, the FL site inserts were evaluated by conducting a series of laboratory tests before and after exposing them to field conditions. Significant conclusions derived from this study are provided below.

5.1 SUMMARY OF RESEARCH CONCLUSIONS

<u>Conclusions Related to Literature Review:</u>

- The limited available data on oil and grease removal indicates that catch basin inserts would provide some removal of oil and grease from stormwater.
- In general, some devices have been tested more thoroughly than others. However due to the variety of configurations and media types among the large number of competing products, it is difficult to comparatively assess their performance.
- Due to the inconsistencies in reporting performance monitoring data and the fact that percent removals (a misleading measure of BMP efficiency) are most often reported, it is not possible to determine the average achievable effluent oil and grease concentrations from catch basin inserts from the existing data.
- It "appears" that oil and grease can only be reduced to about 5-10 mg/L by catch basin inserts. However the available data are too limited to statistically support this assertion. Also, the ability of inserts to retain oil, once it has absorbed to the media has not been thoroughly investigated.

Conclusions Related to Field Inspections:

- In general, catch basin inserts are excellent litter removal devices, although they have limited capacity as compared to the inflow of litter observed.
- In higher litter producing areas in the City of Los Angeles, almost all of the inserts clogged or reached their trash loading capacity very early in the rainy season.
- All manner of litter was collected including paper, plastics, and coarse sediments as well as oil and grease.
- Litter collection interferes with the insert's other desired functions. Excessive accumulation of trash and debris and evidence of clogging at almost all sites would significantly affect oil & grease capture efficiency.
- DrainPac and FloGard have larger capacities and finer screens and therefore retained bulk solids most effectively. Efficient capture of bulk solids consequently helped continued oil capture up until the accumulated debris caused bypass.
- For FloGard, the presence of lip at the curb caused the insert to be bypassed at least on one site.
- Curb-Inlet Basket does not appear to remove sediment except for on the inlet shelf and the insert does not contain a filter fabric. The absorbent boom has low structural integrity because the media was observed to have been washed from the boom.
- HydroKleen, appeared to have the highest potential for removing oil and grease based on the laboratory testing (see below). However, by-passes at low flows and limited capacity for bulk solids (e.g., bulk solids and fine solids caused by-pass to occur quickly) are some of the observed problems for this insert and would limit its actual ability to be effective overall at oil and grease removal. Also, the settling chamber permanently retains water that can breed mosquitoes.

Conclusions Related to Laboratory Tests:

- Retention in the inserts of a gross spill of 1 liter of used motor oil ranged from 10 to 90%. However, most of the captured oil was lost during subsequent flow testing, and in the field, would surely have been lost during the next rain event.
- Apparently, accumulated litter and sediments may help capture of a gross spill of used motor oil up to the point where bypassing occurs.
- Most of the inserts were effectively able to remove particles larger than 250 µm. The DrainPac and FloGard inserts remove solids by sieving. The HydroKleen removes solids by sedimentation in the first compartment and then filtration in the second compartment. Curb Inlet removes small particulates in the absorbent boom and larger particles in mesh screen.
- Smaller particles were sometimes removed by entrapment in sorber "sausages" (Curb Inlet and FloGard) but it is unlikely that this mechanism would be quickly overwhelmed in the field due to the limited capacity for retaining sediments.
- Retention of particles also occurred via settling in the first chamber of the HydroKleen

unit and on the shelf of the Curb Inlet Basket. However, sediments captured by settling appear to be easily lost during high flows.

- Laboratory tests showed that significant "blinding" (e.g., clogging of flow paths) occurred with solids accumulation and resulted in overflow/bypass.
- Trade-offs exist between O&G removal capabilities and capture of litter and solids:
  - Inserts with lots of sorbent for O&G removal have little room for solids and litter and therefore blind more quickly.
  - Inserts with room for litter and solids have less room for sorbents and therefore are less effective for oil and grease removal.
  - Inserts to remove oil and grease in the presence of high loads of litter and solids may not be a good choice.
  - Inserts protected from litter, with devices such as coarse screens installed at the curb, could then be optimized for oil and grease removal by maximizing the volume of sorbents available.

5.2 CHALLENGES, LESSONS LEARNED, AND SUGGESTIONS FOR FUTURE RESEARCH

Some elements of the monitoring plan were modified during the course of the study due to circumstances beyond the research team's control that caused delays in getting project tasks completed. For instance, the catch basin insert testing apparatus at UCLA had to be relocated because of the demolition of a laboratory building, so laboratory testing was delayed. Also, the fire disaster that occurred in southern California during the summer of 2003 left a significant amount of ash covering the area and it was decided that the first events of the season would not likely represent typical conditions. Therefore the project team decided to install and begin conditioning the catch basin inserts during the middle of the wet season rather than at the beginning.

Other significant challenges faced during this study included the initial selection, installation, and tracking of installed inserts. Only approximate drainage areas for the catch basins could be estimated, as it was impossible to determine the rooftop contributing areas. Also, the variety of catch basin configurations (e.g. depth, width, manhole size and shape, etc.) made it difficult to find sites with similar characteristics and in close proximity to one another. Some of these characteristics made installation difficult for some of the inserts, even when detailed field measurements were made. For instance, the plastic lip on the HydroKleen insert had to be trimmed to fit into a couple of the catch basins.

The relative timing of the installations also limited the ability to compare sites. Since the vendors of each insert type installed the inserts, some inserts were installed several weeks after others were installed so the amount of field conditioning differed somewhat between sites. In fact, a couple of the inserts at CPC sites lagged so much that it was decided to switch previously designated FL sites to CPC sites (which were subsequently switched back to FL sites for the field-to-laboratory phase of the study). Choosing new sites or switching sites from CPC to FL was confusing and cumbersome with the original naming convention that was used. It is recommended that if a large number of catch basin sites are to be studied in the future that site is given a unique site number that is never reused as well as a study number that can be reused when a substitution is made.

Another lesson learned during this study is that it is important to ensure communication is established with the department responsible for maintenance of catch basins (Wastewater Collection Systems Division for the City of Los Angeles). It is clearly evident that the City's Watershed Protection Division, who was a participant in this project and was aware of the location of the study catch basin sites, did not notify the Wastewater Collection Systems Division of this study. While the loss of the four study inserts reduced the amount of data that was obtained from this study, it did not seem significantly change the overall conclusions of the study. However, if the City expects to further its goal of improving the quality of runoff from its storm drain system, it is absolutely vital that these two organizations establish more efficient communication channels.

The litter generation rates at the locations of the inserts used in this study were several times and perhaps ten times greater than observed in the previous studies conducted by the investigators.[5,28] While the field observations indicate that oil generation, particularly from illicit dumping of used oil, was also particularly high in the study area, the large amount of litter often blocked the entrance to the catch basin itself. If further work is preformed to use catch basin inserts to trap oil spills (which appears to be needed in the study area), a modified approach should be taken for areas generating such large amounts of litter. Coarse screens, either with square meshes (~1 inch) or expanded metals screens (although expanded metal is more difficult to clean) should be used to protect the catch basin inserts from excessive litter. Street sweeping can be used to pick up the rejected litter and it was demonstrated in the researchers' previous study that the screens are not damaged by street sweepers and vice versa. While the frequency of street sweeping may need to be increased to avoid complete blockage of the inlet, the frequency of catch basin cleaning may be significantly reduced. Also, if the inserts are protected from litter they can be optimized for oil removal and retention. Much greater masses of sorbents, such as is used in the HydroKleen insert, can be used in the insert to provide more oil sorption capacity while reducing the tendency for clogging.

Curb inlet trash screens have been installed by the City of Los Angeles at a few of the field-to-laboratory study locations. These are expected to keep out large objects that obstruct the inserts and prevent the inserts from functioning properly. A recommendation for further research is to compare the performance of the same insert types with and without curb inlet trash screens.

Catch basin insert vendors are beginning to market curb inlet trash screens. For instance, Kristar Enterprises, the manufacturer for FloGard, is currently marketing a curb inlet trash screen to provide pre-treatment to their catch basin insert devices. United Stormwater, the Los Angeles area representative for DrainPac, also markets curb inlet screens.

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[28] Lau, S-L and M.K. Stenstrom, “Best Management Practices to Reduce Pollution from Stormwater in Highly Urbanized Areas,” WEF Tech, Chicago, IL, September 30-October 3, 2002.

APPENDIX A- SITE LOCATION MAPS

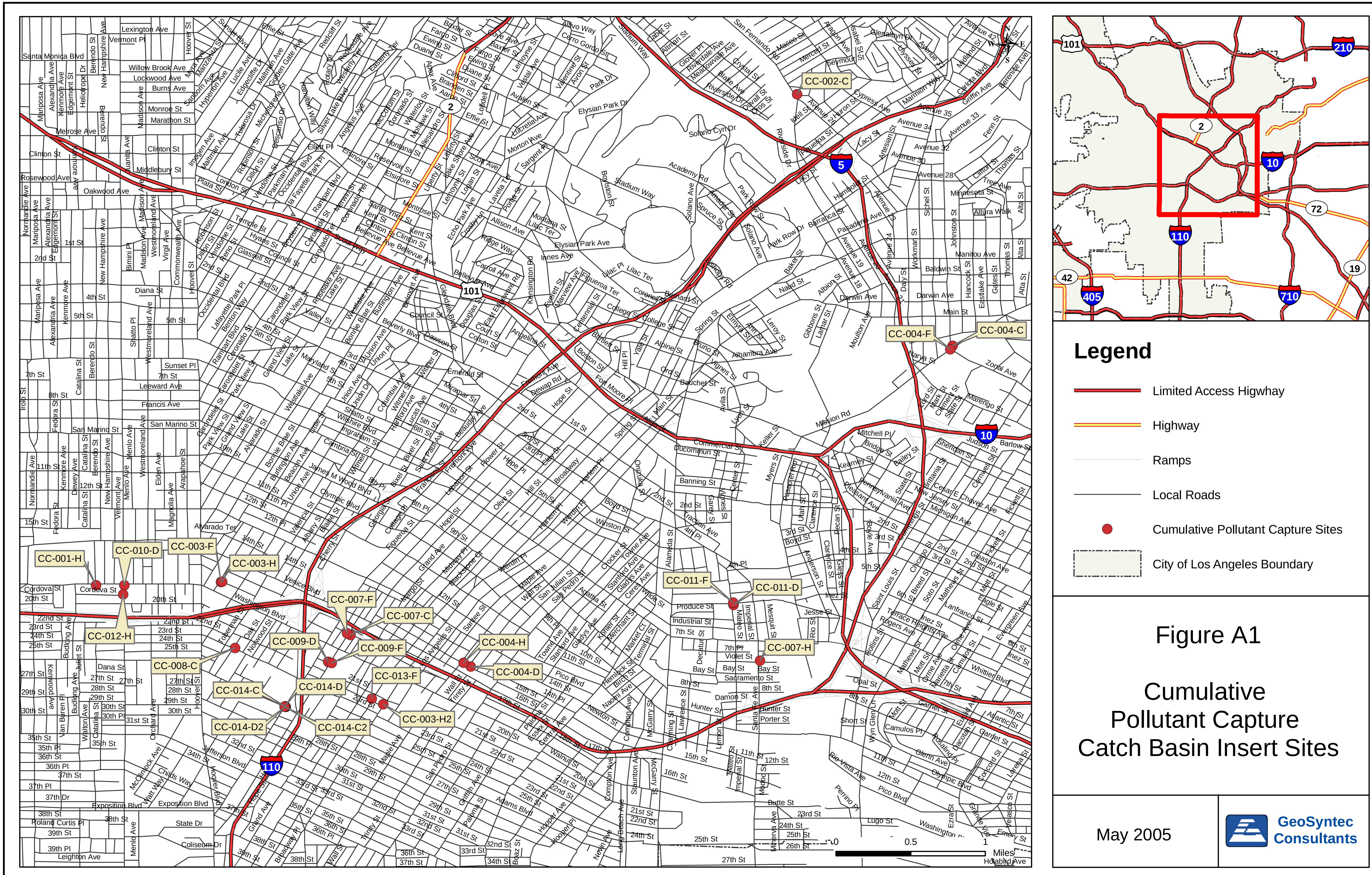
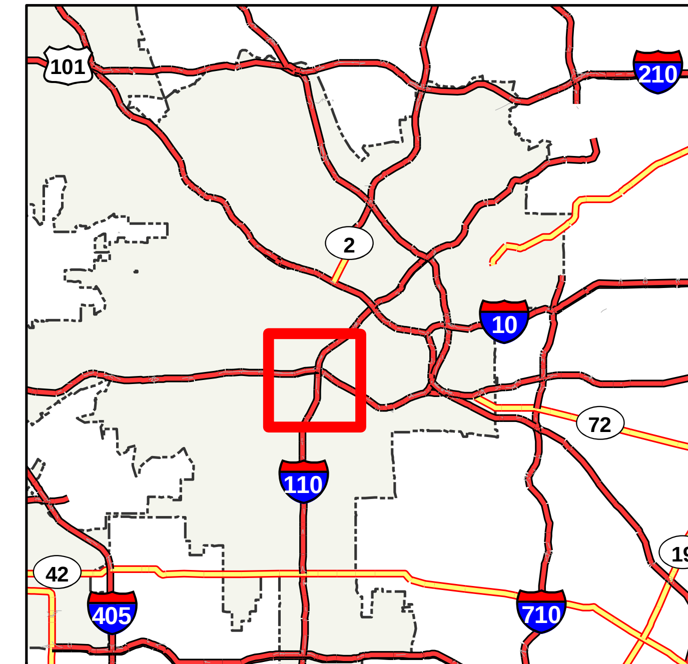


Figure A1

Cumulative Pollutant Capture Catch Basin Insert Sites



Legend

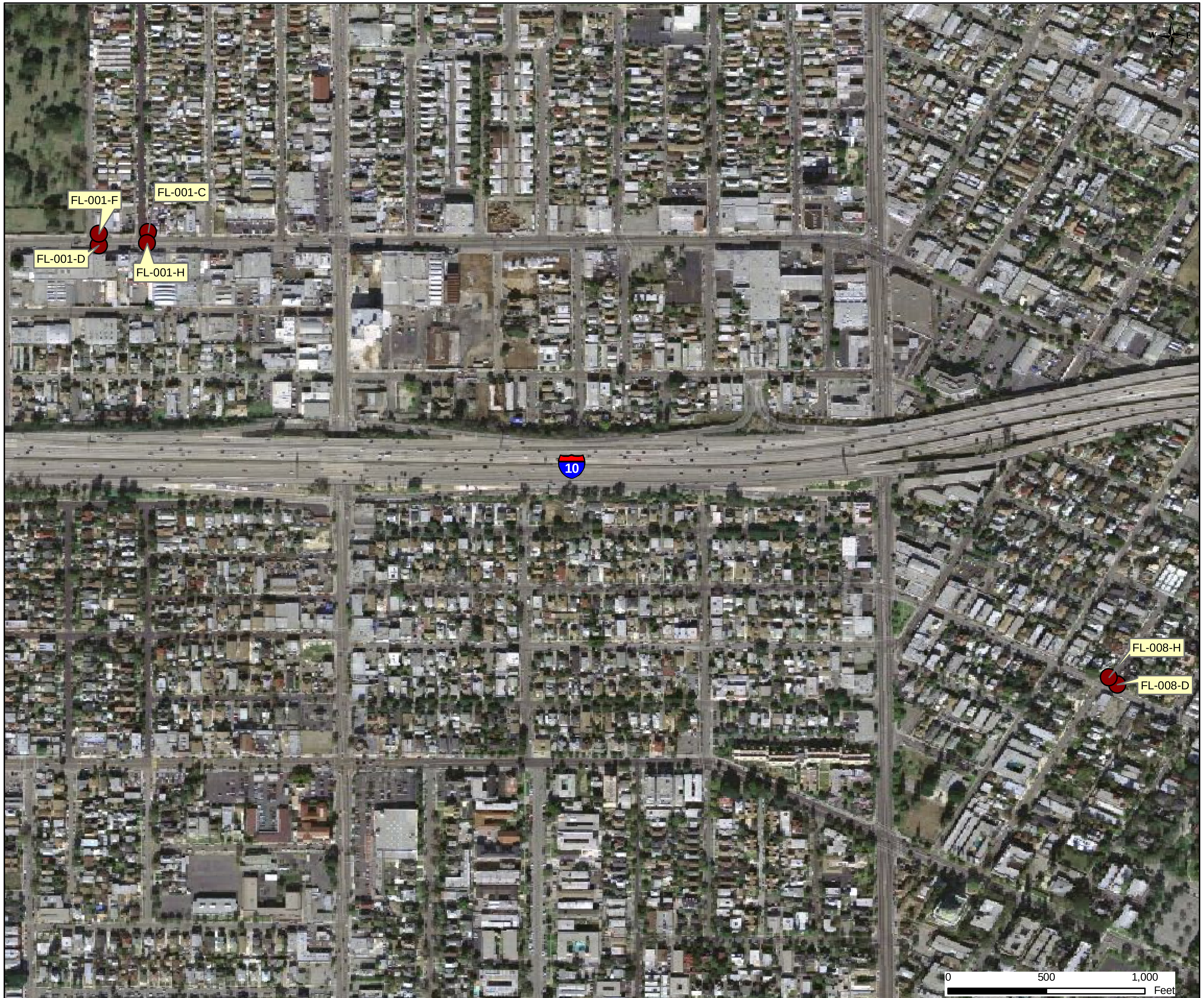
- Limited Access Higway
- Highway
- Ramps
- Local Roads
- Field-to-Laboratory Sites
- City of Los Angeles Boundary

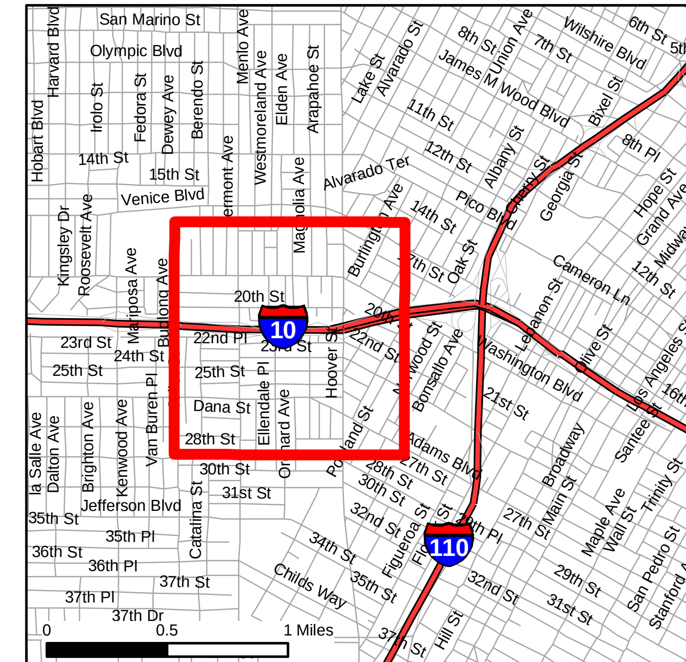
Figure A2

Field-to-Laboratory Catch Basin Insert Sites

May 2005

GeoSyntec Consultants





Legend

- Field-to-Laboratory Sites
- Local Roads
- Limited Access Higway
- Highway
- Ramps

Figure A3

Aerial Photo of West Field-to-Laboratory Catch Basin Insert Sites

May 2005

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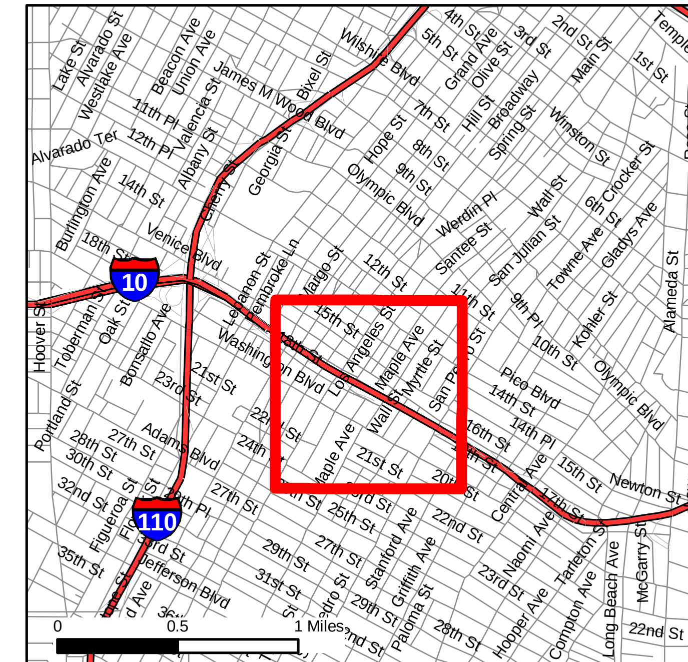

Legend

- Field-to-Laboratory Sites
- Local Roads
- Limited Access Higway
- Highway
- Ramps

Figure A4

Aerial View of
East Field-to-Laboratory
Catch Basin Insert Sites

May 2005

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APPENDIX B - FIELD INSPECTION PHOTOS AND NOTES

Area 1 - Site A

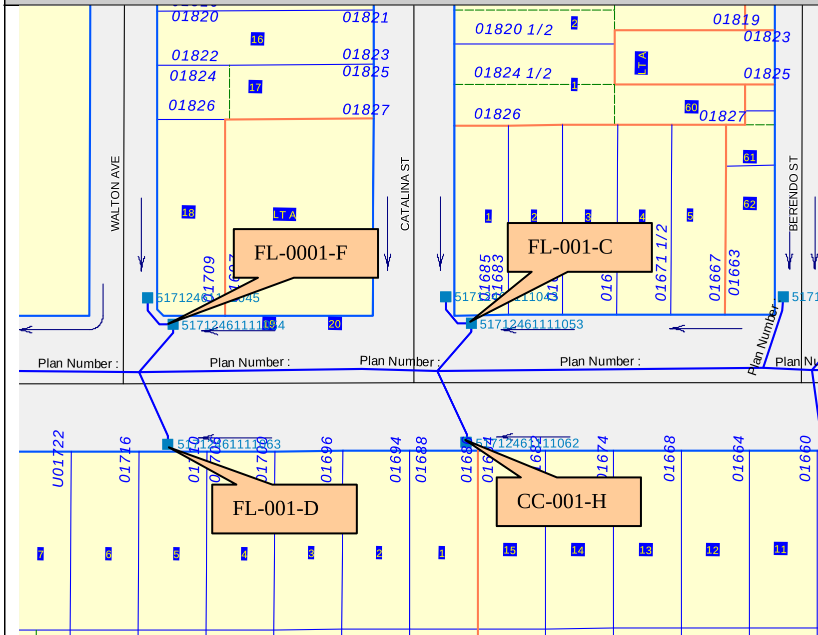
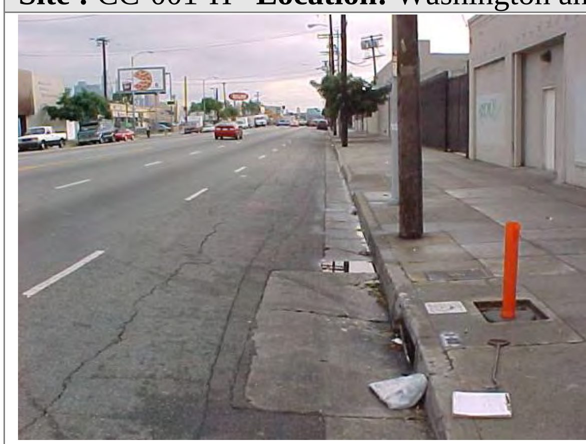


Photo looking east from FL-001-D

Intersection	Washington Blvd. & Walton Ave.
No. of Installations	4

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
FL-001-D	DrainPac	380519	3767123	3.5	3.2	3
FL-001-F	Flogard+Plus	380466	3767357	3.5	3.2	3
FL-001-C	Curb Inlet Basket	380532	3767363	3.5	3.2	3.5
CC-001-H	Hydro-Kleen	380530	3767336	3.5	3.2	3.1

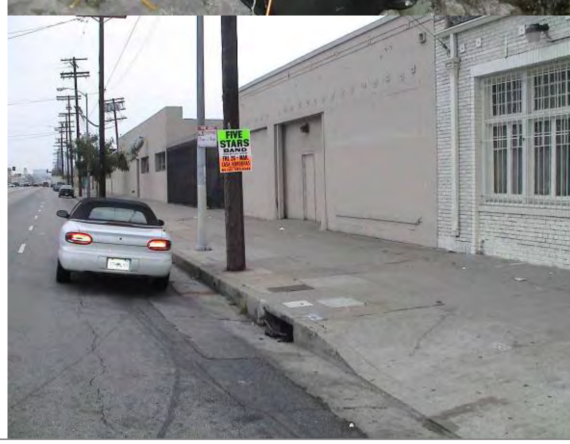
Site : CC-001-H **Location:** Washington and Walton (Area 1 - Site A) | HydroKleen



Date inspected:
12/11/03

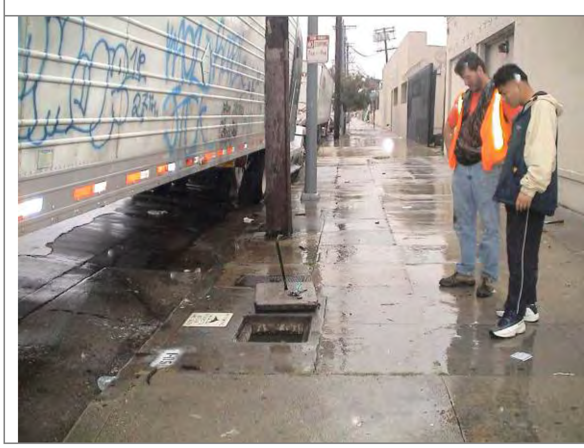
Comments:
Initial site visit. Notice the missing cover and damaged inlet.

Site : CC-001-H **Location:** Washington and Walton (Area 1 - Site A) | HydroKleen



Date inspected:
2/27/04

Comments: After a few storm events this device appears to be in good working order. Notice the missing concrete cover has been replaced.

Site : CC-001-H **Location:** Washington and Walton (Area 1 - Site A)		HydroKleen
		**Date inspected:** 3/23/04 **Comments:** This site had a significant amount of trash inside the catch basin prior to installation. Now the insert is capturing nearly all of the trash. This was previously a field-to-laboratory site that was switched due to installation timing conflicts.
 	 	**Date inspected:** 10/22/04 **Comments:** Significant oily sediment and debris present at the curb; evidence of blockage.
		**Date inspected:** 03/22/05 **Comments:** It was raining during this visit to retrieve this insert. After this visit, this insert was taken to the laboratory for its final tests.

Site : CC-001-H **Location:** Washington and Walton (Area 1 - Site A)	HydroKleen
	

Site : FL-001-D **Location:** Washington and Walton (Area 1 - Site A)	
	**Date inspected:** 2/4/04 **Comments:** This is the first visit after installation and one storm event. Notice water flowing into catch basin appears to be coming from a roof drain. The bottom of this catch basin shows significant oil and grease on the ponded water surface The insert was removed from the catch basin and subsequently transported to the UCLA laboratory for testing during this site visit.

Site : FL-001-D **Location:** Washington and Walton (Area 1 - Site A)

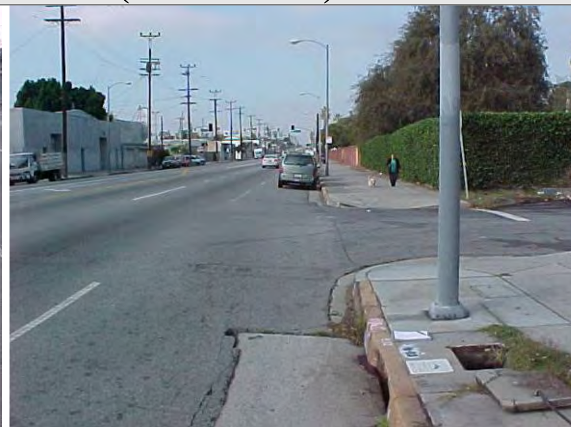
Date inspected: 2/27/04

Comments: Note this is not one of the inspections sites. These photos were taken just downstream (west) of the FL-001-D catch basin site. Notice the excessive amount of trash, including used motor oil and oil-soaked debris. Also note this basin had been cleaned by LADPW maintenance personnel only 1-2 months prior to this photo as indicated by the painted month and year.

Date inspected: 03/22/05

Comments: After this visit, this insert was taken to the laboratory for its final tests.

Site : FL-001-F **Location:** Washington and Walton (Area 1 - Site A)


Date inspected:
12/11/03

Comments: Initial site visit. Top left photo is looking upstream; top right is downstream. The catch basin was relatively clean with minor dry weather flows. Note that this catch basin is inline with the storm drain system.



Date inspected:
2/4/04

Comments: This was the first site visit after one storm event. This insert was removed from the site and subsequently transported to the UCLA laboratory for testing.

Site : FL-001-F **Location:** Washington and Walton (Area 1 - Site A)




Date inspected:

Comments: This insert showed significant signs of sediment caking. The absorbent was hanging outside the insert. After this visit, this insert was taken to the laboratory for its final tests.


Date inspected: 10/21/04

Comments: During this visit the insert was cleaned and the media was replaced.

Site : FL-001-C **Location:** Washington and Walton (Area 1 - Site A)


Date inspected: 12/11/03

Comments: Initial site visit. Top left photo is looking upstream; top right is downstream. The bottom right photo shows resurfacing activities on Catalina Ave. Note that this catch basin is inline with the storm drain system.

Site : FL-001-C **Location:** Washington and Walton (Area 1 - Site A)

Date inspected:
2/4/04

Comments: This is the first visit after installation and one storm event. An oil pan with automotive fluid was found at the inlet of this catch basin during this visit. No signs of oil inside the insert, but plenty of coarse sediment and some vegetative debris. The insert was removed from the catch basin and subsequently transported to the UCLA laboratory for testing during this site visit.

Date inspected:
03/22/05

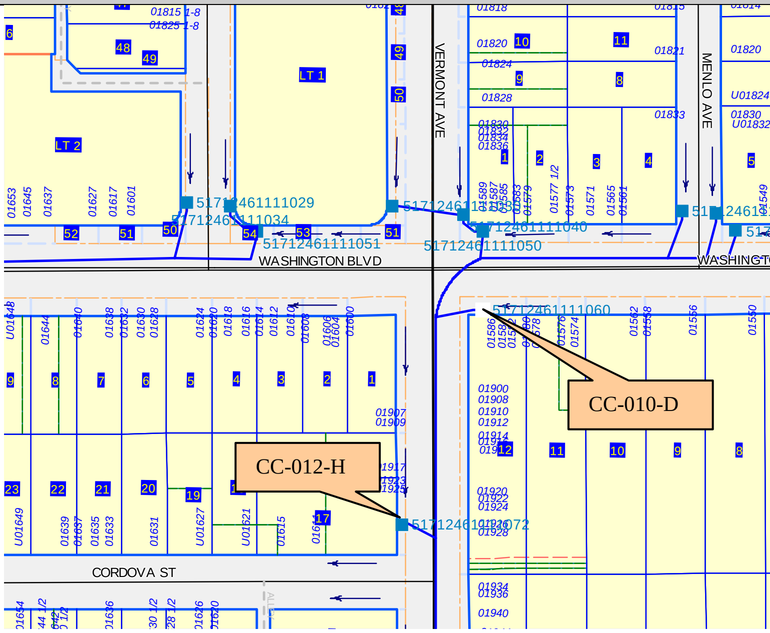
Comments: During this visit, the insert showed significant signs of sediment accumulation and oily sediment. It also appeared to have recently bypassed. After this visit, this insert was taken to the laboratory for its final tests.

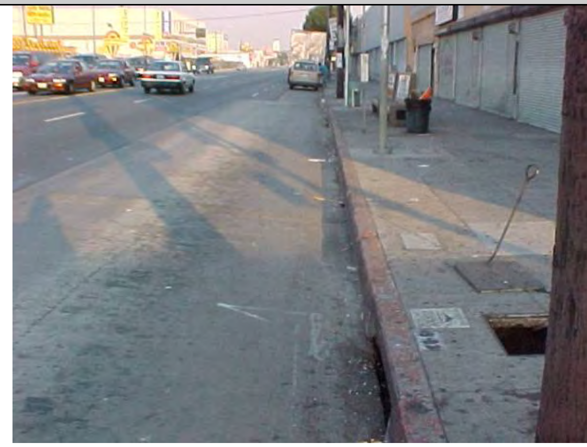
Site : FL-001-C **Location:** Washington and Walton (Area 1 - Site A)

Date inspected:
10/21/04

Comments: These photos were taken immediately after it was installed in preparation for the wet season.

Area 1 - Site B



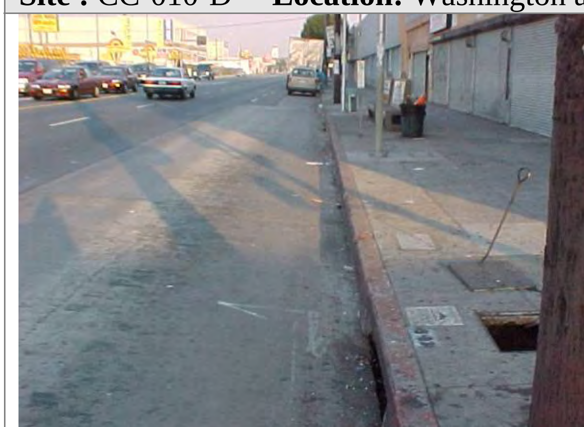


Looking upstream (east) of CC-010-D

Intersection	Washington Blvd. & Vermont Ave. Vermont & Cordova
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-010-D	DrainPac	380866	3767153	3.5	3.2	3.2
CC-012-H	Hydro-Kleen	380849	3767053	3	3.2	5.7

Site : CC-010-D **Location:** Washington and Vermont Ave, SW (Area 1 - Site B) | DrainPac



Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream into the intersection. As shown in the figures, obviously this site is located in a very busy intersection with high trash loading.

Site : CC-010-D **Location:** Washington and Vermont Ave, SW (Area 1 - Site B) | DrainPac


Date inspected:
2/4/04

Comments: This was the first site visit after installation. It was raining and appeared to be at full hydraulic capacity but still processing the flow.


Date inspected:
2/27/04

Comments: Trash at lip of insert indicates bypass may have previously occurred. Standing water in insert slowly draining indicates the filter media is beginning to clog.




Date inspected:
3/23/04

Comments: This site was completely overwhelmed with trash during this visit. Subsequent events are likely to dislodge larger objects and floatables.

Site : CC-010-D **Location:** Washington and Vermont Ave, SW (Area 1 - Site B)	DrainPac
	**Date inspected:** 6/30/04 **Comments:** The insert is now completely buried by trash. This device will be retired during the next site visit.
	**Date inspected:** 10/21/04 **Comments:** Some of the trash that was in the insert has been removed and some bypass, but still lots of trash and debris. The insert was retired during this visit.

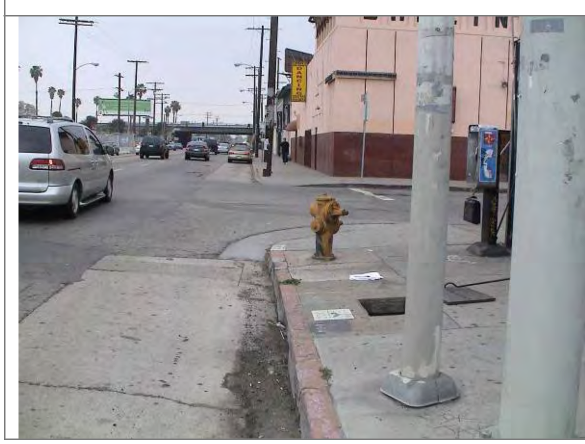
Site : CC-012-H **Location:** Vermont, N of Cordova, West side (Area 1 - Site B) | Hydro Kleen

Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. This deep catch basin had a significant amount of trash.

Date inspected:
2/27/04

Comments: This insert was installed in the second week of February. After about a week and a half, there is already significant trash and debris with signs of bypass.



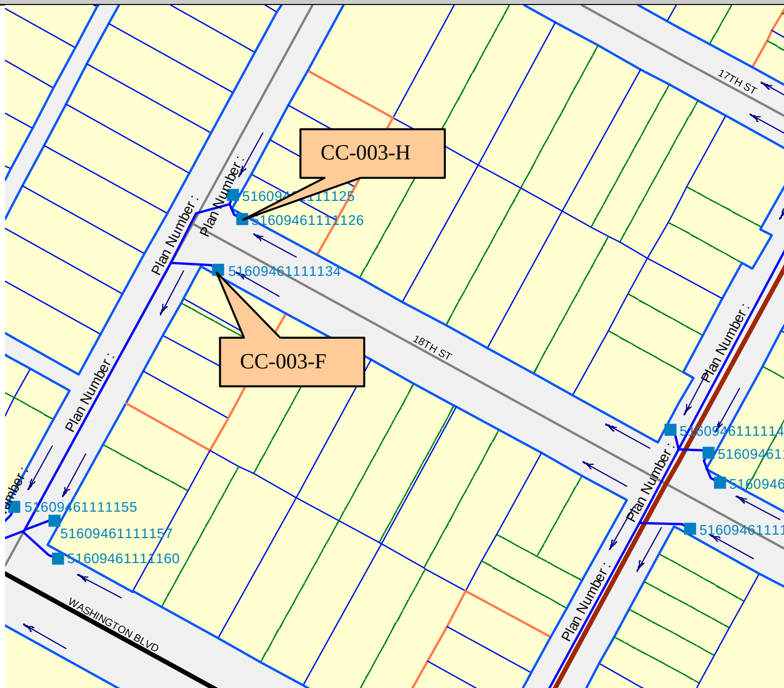
Date inspected:
3/23/04

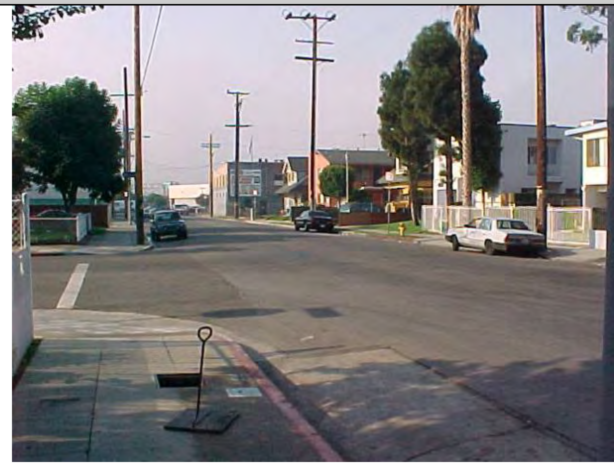
Comments: After another month in the field this insert has nearly reached its trash loading capacity.

<table>
<tr><td>Site : CC-012-H Location: Vermont, N of Cordova, West side (Area 1 - Site B)</td><td>Hydro Kleen</td></tr>
<tr><td> </td><td></td></tr>
<tr><td> </td><td>Date inspected:
6/30/04

Comments: The insert is now overflowing with trash and should be retired during the next site visit.</td></tr>
</table>

Area 1 - Site C





Looking toward intersection from Burlington Ave. (south)

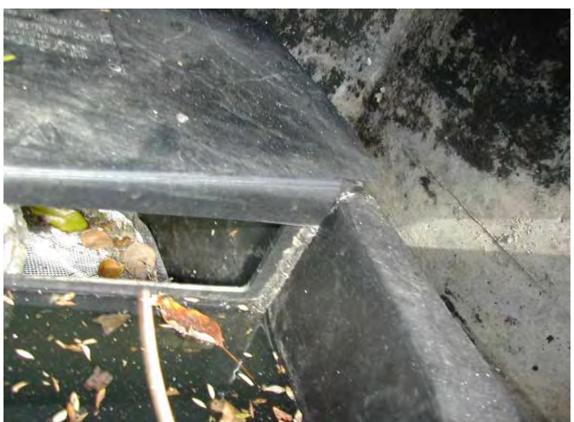
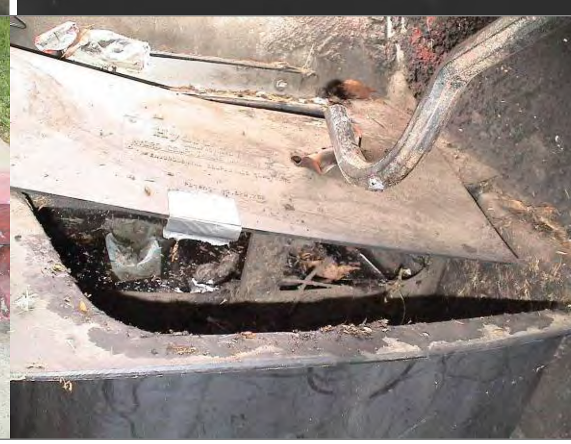
Intersection	18th St. & Burlington Ave.
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-003-H	Hydro-Kleen	381658	3767369	3.5	3.2	2.8
CC-003-F	Flogard+Plus	381649	3767368	3.5	3.2	3

Site : CC-003-H **Location:** 18th and Burlington Ave, S corner (Area 1 - Site C) HydroKleen

Date inspected: 12/11/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream to the intersection. All residential area. Little trash and debris in catch basin.

Site : CC-003-H **Location:** 18th and Burlington Ave, S corner (Area 1 - Site C)	HydroKleen
 	
   	**Date inspected:** 2/27/04 **Comments:** As intended by the design, notice the standing water in the sedimentation chamber and the captured trash and debris in the filtration chamber.
 	**Date inspected:** 3/23/04 **Comments:** There was less water during this visit, but there is evidence of recent high flow bypass with the sediment residue on the lid and lip of the insert. The media appears to be beginning to clog.

Site : CC-003-H **Location:** 18th and Burlington Ave, S corner (Area 1 - Site C) | HydroKleen

Date inspected:
6/30/04

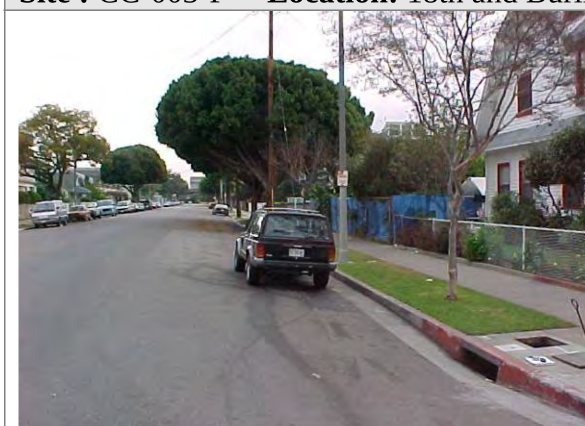
Comments: The insert is completely full and the media is likely clogged. The insert will be retired during the next site visit.

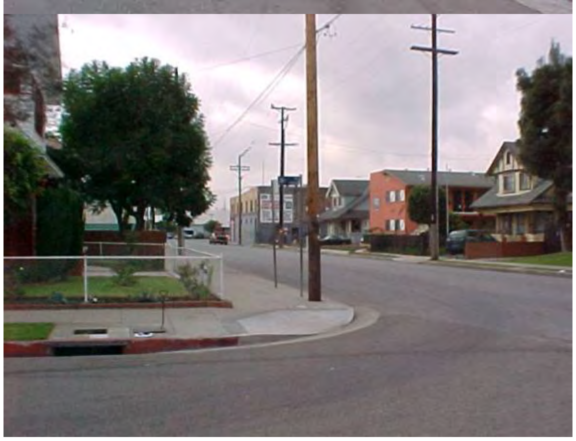
Date inspected:
10/21/04

Comments: As before, this insert was filled with material during this visit. The trash was removed for laboratory analysis. This site was converted to an FL site for the next wet season.

Site : CC-003-H **Location:** 18th and Burlington Ave, S corner (Area 1 - Site C) | HydroKleen

Site : CC-003-F **Location:** 18th and Burlington Ave, N corner (Area 1 - Site C) | Flo-Gard Plus

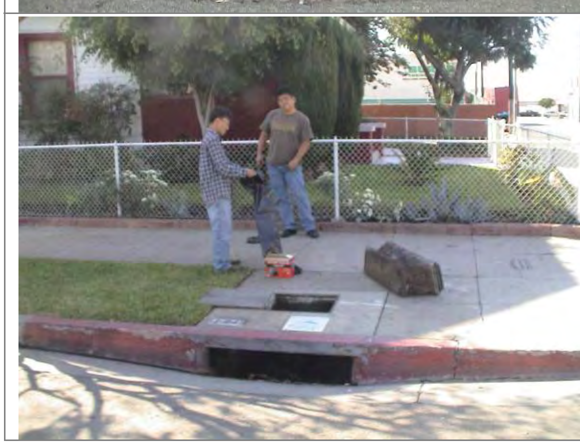


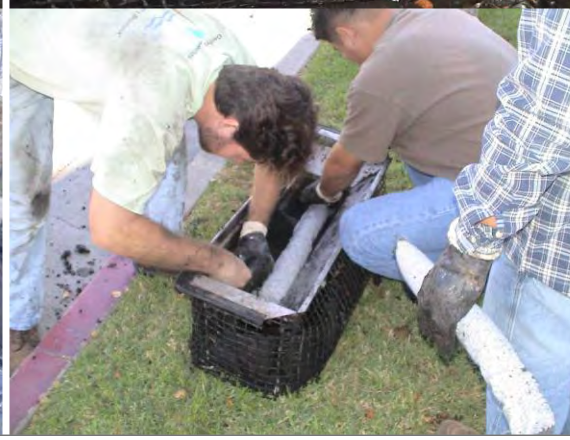


Date inspected:
12/11/03

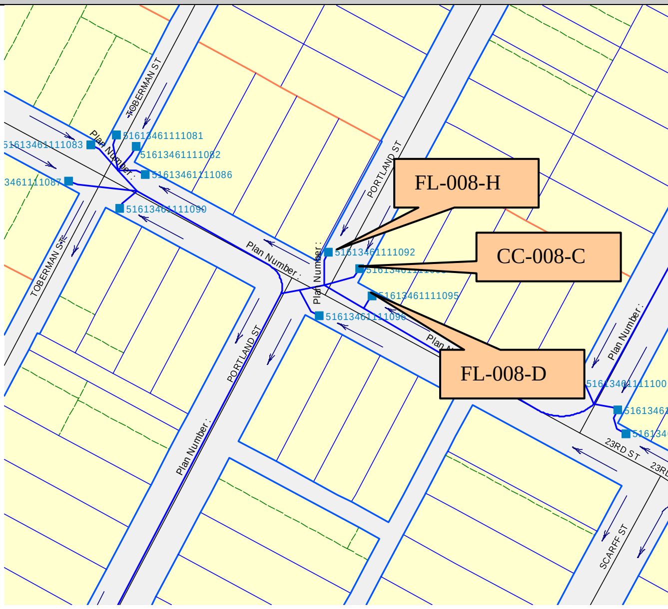
Comments: This was the initial site inspection prior to insert installation. Notice the relatively small amount of trash and debris inside the catch basin.

Site : CC-003-F **Location:** 18th and Burlington Ave, N corner (Area 1 - Site C)	Flo-Gard Plus
  	**Date inspected:** 2/4/04 **Comments:** These pictures were taken during an actual storm event. Notice bypass flows along the lip and down the side of the insert. Also notice the absorbent boom floating at the surface of the insert; which is the intention of the design.
   	**Date inspected:** 2/27/04 **Comments:** Notice the significantly greater amount of trash and debris since the last inspection.

Site : CC-003-F **Location:** 18th and Burlington Ave, N corner (Area 1 - Site C)		Flo-Gard Plus
		**Date inspected:** 3/23/04 **Comments:** The insert is now shown nearly at full capacity.
		
		**Date inspected:** 6/30/04 **Comments:** The insert cannot hold anymore trash. Any further loadings will bypass.
		**Date inspected:** 10/22/04 **Comments:** The material in this insert was removed during this visit. New media was inserted and it was converted to an FL site.

Site : CC-003-F **Location:** 18th and Burlington Ave, N corner (Area 1 - Site C)	Flo-Gard Plus
   	

Area 1 - Site D

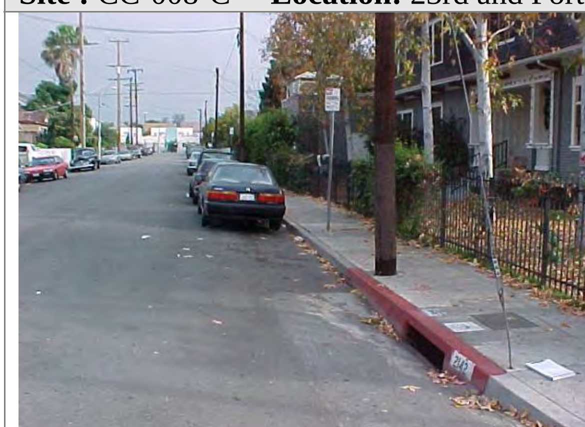


Looking upstream (southeast) of FL-008-D

Intersection	23rd St & Portland St
No. of Installations	3

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-008-C	Curb Inlet Basket	381765	3766656	3.5	3.2	2.7
FL-008-D	DrainPac	381851	3766453	3.2	3.5	3.0
FL-008-H	Hydro-Kleen	381758	3766660	3.5	3.2	2.7

Site : CC-008-C **Location:** 23rd and Portland, East Side (Area 1 - Site D) | Curb Inlet Basket



Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. Nearby deciduous trees appear to deliver excessive leafy debris to this catch basin.

Site : CC-008-C **Location:** 23rd and Portland, East Side (Area 1 - Site D)	Curb Inlet Basket
 	**Date inspected:** 2/4/04 **Comments:** First site visit after installation and one storm event. Some trash and debris accumulation, but still plenty of capacity.
   	**Date inspected:** 3/23/04 **Comments**: Compared to the last inspection, the insert has accumulated significant trash and debris. It now appears to be near capacity and probably should be retired.
 	**Date inspected:** 6/30/04 **Comments:** As before, this insert is full and is beginning to overflow with trash.

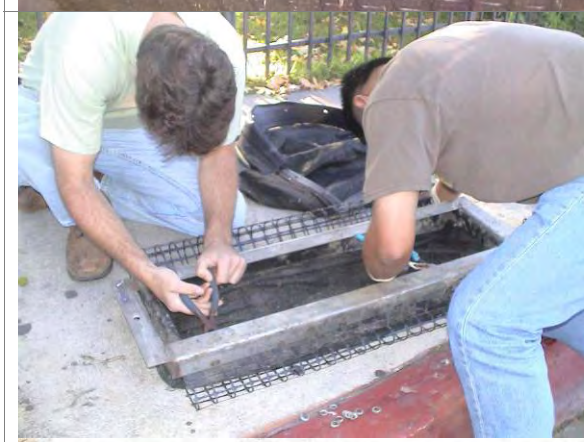
Site : CC-008-C **Location:** 23rd and Portland, East Side (Area 1 - Site D)	Curb Inlet Basket
 	
 	**Date inspected:** 10/21/04 **Comments:** This insert was retired during this visit.

Site : FL-008-D **Location:** 23rd and Portland, NE on 23rd (Area 1 - Site D)	DrainPac
  	**Date inspected:** 12/10/03 **Comments:** Initial site visit. Top left photo is looking upstream; top right is looking downstream.

Site : FL-008-D **Location:** 23rd and Portland, NE on 23rd (Area 1 - Site D) | DrainPac

Date inspected:
2/4/04

Comments: This was the first inspection of this site. Notice the device has accumulated significant trash for only one storm event. This was originally a CC site, but was changed to an FL site due to installation timing conflicts.



Date inspected:
10/22/04

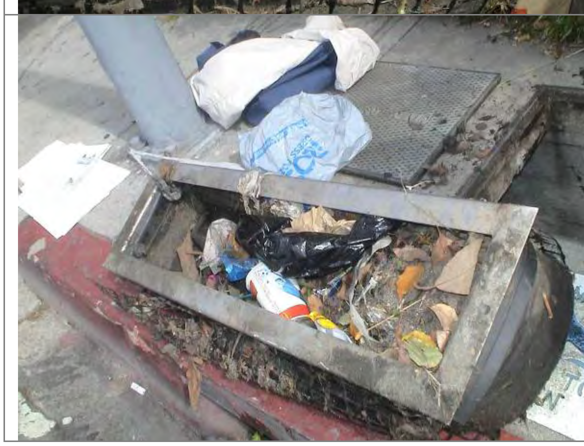
Comments: This FL insert was installed during this visit in preparation for the wet season.

Site : FL-008-D **Location:** 23rd and Portland, NE on 23rd (Area 1 - Site D) | DrainPac










Date inspected:
03/22/05

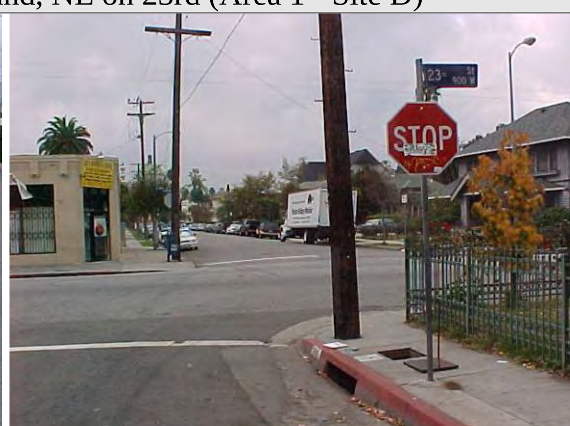
Comments: After this visit, this insert was taken to the laboratory for its final tests.

Site : FL-008-D **Location:** 23rd and Portland, NE on 23rd (Area 1 - Site D)

DrainPac

Site : FL-008-H **Location:** 23rd and Portland, NE on 23rd (Area 1 - Site D)

Hydro Kleen



Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. There is evidence of significant trash loading to this catch basin as shown in the photo.

Site : FL-008-H **Location:** 23rd and Portland, NE on 23rd (Area 1 - Site D)	Hydro Kleen




Date inspected:
2/4/04

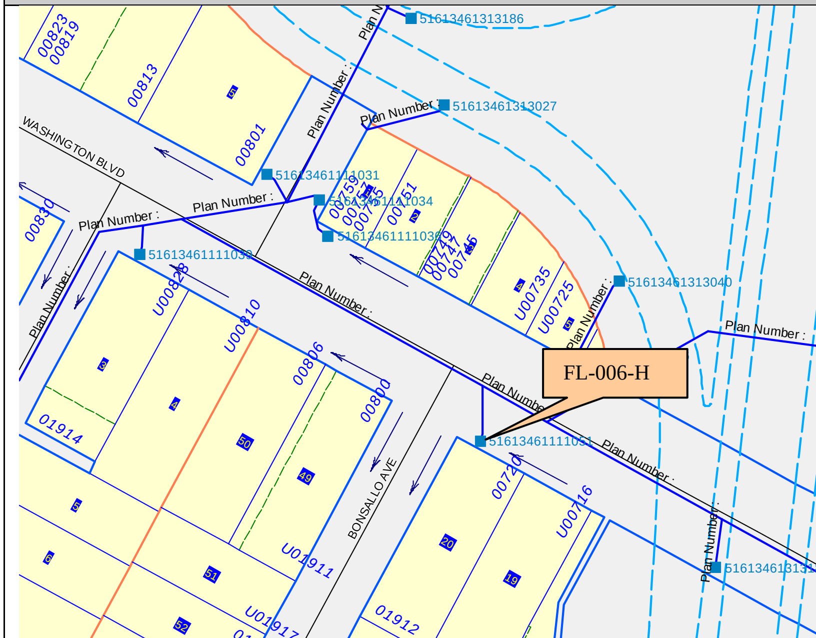
Comments: Notice the standing water. This device is actually designed to have standing water in the first chamber to allow for settling. This was originally a CC site, but was changed to an FL site due to installation timing conflicts. It was removed and subsequently transported to the UCLA laboratory during this visit.



Date inspected:
03/22/05

Comments: After a few months in the field this insert did not show significant accumulation. After this visit, this insert was taken to the laboratory for its final tests.

Area 1 - Site E

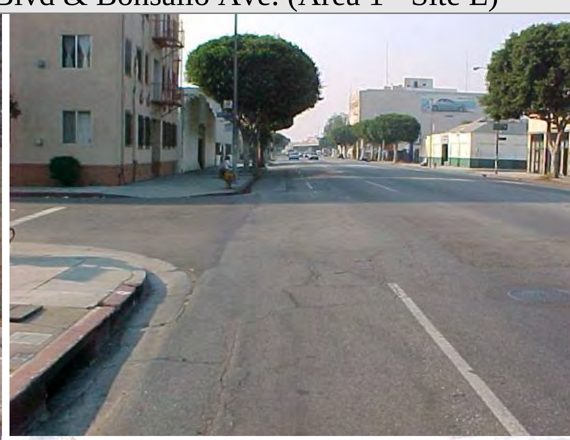


Looking upstream (southeast)

Intersection	Washington Blvd & Bonsallo Ave.
No. of Installations	1

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
FL-006-H	Hydro-Kleen	382356	3766644	3.5	3.2	3.0

Site : FL-006-H **Location:** Washington Blvd & Bonsallo Ave. (Area 1 - Site E) | Hydro Kleen



Date inspected:
10/24/03

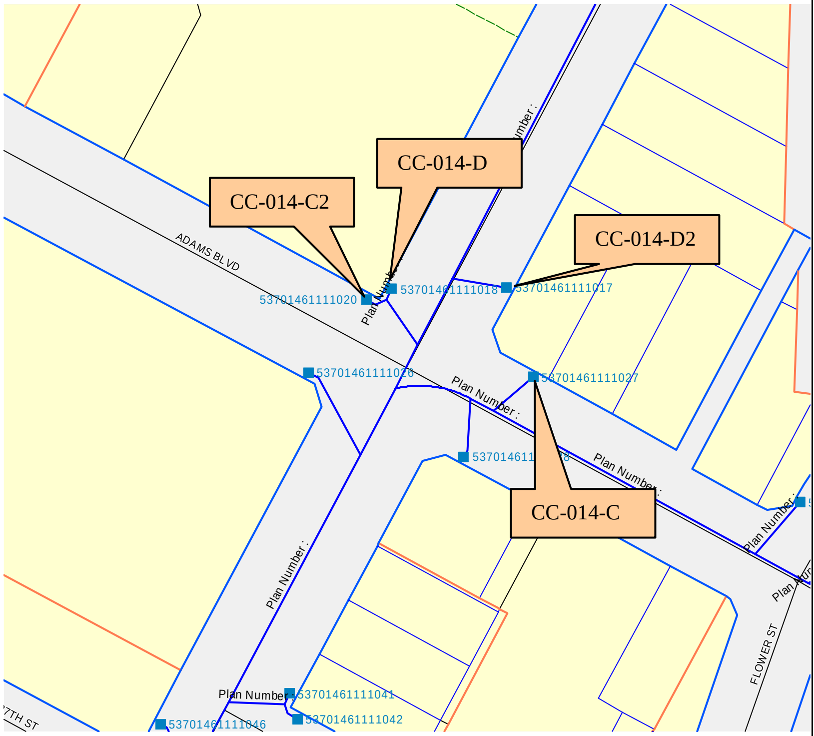
Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. Bottom left picture is looking down Bonsallo Ave. Notice the large amount of trash and debris within the catch basin.

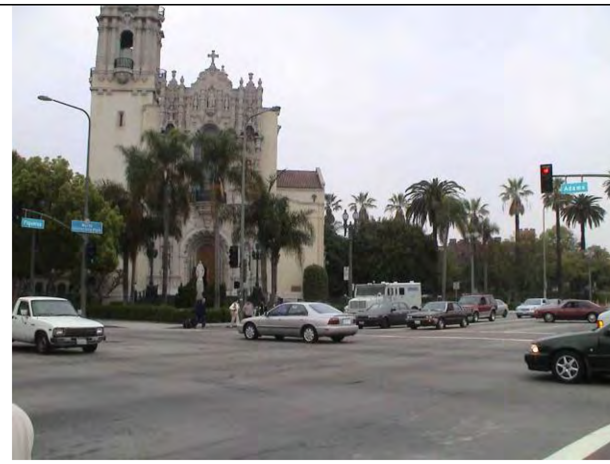
Site : FL-006-H **Location:** Washington Blvd & Bonsallo Ave. (Area 1 - Site E)

Hydro Kleen

Date inspected:
2/4/04

Comments: This installation utilizes a weir to route flows into the insert because the inlet width is wider than the insert width. Majority of the flows at this site were found to bypass the insert during this storm event. The insert was removed and transported to the laboratory for testing. Note that the lip of the insert had to be trimmed and notched to fit in this catch basin. It was sealed using black caulking. Thus, upon reinstallation the insert should again be caulked to minimize the chance for bypass.



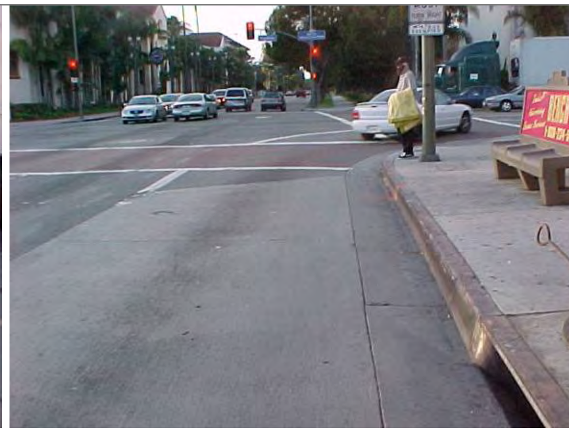
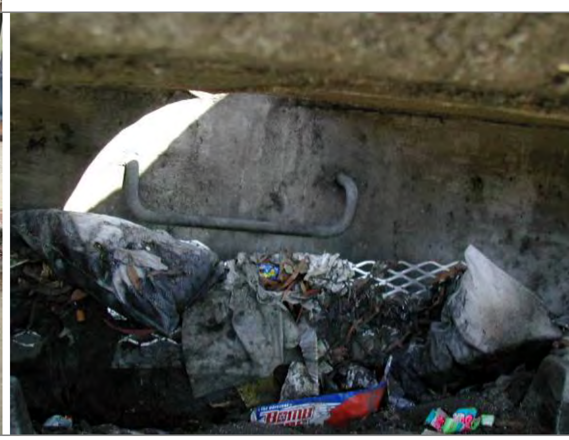


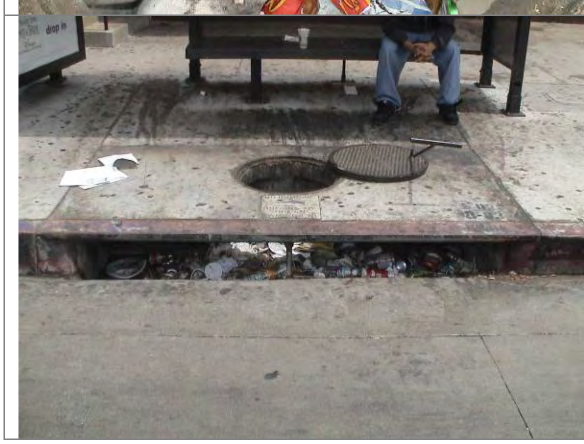
Looking across the intersection from the north east corner.

Looking across intersection from southeast corner.

Intersection	Figueroa St. & Adams Blvd.
No. of Installations	4

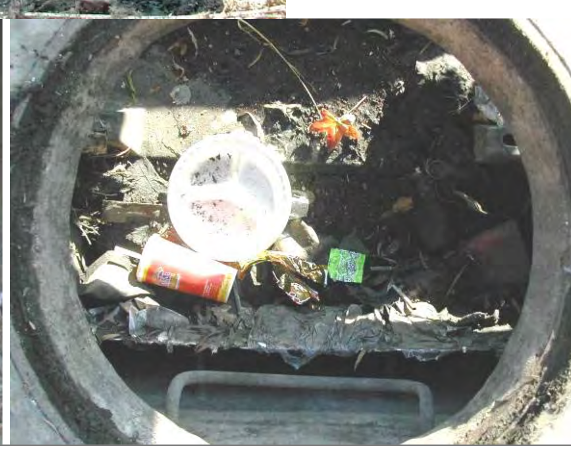
Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-014-C2	Curb Inlet Basket	382170	3766022	3.5	3.2	3.3
CC-014-C	Curb Inlet Basket	382226	3766007	7	3.2	5.9
CC-014-D	DrainPac	382274	3765843	7	3.2	4.6
CC-014-D2	DrainPac	38220	3766028	7	3.1	4

Site : CC-014-C **Location:** Adams and Figueroa St (Area 1 - Site F)		Curb-Inlet Basket
		**Date inspected:** 12/10/03 **Comments:** Initial site visit. Top left photo is looking upstream; top right photo is looking downstream. This catch basin is at a bus stop that gets a lot of vehicular and pedestrian traffic.
 		**Date inspected:** 2/4/04 **Comments:** First site visit since installation indicates significant trash loadings at this site.
		**Date inspected:** 2/27/04 **Comments:** Notice this site exhibits very high sediment loadings and evidence of oil and grease.

Site : CC-014-C **Location:** Adams and Figueroa St (Area 1 - Site F)		Curb-Inlet Basket
		
 		**Date inspected:** 3/23/04 **Comments:** After just two months, this insert is completely filled with mostly anthropogenic refuse and sediment.
		**Date inspected:** 6/30/04 **Comments:** Additional trash has accumulated in the insert and on the sedimentation shelf. This insert should be retired during the next site visit.

Site : CC-014-C **Location:** Adams and Figueroa St (Area 1 - Site F)

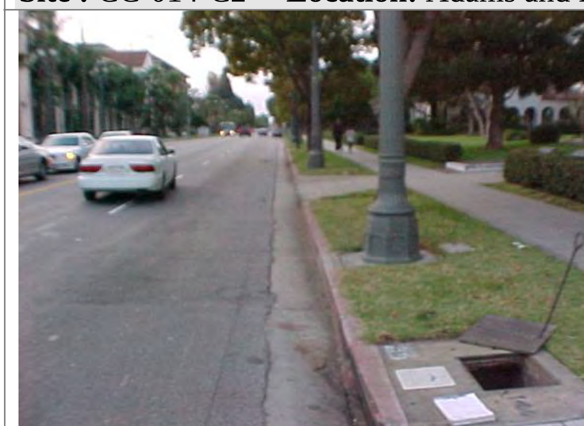
Curb-Inlet Basket

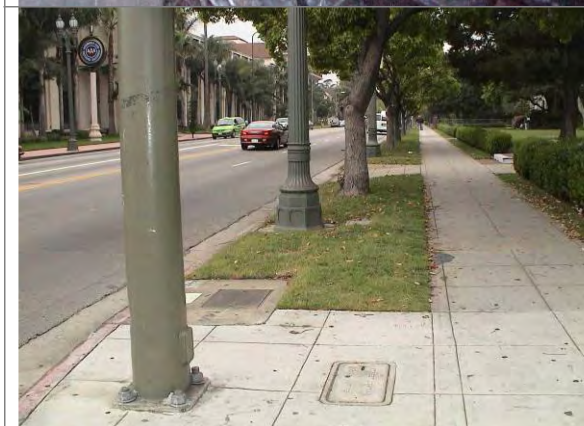


Date inspected: 10/21/04

Comments: The insert at this busy intersection has received lots of trash and sediment. The media shown in the lip of the insert appears deflated indicating the absorbent material has been lost during operation. Significant sediment build-up on weir indicates coarse sediment removal is occurring.

Site : CC-014-C **Location:** Adams and Figueroa St (Area 1 - Site F)		Curb-Inlet Basket
		

Site : CC-014-C2 **Location:** Adams and Figueroa St (Area 1 - Site F)		Curb Inlet Basket
		**Date inspected:** 12/10/03 **Comments:** Initial site visit. Top left photo is looking upstream; top right photo is looking downstream toward the intersection. Significant trash and debris loads present at site. Notice the catch basin outlet appears to be nearly clogged.
		

Site : CC-014-C2 Location: Adams and Figueroa St (Area 1 - Site F)		Curb Inlet Basket
		
 	 	**Date inspected:** 2/4/04 **Comments:** First site visit since installation. As compared to CC-014-C across the street, this site contains more leaf litter and sediment than human-generated trash.
		**Date inspected:** 2/27/04 **Comments:** More trash and debris has accumulated since last visit and some has bypassed insert, but still appears to be slightly below capacity.

Site : CC-014-C2 **Location:** Adams and Figueroa St (Area 1 - Site F) | Curb Inlet Basket

Date inspected:
3/23/04

Comments: The insert is now at capacity and should be cleaned prior to the next wet season.

Date inspected:
6/30/04

Comments: As before, this insert is full and needs to be cleaned. The last cleaning of this catch basin appears to have been Sept. 2003. Notice the build-up of sediment and growth of weeds at the inlet of this catch basin.

Site : CC-014-C2 **Location:** Adams and Figueroa St (Area 1 - Site F) | Curb Inlet Basket

Date inspected:
10/22/04

Comments: This insert receives mostly sediment, leaves, and pine needles. The media appears to be "deflated" indicating the absorbent material was lost during operation. It was retired after this inspection.

Site : CC-014-D **Location:** Figueroa St and Adams (Area 1 - Site F) | DrainPac

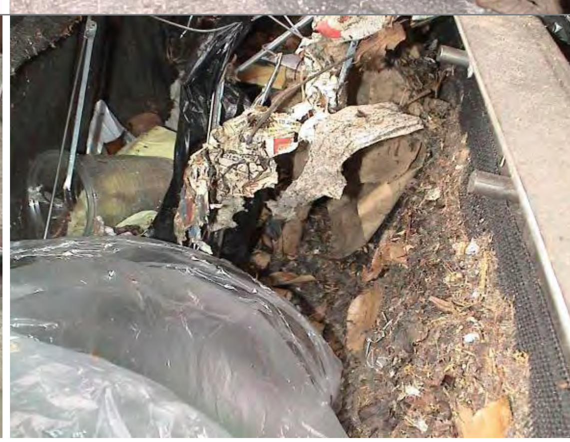
Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right photo is looking downstream toward the intersection. This site is located at a bus stop.

Site : CC-014-D **Location:** Figueroa St and Adams (Area 1 - Site F) | DrainPac

Date inspected:
2/4/04

Comments: This was the first site visit after installation. The photo on the top left is a "birds-eye" view of the insert. Notice there is still some water from the previous day's storm event. The photo on the top left shows the relatively clean catch basin bottom due to the high capture rate of the insert.



Date inspected:
3/23/04

Comments: Compared to the last inspection there is significantly more trash and debris, but the insert still has capacity and appears to be functioning properly. Only a small amount of bypass is indicated by the limited amount of debris at the bottom of the catch basin.

Site : CC-014-D **Location:** Figueroa St and Adams (Area 1 - Site F) | DrainPac

Date inspected:
6/30/04

Comments: Since the last visit a lot more trash has accumulated in the insert and is now nearly at capacity.

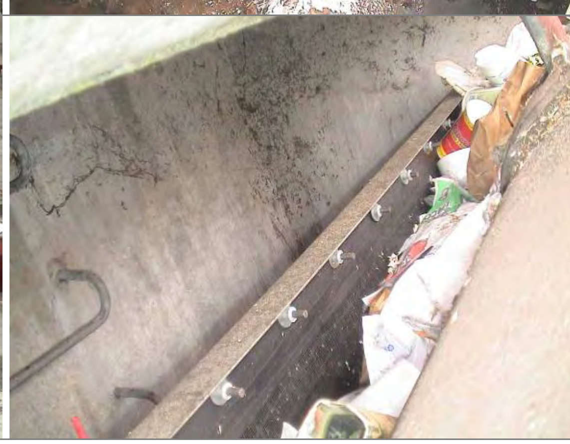
Site : CC-014-D **Location:** Figueroa St and Adams (Area 1 - Site F)	DrainPac
	

Site : CC-014-D2 **Location:** Figueroa St and Adams (Area 1 - Site F)	DrainPac
   	**Date inspected:** 12/10/03 **Comments:** Initial site visit. Top left photo is looking upstream; top right photo is looking downstream toward the intersection. This site is located at a bus stop.
 	**Date inspected:** 2/4/04 **Comments:** This is the first inspection after installation and it appears to be functioning well.

Site : CC-014-D2 **Location:** Figueroa St and Adams (Area 1 - Site F) | DrainPac

Date inspected:
3/23/04

Comments: After nearly two months, this insert is still functioning well and has remaining capacity.

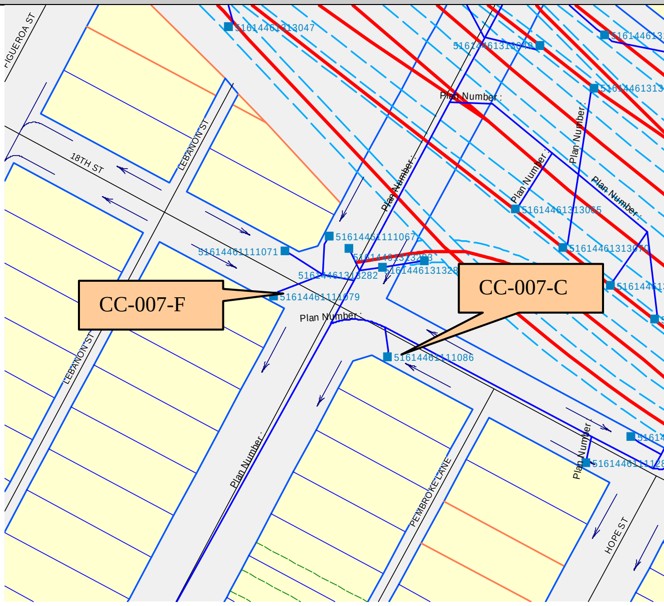


Date inspected:
6/30/04

Comments: More trash and debris have accumulated since the last visit. However, it appears to still have some remaining capacity.

Site : CC-014-D2 **Location:** Figueroa St and Adams (Area 1 - Site F)	DrainPac
 	

Area 1 - Site G

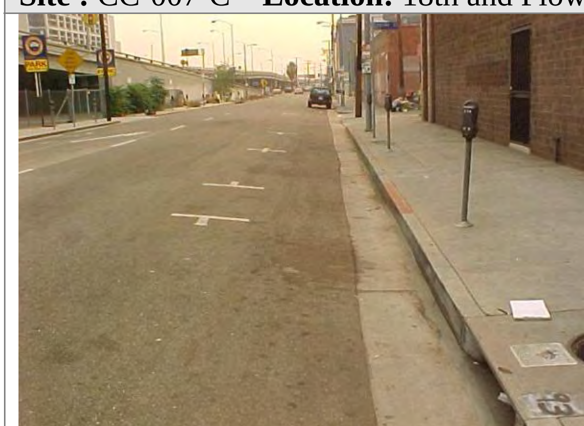


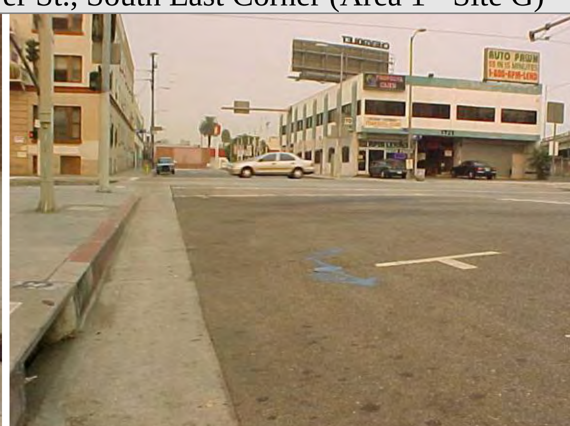
Northwest corner of 18th and Flower St.

Intersection	18th St. & Flower St.
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-007-C	Curb Inlet Basket	382871	3766585	3.5	3.0	6.5
CC-007-F	Flogard+Plus	382771	3766801	3.5	3.2	3.5

Site : CC-007-C **Location:** 18th and Flower St., South East Corner (Area 1 - Site G) — Curb Inlet Basket





Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream.

Site : CC-007-C **Location:** 18th and Flower St., South East Corner (Area 1 - Site G)		Curb Inlet Basket
		
 		**Date inspected:** 2/4/04 **Comments:** This visit occurred about a week after installation. Notice the oil collecting on the surface of the absorbent boom.
		**Date inspected:** 2/27/04 **Comments:** As compared to the last inspection, this insert has received a significant amount of oil; probably from a direct illicit discharge of used motor oil. Notice the puddle of oil on the lip of this insert.

Site : CC-007-C **Location:** 18th and Flower St., South East Corner (Area 1 - Site G) | Curb Inlet Basket

Date inspected:
3/23/04

Comments: This insert is no longer visible due to the excessive trash and debris.

Date inspected:
6/30/04

Comments: As before, this insert is completely overwhelmed with trash and needs to be cleaned. It should be retired during the next site visit.

Site : CC-007-C **Location:** 18th and Flower St., South East Corner (Area 1 - Site G)		Curb Inlet Basket
		
		
		
		**Date inspected:** 10/21/04 **Comments:** The presence of standing water indicates that this insert is clogged. It was retired after this visit.

Site : CC-007-C Location: 18th and Flower St., South East Corner (Area 1 - Site G)	Curb Inlet Basket

Site : CC-007-F Location: 18th St. & Flower St, Southwest corner (Area 1 - Site G)	FloGard

Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. This is a shallow catch basin with a relatively small amount of trash deposition.

Site : CC-007-F **Location:** 18th St. & Flower St, Southwest corner (Area 1 - Site G) | FloGard

Date inspected:
2/4/04

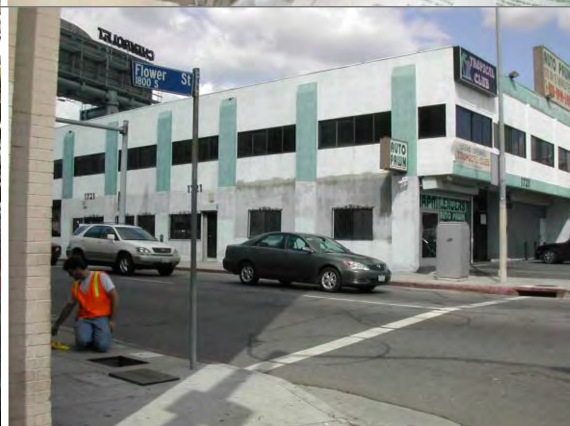
Comments: Standing water indicates the filter media may be beginning to clog. Notice the floating absorbent boom of amorphous alumina silicate in the picture on the left.

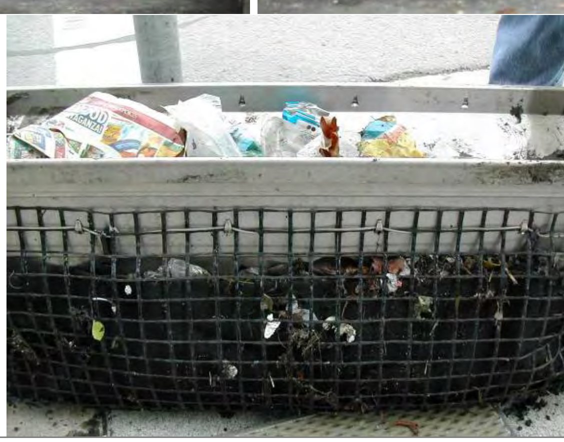
Date inspected:
2/27/04

Comments: Not much changed from last inspection except the standing water had drained and there was slightly more trash and debris.

Site : CC-007-F **Location:** 18th St. & Flower St, Southwest corner (Area 1 - Site G)	FloGard
   	**Date inspected:** 3/23/04 **Comments:** The insert appears to have reached its trash holding capacity and probably should be retired.
   	**Date inspected:** 6/30/04 **Comments:** As before, this insert appears to be at capacity and is currently overflowing with trash. Much of the trash appears to have been transported by wind rather than runoff.

Site : CC-007-F **Location:** 18th St. & Flower St, Southwest corner (Area 1 - Site G) | FloGard

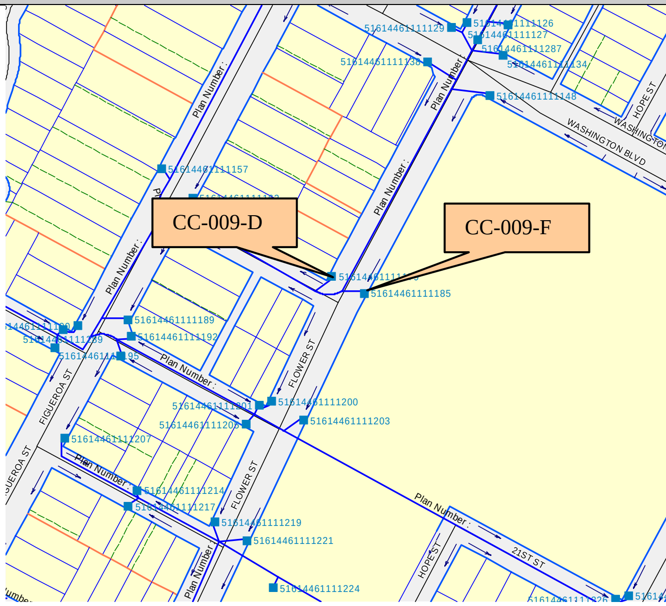




Date inspected:
10/21/04

Comments: Appears that significant trash has bypassed the insert. It was retired after this visit.

Area 1 - Site H



Looking upstream (~north) of CC-009F

Intersection	20th St & Flower St
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-009-D	DrainPac	382592	3766501	3.5	3.2	3.7
CC-009-F	Flogard+Plus	382699	3766287	3.2	3.5	5

Site : CC-009-D **Location:** 20th and Flower St., West Side (Area 1 - Site H) — DrainPac

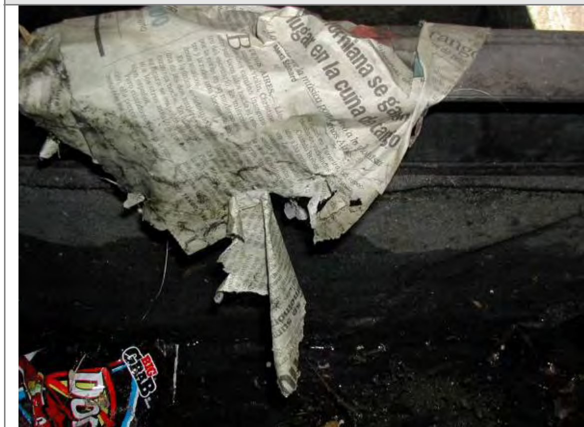
Date inspected: 12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream.

Site : CC-009-D **Location:** 20th and Flower St., West Side (Area 1 - Site H) | DrainPac

Date inspected:
2/4/04

Comments: Notice the insert is nearly at its flow capacity during this runoff event, but is still passing the flow.

Site : CC-009-D **Location:** 20th and Flower St., West Side (Area 1 - Site H)		DrainPac
		**Date inspected:** 2/27/04 **Comments:** Very little accumulation of trash since last site visit.
 	 	**Date inspected:** 3/23/04 **Comments:** There doesn't appear to be a lot of trash, but notice the build-up of fine sediment on the surface of the filter.
		**Date inspected:** 6/30/04 **Comments:** As compared to the last visit, a significant amount of trash has accumulated in the insert, but it still has remaining capacity. Some wind-blown trash appears to have bypassed the unit.

Site : CC-009-D **Location:** 20th and Flower St., West Side (Area 1 - Site H)	DrainPac





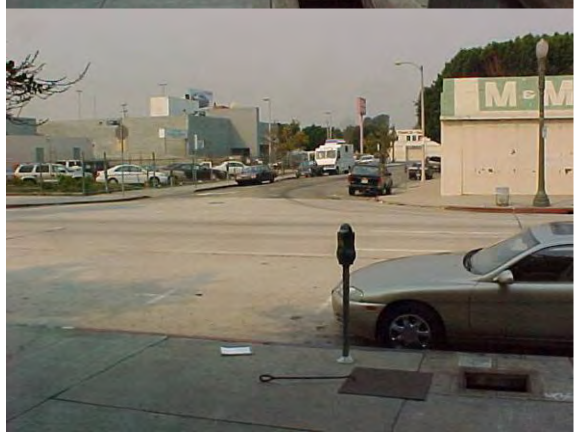
Date inspected:
10/21/04

Comments: Mostly sediment in this insert. Appears to have been cleaned since last visit.

Site : CC-009-F **Location:** 20th and Flower St., East Side (Area 1 - Site H)	Flo-Gard

Site : CC-009-F **Location:** 20th and Flower St., East Side (Area 1 - Site H) | Flo-Gard




Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream.


Date inspected:
2/4/04

Comments: These pictures were taken during an actual event. The effluent from the insert was relatively clean and the inlet bottom was also relatively clean

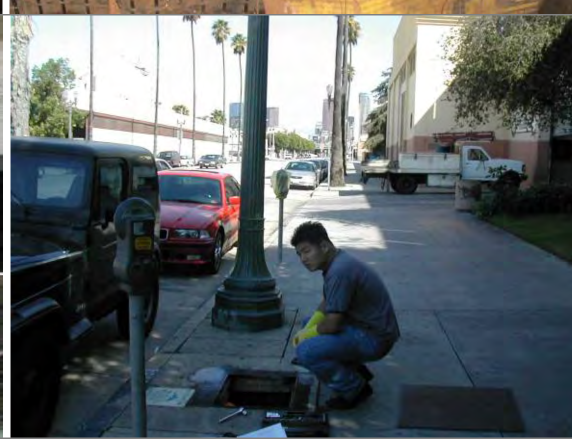
Site : CC-009-F **Location:** 20th and Flower St., East Side (Area 1 - Site H) | Flo-Gard

Date inspected:
2/27/04

Comments: Notice the absorbent boom has nearly floated out of the device.

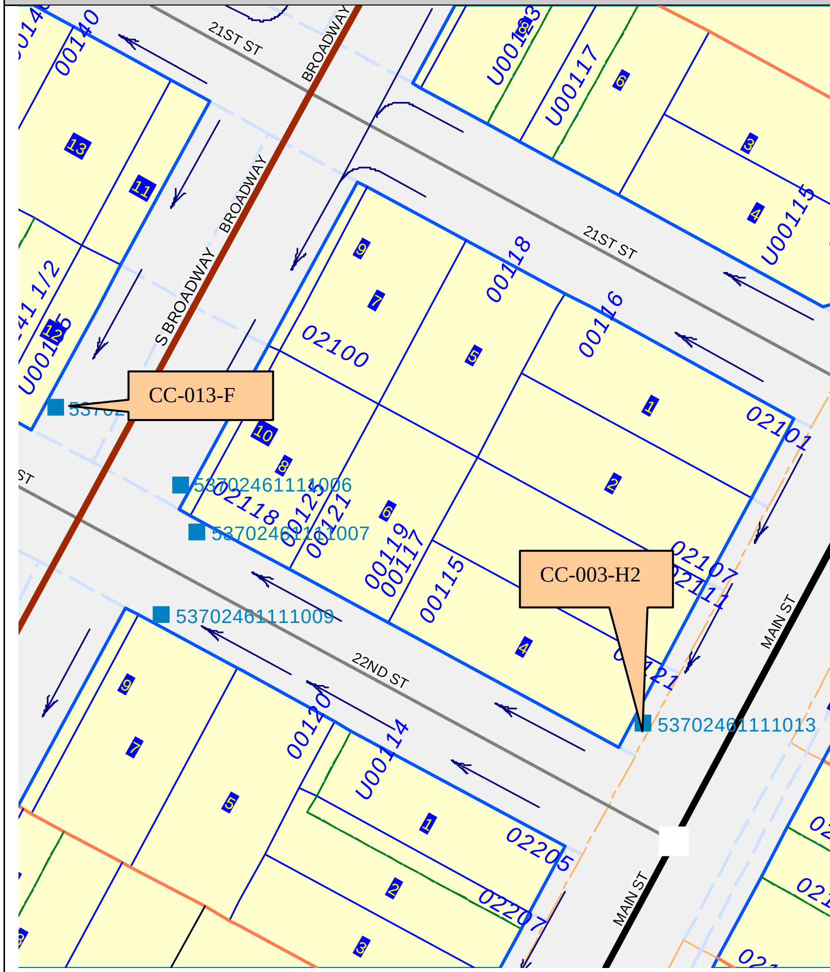
Date inspected:
3/23/04

Comments: A later inspection reveals the debris is still trapped in the insert. The upper portion of the insert appears to be less effective for trapping sediment and small debris, so this insert is at capacity even though it may not appear full. Also, the absorbent is not likely providing much treatment with the way it is hanging out of the basket.

Site : CC-009-F **Location:** 20th and Flower St., East Side (Area 1 - Site H)		Flo-Gard
		
		**Date inspected:** 6/30/04 **Comments:** The absorbent with this insert appears to have been dislodged.
		
		**Date inspected:** 10/21/04 **Comments:** As compared to the last visit, this insert appears have been cleaned and is in good working condition.

Site : CC-009-F **Location:** 20th and Flower St., East Side (Area 1 - Site H)	Flo-Gard

Area 1 - Site I



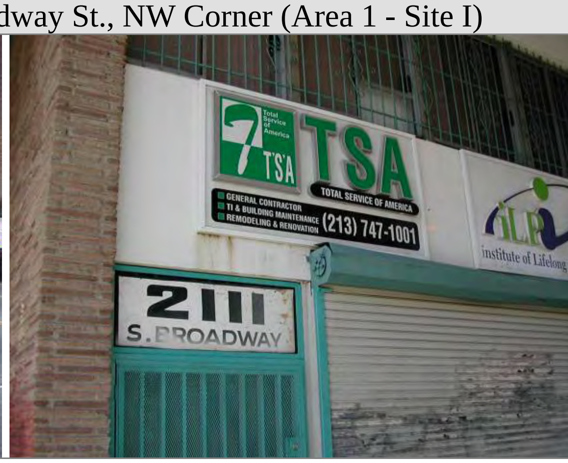
Looking west from across the street from CC-0130F


Looking south toward CC-003-H2 from Main

Intersection	22nd St and Broadway St. 22nd St. & Main.
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-013-F	Flogard+Plus	383060	3765882	3.5	3.2	3.4
CC-003-H2	Hydro-Kleen	383159	3765836	3.6	3.5	2.7

Site : CC-013-F **Location:** 22nd and Broadway St., NW Corner (Area 1 - Site I) | Flo-Gard



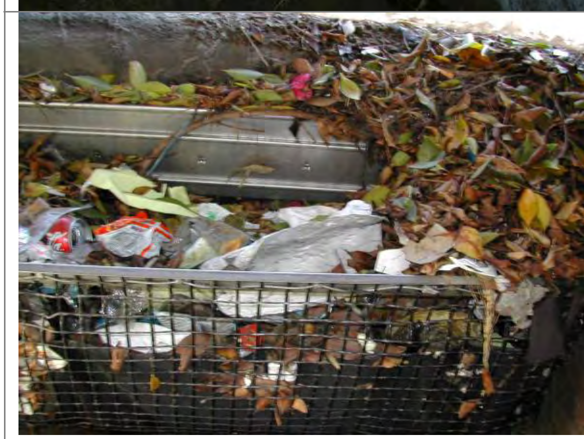
Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking across the street toward the curb inlet.

Site : CC-013-F **Location:** 22nd and Broadway St., NW Corner (Area 1 - Site I) | Flo-Gard


Date inspected:
2/4/04

Comments: This was the first site visit after installation and one storm event. The insert is already nearly at capacity.

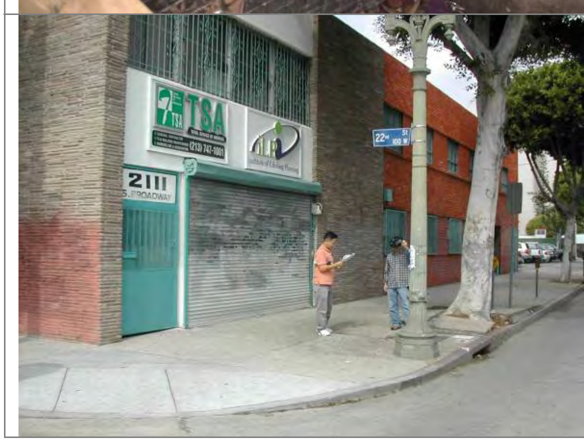



Date inspected:
2/27/04

Comments:
About two weeks later, this site was already overwhelmed with leaves and trash.

Date inspected:
3/23/04

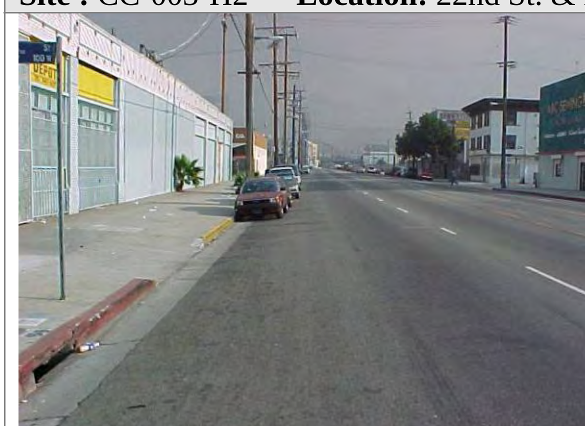
Comments: Later inspections still show a lot of the leaves and trash were still trapped in the insert. The insert is completely full at this point and needs to be cleaned.

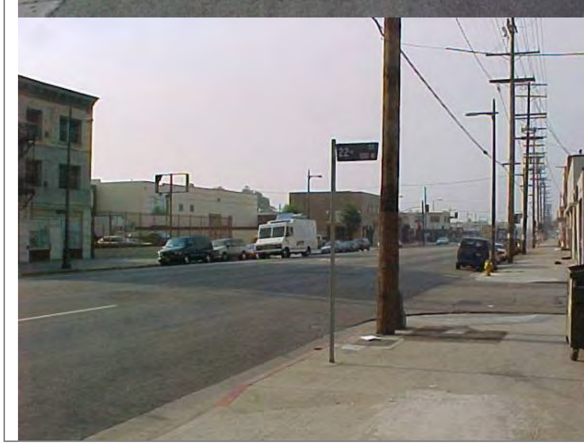
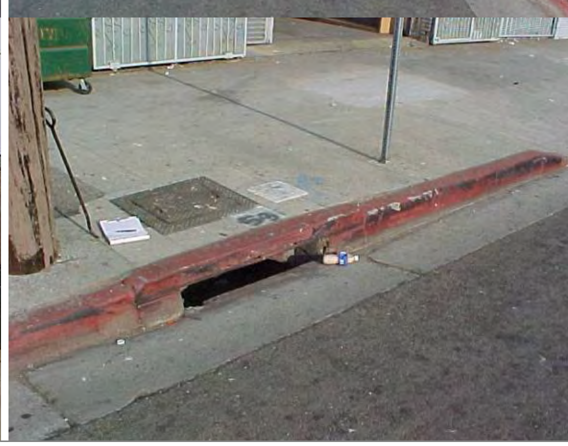
Site : CC-013-F **Location:** 22nd and Broadway St., NW Corner (Area 1 - Site I)		Flo-Gard
		
		**Date inspected:** 6/30/04 **Comments:** As before, this insert is completely overwhelmed with trash and debris and needs to be retired.
		
		**Date inspected:** 10/21/04 **Comments:** It was retired after this visit.

Site : CC-013-F **Location:** 22nd and Broadway St., NW Corner (Area 1 - Site I) | Flo-Gard




Site : CC-003-H2 **Location:** 22nd St. & Main (Area 1 - Site I) | Hydro Kleen



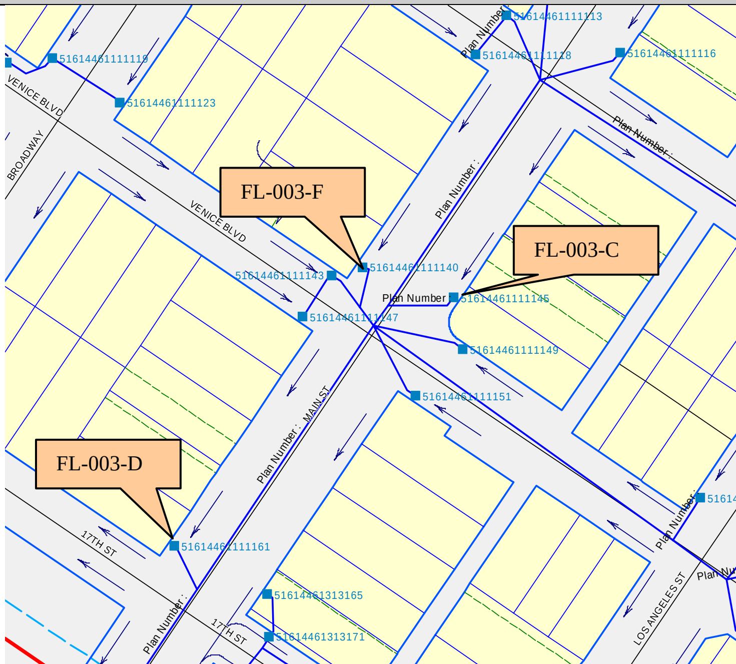
Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking upstream; top right photo is looking downstream. Notice about a garbage bag worth of trash had been deposited in the catch basin. This site was originally an FL site, but was changed due to installation timing conflicts.

Site : CC-003-H2 **Location:** 22nd St. & Main (Area 1 - Site I)		Hydro Kleen
		
		**Date inspected:** 2/4/04 **Comments:** The insert had not yet been installed at the time of this visit.
		**Date inspected:** 2/27/04 **Comments:** This site was only briefly inspected during this visit and has been inadvertently overlooked during subsequent site visits because it was thought to be an FL site. The catch basin was cleaned prior to installation of the insert.
		**Date inspected:** 03/22/05 **Comments:** After this visit, this insert was taken to the laboratory for its final tests.

Site : CC-003-H2 **Location:** 22nd St. & Main (Area 1 - Site I)	Hydro Kleen
	

Area 1 - Site J

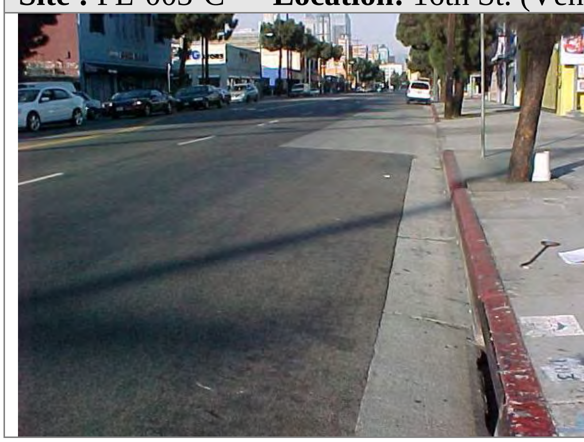


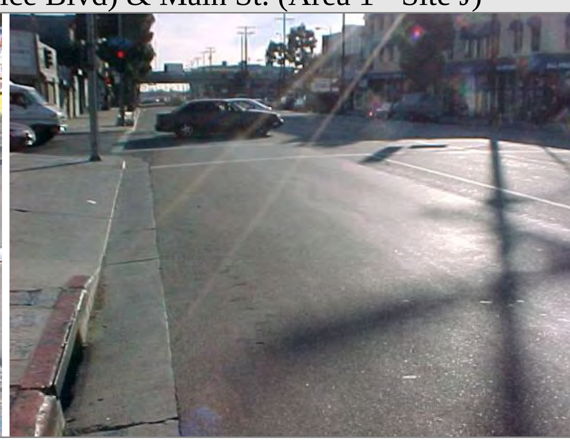
Looking north from FL-003-C

Intersection	16th St. (Venice Blvd) & Main St. 17th St. & Main St.
No. of Installations	3

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
FL-003-D	DrainPac	383386	3766539	3.5	3.2	3
FL-003-F	Flogard+Plus	383452	3766626	3.5	3.2	3.6
FL-003-C	Curb Inlet Basket	383550	3766421	3.5	3.2	3.0

Site : FL-003-C **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J) — Curb-Inlet Basket



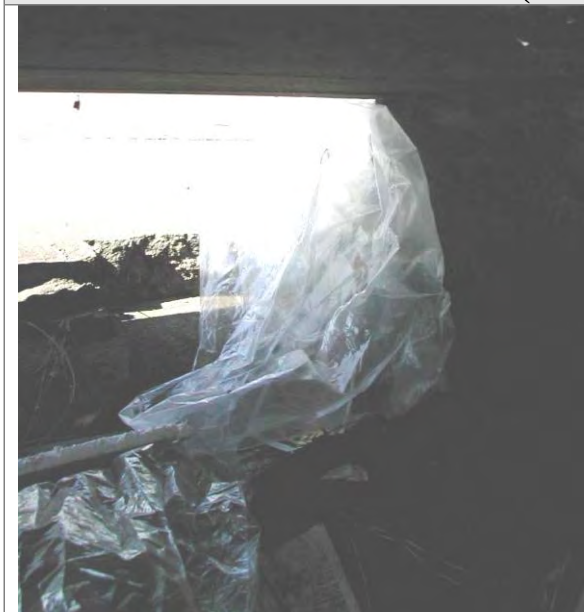


Date inspected:
10/24/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. There is a Chevron gas station on the corner that may be contributing to some of the runoff to this CB.

Site : FL-003-C **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J)		Curb-Inlet Basket
		
		**Date inspected:** 2/4/04 **Comments:** Notice the coarse sand accumulating on the shelf of this insert. This may help reduce the chance of clogging, but the plastic bags are the overflow screen. Note the insert has been removed in the bottom picture for subsequent transport to the UCLA testing laboratory.
		
		

Site : FL-003-C **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J)	Curb-Inlet Basket



Date inspected:
2/27/04

Comments: Note the insert has been removed for laboratory testing and only the debris shelf and mounting brackets remain.

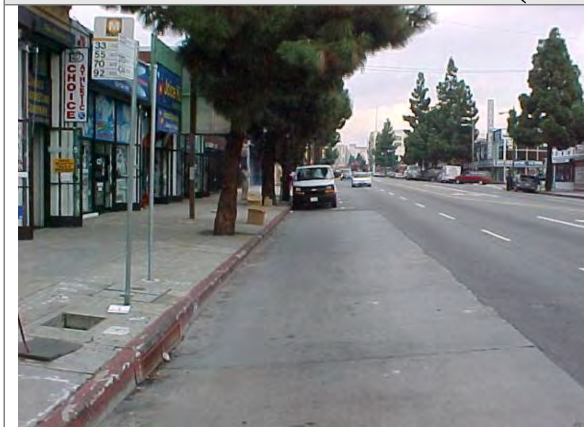
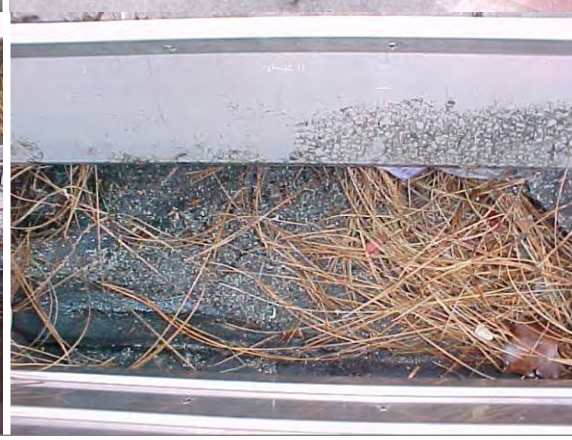
Date inspected:
10/21/04

Comments: The contents of this insert were removed and a new absorbent was installed in preparation for the wet season.

Date inspected:
03/22/05

Comments: Since the last visit this insert shows significant accumulation of pine needles and sediment. After this visit, this insert was taken to the laboratory for its final tests.

Site : FL-003-C **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J)	Curb-Inlet Basket
 	
 	
	

Site : FL-003-F **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J)		FloGard Plus
 	 	**Date inspected:** 12/10/03 **Comments:** Initial site visit. Top left photo is looking upstream; top right is looking downstream. Notice the inlet to this CB has an expanded metal screen, so that only small debris and sediment makes it into the CB.
 	 	**Date inspected:** 2/4/04 **Comments:** This is the first site visit after installation. Notice the relative minor amount of sediment and debris in this insert - mostly pine needles and sand. The bottom of the catch basin is clean. This insert was removed from the CB and subsequently transported to the UCLA laboratory during this visit.

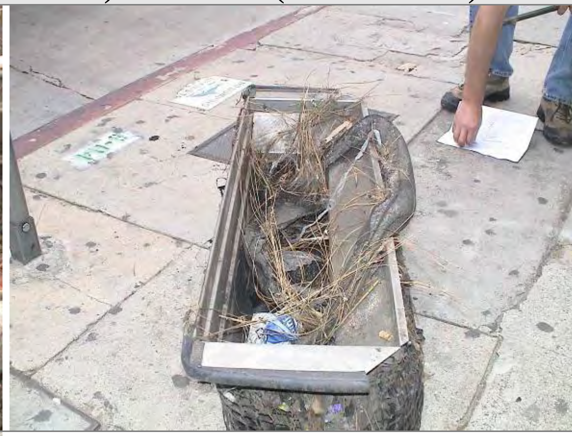
Site : FL-003-F **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J) | FloGard Plus

Date inspected:
10/21/04

Comments:

Date inspected:
03/22/05

Comments: As with many other sites with this insert, the absorbent media is sticking out of the insert. After this visit, this insert was taken to the laboratory for its final tests.

Site : FL-003-F **Location:** 16th St. (Venice Blvd) & Main St. (Area 1 - Site J)		FloGard Plus
		
		

Site : FL-003-D **Location:** 17th St. & Main St. (Area 1 - Site J) | DrainPac

Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. This site apparently receives lots of leaf litter and street trash. Notice the outlet in the bottom photo is nearly clogged with debris.

Date inspected:
2/4/04

Comments: This is the first site visit after installation and one rain event. Only a minor amount of debris was found in the insert. This insert was removed from the CB and subsequently transported to the UCLA laboratory during this visit.

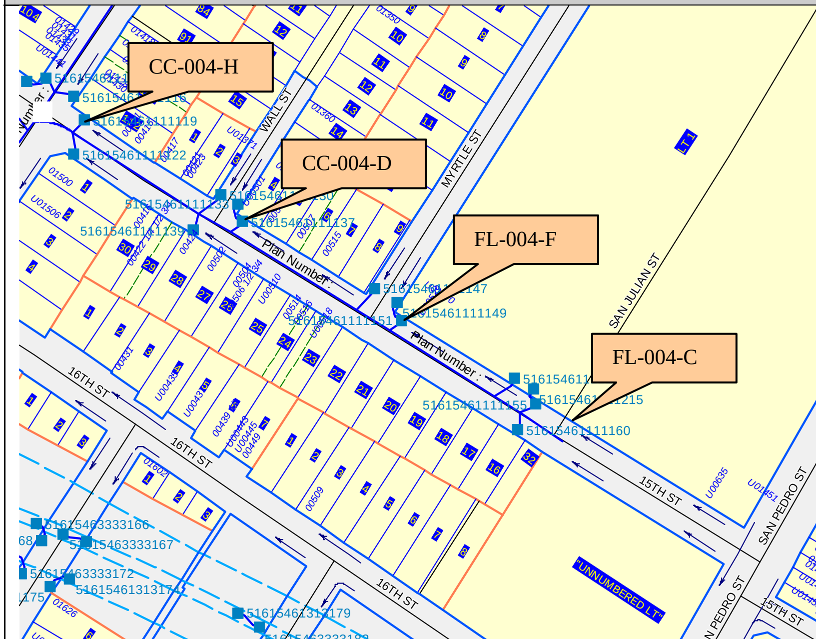
Site : FL-003-D **Location:** 17th St. & Main St. (Area 1 - Site J)

DrainPac

Date inspected:
03/22/05

Comments: After this visit, this insert was taken to the laboratory for its final tests.

Area 1 - Site K

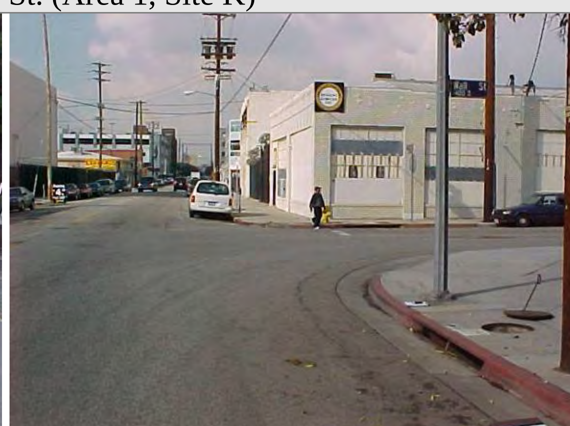


Looking east from west side of intersection.

Intersection	15th and Maple St. to San Pedro St.
No. of Installations	4

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-004-D	DrainPac	383876	3766430	7	4.3	3.1
FL-004-F	Flogard+Plus	383940	3766382	3.6	3.2	3.6
FL-004-C	Curb Inlet Basket	384034	3766333	3.5	3.2	3.6
CC-004-H	Hydro-Kleen	383800	3766465	3.5	3.2	3.3

Site : CC-004-D **Location:** 15th and Wall St. (Area 1, Site K) | DrainPac



Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. This was originally an FL site, but was changed to a CC site because the inlet was 7' and the laboratory is set up for 3.5' wide inserts.

Site : CC-004-D **Location:** 15th and Wall St. (Area 1, Site K)		DrainPac
		
		**Date inspected:** 1/30/04 **Comments:** Couple of days after installation. No debris inside of insert.
 	 	**Date inspected:** 3/23/04 **Comments:** Still relatively clean since last visit; significant capacity remaining.

Site : CC-004-D **Location:** 15th and Wall St. (Area 1, Site K) | DrainPac






Date inspected:
6/30/04

Comments: This inserts has not received much additional trash and debris since last inspection and is still well below capacity.

Date inspected:
10/21/04

Comments: As before, this site received a relatively small amount of debris. This site was retired after this visit.

Site : CC-004-H **Location:** 15th and Maple St. (Area 1, Site K)	HydroKleen


Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. Note that black widows were observed in this catch basin.
This site originally was to be an FL site, but it was decided that the screen would not allow for a good comparison between technologies that do not have screens. The overburden of trash loadings now observed for nearly all of the sites indicates that sites with these screens may be among the best for evaluating the performance of catch basin inserts at removing fine sediment and oil and grease.

Date inspected:
3/23/04

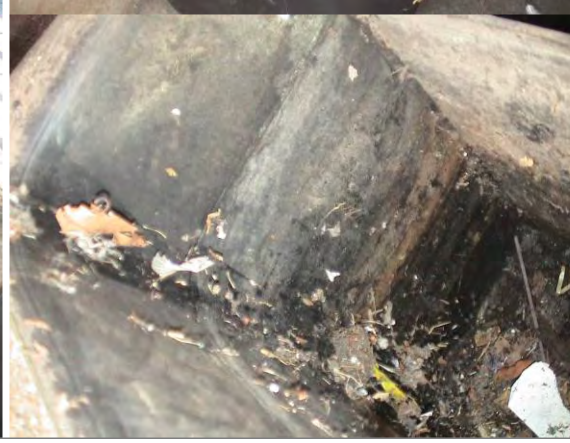
Comments: This is the only site that already had a curb screen. Notice how clean the insert is with mostly only water and oil in the sedimentation chamber of the insert.

Site : CC-004-H **Location:** 15th and Maple St. (Area 1, Site K) | HydroKleen





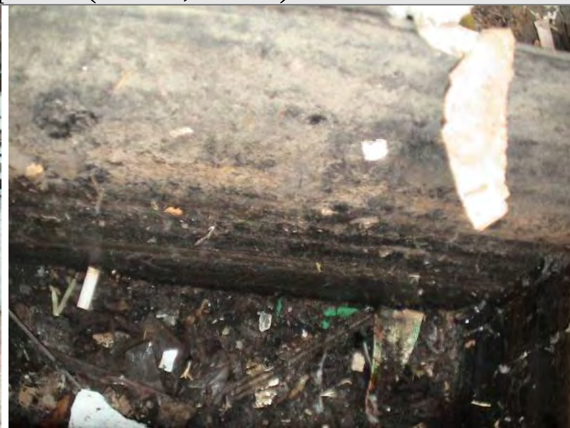


Date inspected:
6/30/04

Comments: This insert is still relatively clean and the standing water has nearly all evaporated. This indicates the curb side screen is a very effective method for keeping catch basin inserts in working order.

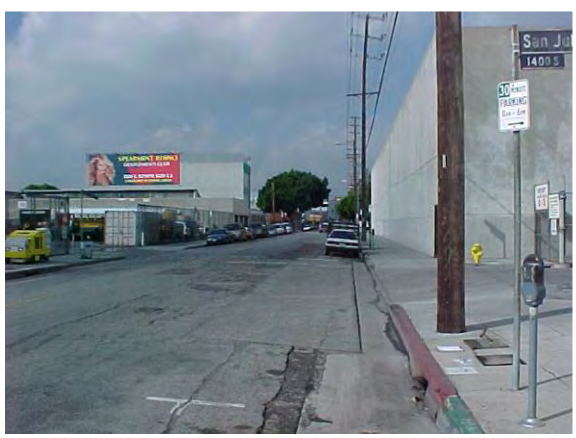
Site : CC-004-H **Location:** 15th and Maple St. (Area 1, Site K) | HydroKleen



Date inspected:
10/21/04

Comments: As before, this site showed limited trash accumulation, indicating the effectiveness of the trash screen.

Site : FL-004-C **Location:** 15th and San Julian St. (Area 1, Site K) | Curb-Inlet Basket



Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. This catch basin is located across the street from the LA Unified School District bus storage yard. Notice this catch basin is in-line with the

Site : FL-004-C **Location:** 15th and San Julian St. (Area 1, Site K) | Curb-Inlet Basket




storm drain system (e.g., there are both inlet and outlet pipes) and there is evidence of dry-weather flows.




Date inspected:
2/4/04

Comments: Couple of days after installation and one storm event. Notice the school bus parked in next to curb in the top right photo. This street gets lots of school bus traffic because the LACUSD properties nearby. The bottom left photo shows the shelf and mounting bracket of the insert after removal. The insert was subsequently taken to the UCLA laboratory for testing.

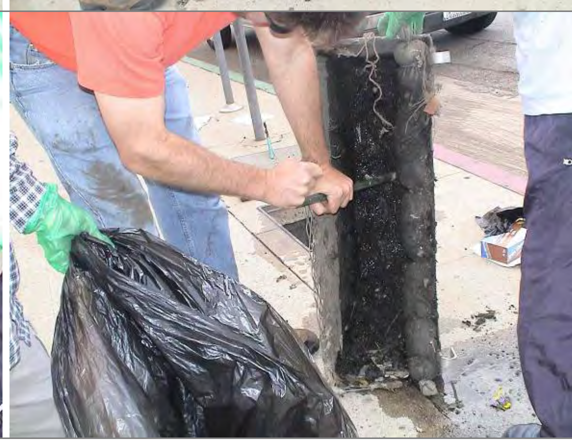
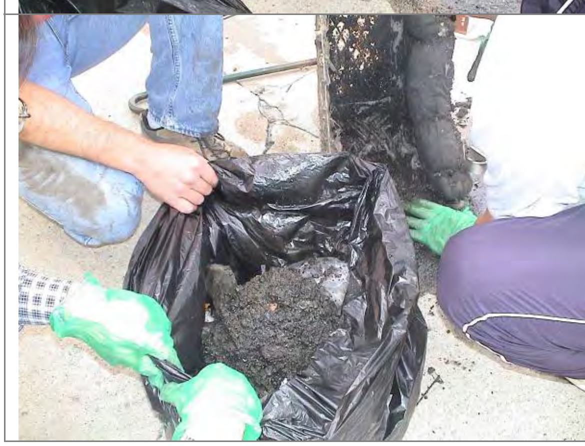
Site : FL-004-C **Location:** 15th and San Julian St. (Area 1, Site K) | Curb-Inlet Basket



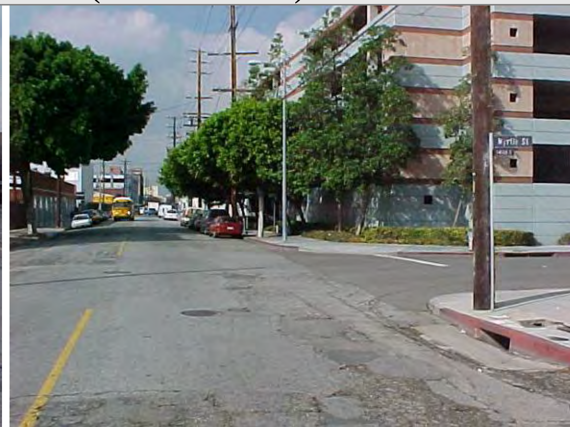


Date inspected:
10/21/04

Comments: During this inspection it was noted that the City had installed one of their complete capture devices. Luckily, our insert was compatible with this design and did not get removed.


Site : FL-004-C **Location:** 15th and San Julian St. (Area 1, Site K)		Curb-Inlet Basket
		
		
		
		

Site : FL-004-F **Location:** 15th and Myrtle St. (Area 1 - Site K) | Flo-Gard Plus



Date inspected:
12/10/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. This is an inline catch basin with a small amount of trash and minor dry weather flow.

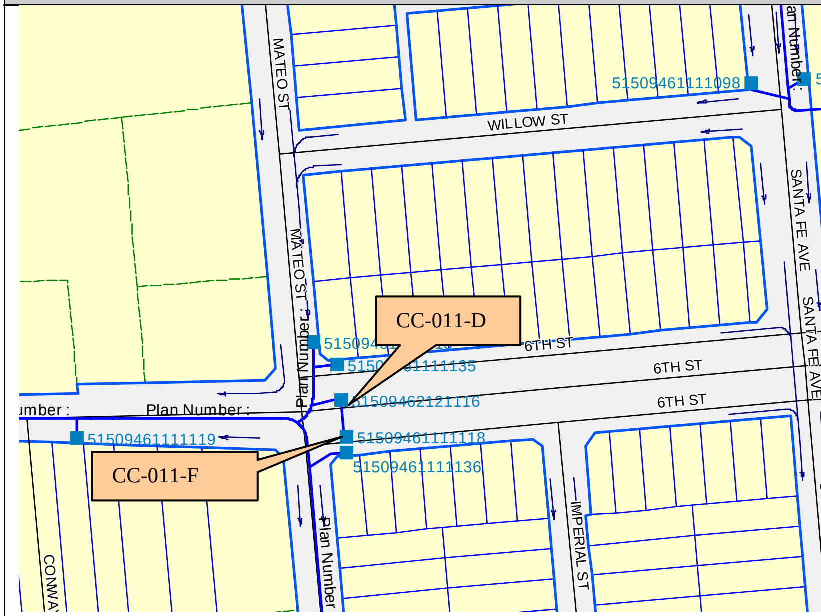
Date inspected:
2/4/04

Comments: First site visit after installation and one storm event. This catch basin appears to have only received a small amount of trash and debris. The insert was removed and subsequently transported to the UCLA laboratory for testing.

Site : FL-004-F **Location:** 15th and Myrtle St. (Area 1 - Site K)		Flo-Gard Plus
		
		**Date inspected:** 10/21/04 **Comments:** The insert at this site was removed by the City and replaced with one of their complete capture devices.
 	 	**Date inspected:** 03/22/05 **Comments:** After this visit, this insert was taken to the laboratory for its final tests.

Site : FL-004-F **Location:** 15th and Myrtle St. (Area 1 - Site K)	Flo-Gard Plus
	

Area 2 - Site L

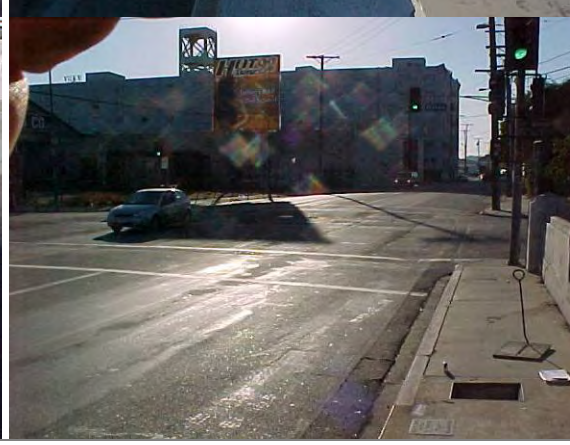


Looking upstream (east)

Intersection	6th St. & Mateo St.
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-011-D	DrainPac	386309	3766893	7	2.2 (bottom) 4.6 (top)	6.7
CC-011-F	Flogard+Plus	386226	3767081	7	2.8	5.9

Site : CC-011-D **Location:** 6th and Mateo St. (Area 2 - Site L) | DrainPac



Date inspected:
10/24/03

Comments: Initial site visit. Top two photos are looking upstream; Middle left is looking downstream. Note all runoff to this site is roadway runoff.

Site : CC-011-D **Location:** 6th and Mateo St. (Area 2 - Site L) | DrainPac

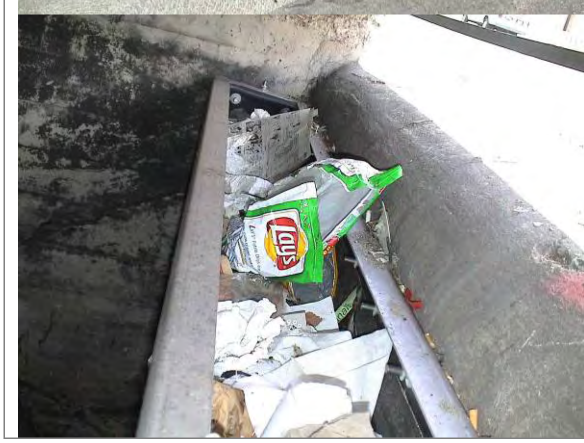
Date inspected:
2/4/04

Comments: This was the first site visit after installation. Some trash was present, but not nearly at capacity.

Date inspected:
3/23/04

Comments: Significant trash and debris captured in the insert since last visit. Appears to be at capacity and should be cleaned before the next wet season.

Site : CC-011-D **Location:** 6th and Mateo St. (Area 2 - Site L) | DrainPac

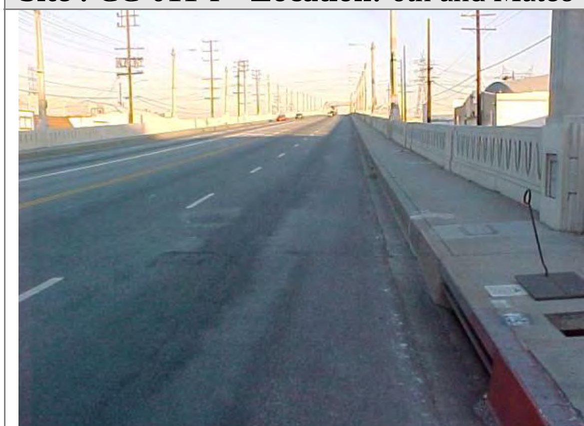


Date inspected:
6/30/04

Comments: More trash and debris have accumulated in this insert. It probably should be retired during the next site visit.

Site : CC-011-D **Location:** 6th and Mateo St. (Area 2 - Site L) | DrainPac

Site : CC-011-F **Location:** 6th and Mateo St., South East Corner (Area 2 - Site L) | FloGard



Date inspected:
10/24/03

Comments: Initial site visit. Top two photos are looking upstream; Middle left is looking downstream. All runoff to this site is roadway runoff. Notice the amount of trash deposited in the catch basin is much less than the catch basin across the street.

Site : CC-011-F **Location:** 6th and Mateo St., South East Corner (Area 2 - Site L)	FloGard
	**Date inspected:** 2/4/04 **Comments:** This was the first site visit after installation and one storm event.
     	**Date inspected:** 3/23/04 **Comments:** Notice the upstream insert has collected significantly more trash and debris than the downstream insert, indicating that runoff is the primary transport mechanism. However, wind transport appears to also contribute significantly.

Site : CC-011-F **Location:** 6th and Mateo St., South East Corner (Area 2 - Site L) | FloGard



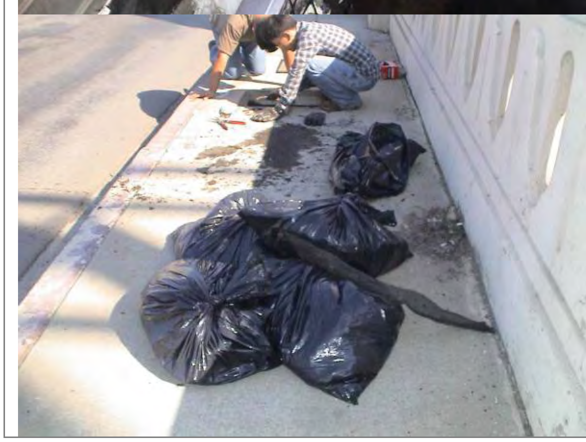



Date inspected:
6/30/04

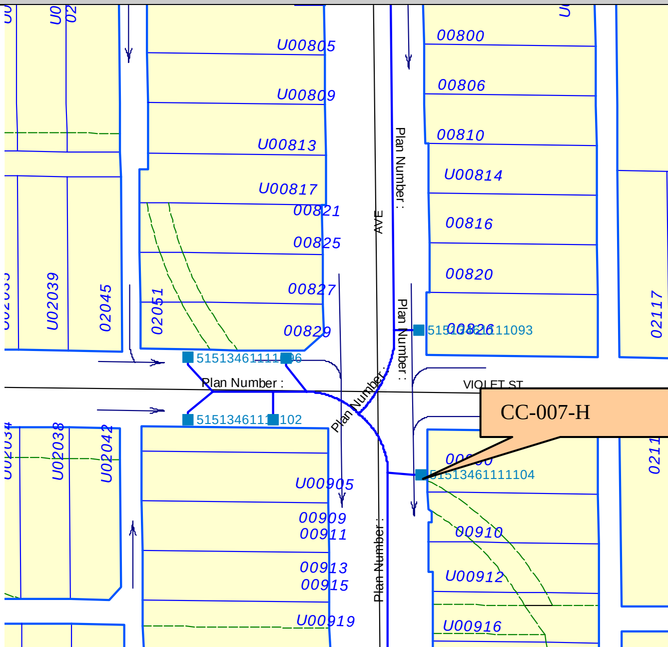
Comments: Since the last visit, not much additional trash and debris have accumulated in the insert. Nonetheless, it is nearly at capacity and should be retired.


Date inspected:
10/22/04

Comments: As compared to the last visit, this insert appears to have been cleaned, but still a significant amount of debris had been captured.

Site : CC-011-F **Location:** 6th and Mateo St., South East Corner (Area 2 - Site L)	FloGard
       	

Area 2 - Site M



Looking toward intersection from Santa Fe (looking North)

Intersection	Santa Fe & Violet SE
No. of Installations	1

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-007-H	Hydro-Kleen	386536	3766241	7.0	3.0	4.0

Site : CC-007-H **Location:** Santa Fe and Violet, South East Corner (Area 2 - Site M) | HydroKleen

Date inspected:
10/21/03

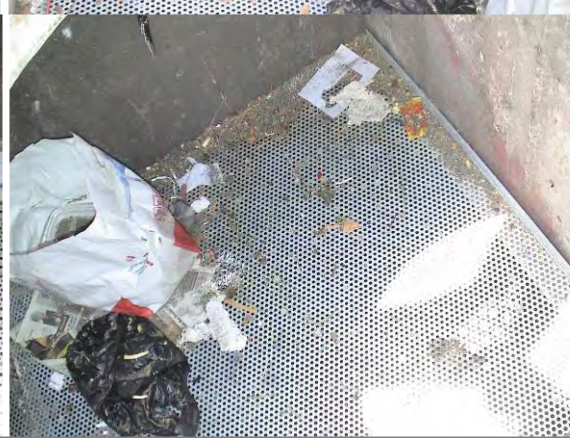
Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. Notice the damage to the 7' curb inlet.

Site : CC-007-H **Location:** Santa Fe and Violet, South East Corner (Area 2 - Site M)		HydroKleen
		
 		**Date inspected:** 2/4/04 **Comments:** Two devices were placed in this catch basin to accommodate the larger opening. It appears runoff is reaching both inserts, but the floatable debris is accumulating more on the upstream end (top left photo).
		**Date inspected:** 3/23/04 **Comments**: Evidence of by-pass shown by plastic bag hanging over the top of the insert.

Site : CC-007-H **Location:** Santa Fe and Violet, South East Corner (Area 2 - Site M) | HydroKleen





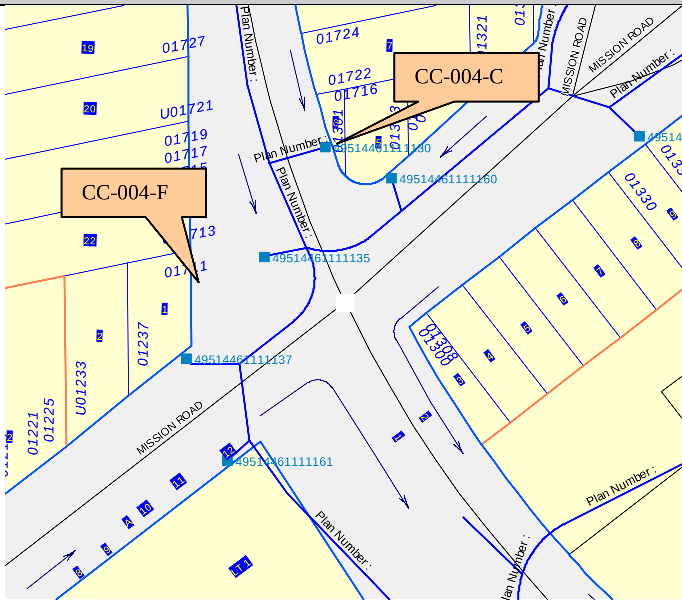



Date inspected:
6/30/04

Comments: Without our knowledge, the insert has been removed and replaced with this trash screening device by the City. Wing Tam is trying to locate our insert so that we can take it to the UCLA laboratory for its final analysis.

Site : CC-007-H **Location:** Santa Fe and Violet, South East Corner (Area 2 - Site M)	HydroKleen
 	

Area 2 - Site N

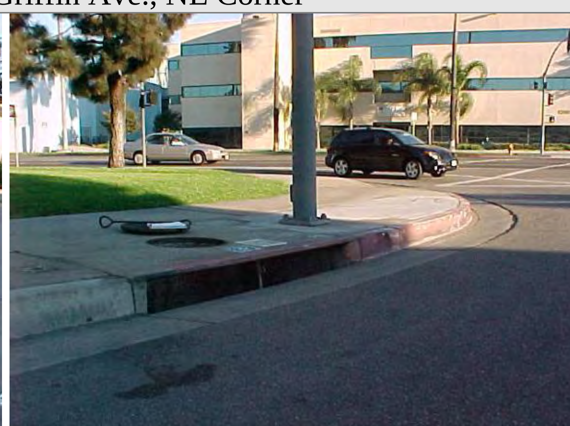


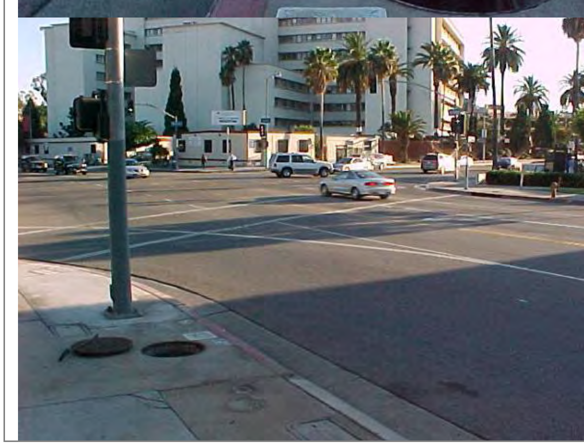
Looking across street from 004-C (southeast)

Intersection	Mission Rd. & Griffin Ave.
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-004-C	Curb Inlet Basket	388302	3769613	7	3.1	3.3
CC-004-F	Flogard+Plus	388208	3769792	7	3.1	5

Site : CC-004-C **Location:** Mission and Griffin Ave., NE Corner — Curb-Inlet Basket





Date inspected:
10/20/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream.

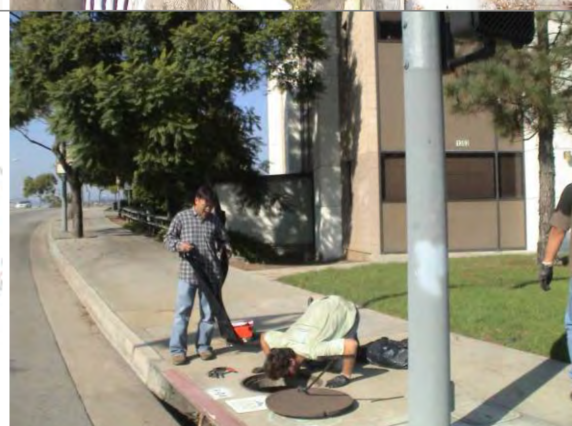
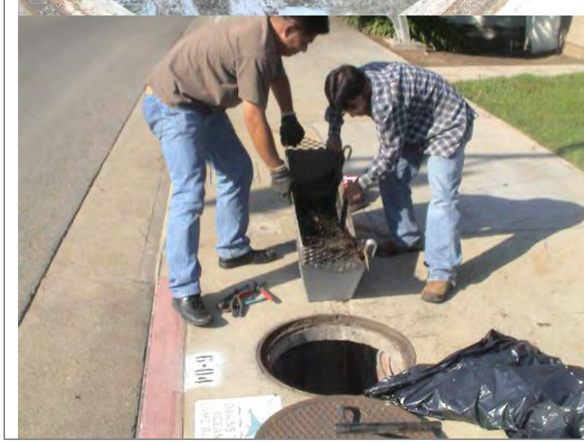
Site : CC-004-C **Location:** Mission and Griffin Ave., NE Corner | Curb-Inlet Basket

Date inspected:
2/4/04

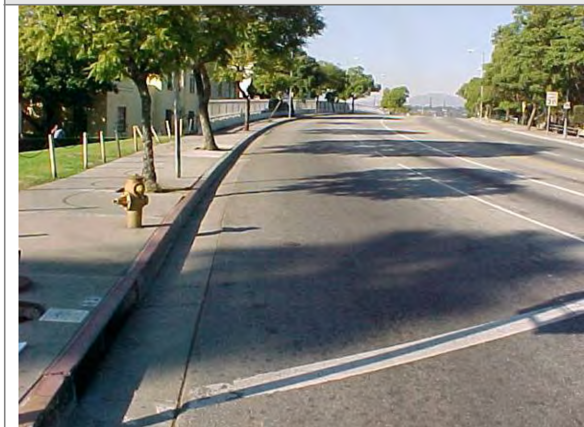
Comments: This visit was shortly after installation.

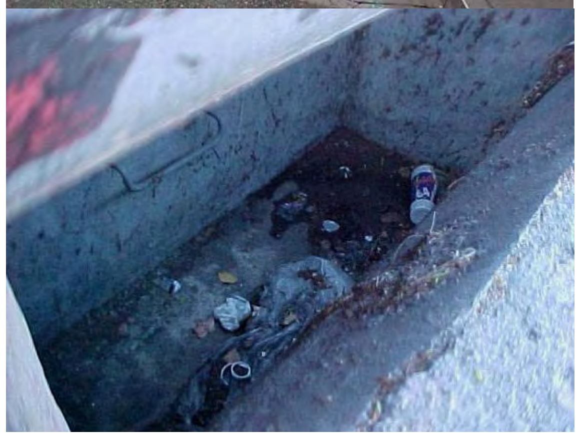
Date inspected:
3-23-04

Comments: Sediment and pine needle debris have completely filled this insert. However, there is no evidence of clogging or significant bypass.

Site : CC-004-C **Location:** Mission and Griffin Ave., NE Corner		Curb-Inlet Basket
		**Date inspected:** 6/30/04 **Comments:** This insert has recently been cleaned. Notice the absorbent boom is no longer present; probably due to vactor truck.
		
		**Date inspected:** 10/22/04 **Comments:** This insert appears to have been recently cleaned and the absorbent boom removed.
		

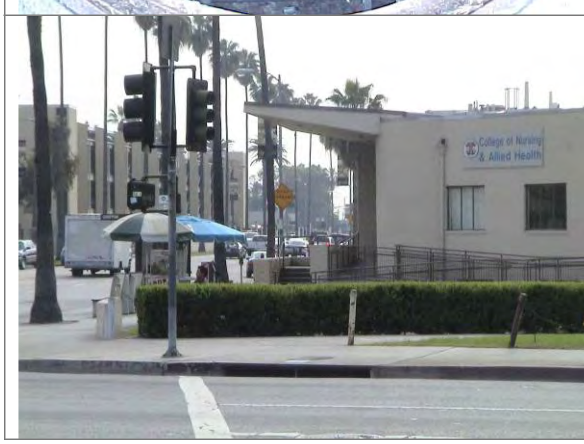
Site : CC-004-F **Location:** Mission and Griffin Ave., NW Corner | Flo-Gard




Date inspected:
10/20/03

Comments: Initial site visit. Top left photo is looking upstream; top right is looking downstream. There was about 1 garbage bag of trash present in the bottom of the catch basin during this visit. Notice the location of this catch basin is on the edge of the road, not in the middle as shown in the location map above.



Date inspected:
2/4/04

Comments: This visit was shortly after installation. The installation consists of two Flo-Gard Plus inserts side-by-side to cover the entire 7' curb opening.

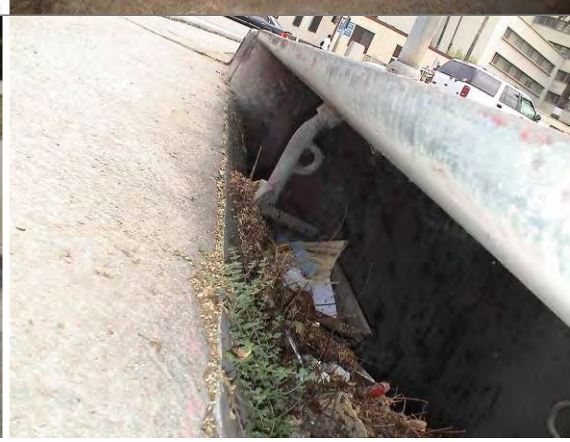
Site : CC-004-F **Location:** Mission and Griffin Ave., NW Corner	Flo-Gard






Date inspected:
3/23/04

Comments: As with the one across the street, this insert is filled with pine needles almost to capacity, but notice only the upstream insert is at capacity.

Date inspected:
6/30/04

Comments: Similar to the one across the street, this insert was recently cleaned as indicated by the month and year painted on the curb. However, both installations are at full capacity indicating the insert was not actually cleaned.

Site : CC-004-F **Location:** Mission and Griffin Ave., NW Corner	Flo-Gard



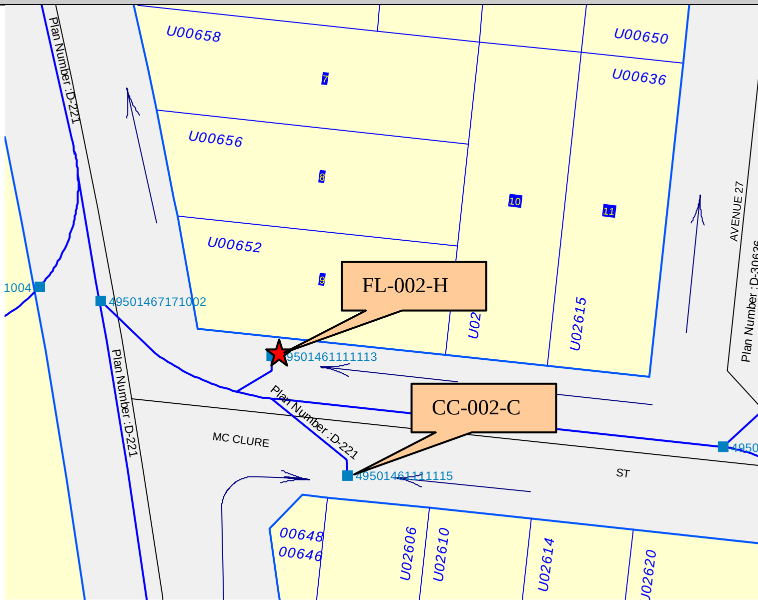





Date inspected:
10/22/04

Comments: The upstream insert was at capacity during this visit and the downstream insert about half full. The insert was removed and the contents extracted for laboratory sieve analysis.

Area 2 - Site O

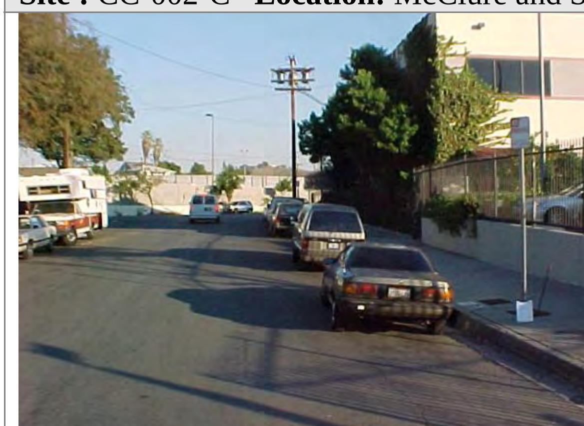


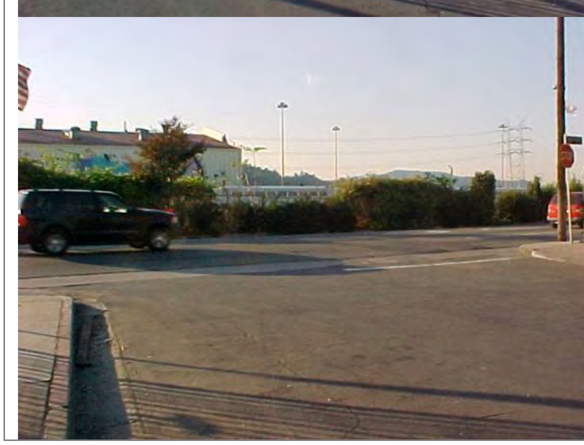
Looking upstream from 002-H (east)

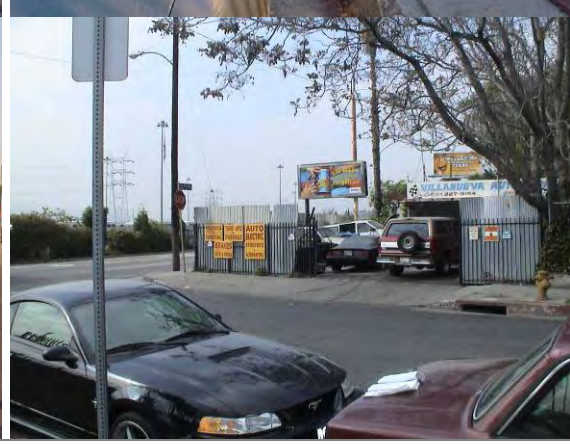
Intersection	Mc Clure St. & San Fernando Rd.
No. of Installations	2

Inlet Number	Technology Type	Easting	Northing	Measurements (see Figure 2)		
				A-Curb Opening	B-Drain inside width	C-Drain inside depth
CC-002-C	Curb Inlet Basket	386929	3772531	3.4	3.2	3.4
FL-002-H	Hydro-Kleen	387010	3772343	3.7	3.2	3.3

Site : CC-002-C **Location:** McClure and San Fernando Rd., S Corner — Curb-Inlet Basket

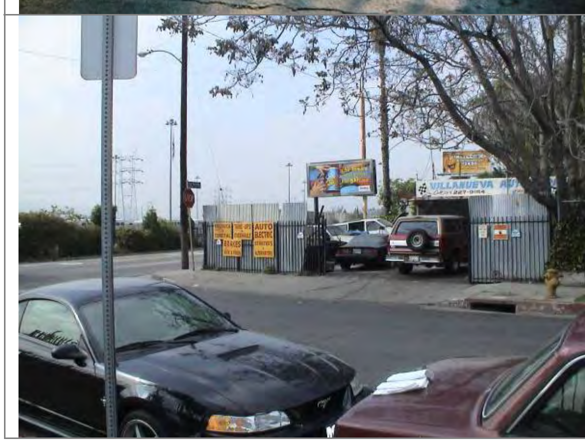






Date inspected:
12/11/03

Comments:
Initial site visit. Top photos are looking upgradient. Auto repair shop across the street; appears to be parking customer's vehicles on street in front off catch basin.

Site : CC-002-C **Location:** McClure and San Fernando Rd., S Corner		Curb-Inlet Basket
		
		
		**Date inspected:** 2/4/04 **Comments:** This site has high sediment and O&G loads. Oil was flowing in the gutter and into this insert during the visit. The picture on the right was taken a few days after installation.
		**Date inspected:** 3/23/04 **Comments:** This insert at this site has collected a lot of sediment and oily residue appears on the absorbent boom and the captured sediment.

Site : CC-002-C **Location:** McClure and San Fernando Rd., S Corner	Curb-Inlet Basket




Date inspected:
6/03/04

Comments: This insert has recently been cleaned by the LADPW staff. Notice the absorbent boom is no longer present. The media may have been sucked out with a vactor truck.


Date inspected:
10/22/04

Comments: This insert was retired after this visit.

Site : CC-002-C **Location:** McClure and San Fernando Rd., S Corner | Curb-Inlet Basket

Site : FL-002-H **Location:** McClure and San Fernando Rd., N Corner | Hydro Kleen

Date inspected:
10/23/03

Comments: Initial site visit. Notice the large amount of leaf matter collected in the catch basin. A car repair shop is located next to this site. Top right picture is looking upstream; top bottom picture. Note that this site was originally a CC site, but was changed to an FL site due to installation timing conflicts.

Site : FL-002-H **Location:** McClure and San Fernando Rd., N Corner	Hydro Kleen
 	**Date inspected:** 2/4/04 **Comments:** First site visit after installation and a single storm event. The insert was installed backwards with the filtration chamber before the sedimentation chamber. The media was placed in the sedimentation chamber, which caused it to float out of the chamber during storm flows. This device was removed from this location during this visit.

APPENDIX C- LABORATORY ANALYTICAL METHODS

C.1 OIL AND GREASE ANALYSIS

Oil and grease was measured using a solid phase extraction (SPE) technique developed earlier by the authors (Lau and Stenstrom, 1997). This technique uses a known volume of sample (generally 500 ml or 1000 ml for this study) which is pumped through an SPE column at a constant but low rate (e.g., 5 ml/min). The oil and grease in the sample is sorbed on the SPE column. After the sample is pumped through the column, it is eluted with a small volume of solvent (5 ml): methylene chloride and hexane. The sample bottle is also washed with a small volume of solvent (isopropanol). The two solvent volumes are combined and placed in a tarred container. The solvents are allowed to dry at 50°C using a gentle nitrogen purge. The residue is weighed. The results are reported as mg/L based upon the original sample volume. This method is not yet a standard method, but is being developed by the US EPA and others as a standard method. It has the advantages of higher recovery, especially for the more volatile components in oil and grease, and using less solvent (the solvents used for traditional oil and grease analyses are usually flammable, toxic and either green house gases or ozone depleting gases). By using different sample volumes is it possible to have low detection limits, and the limit with 500-ml sample volume is typically 0.25 mg/L. This method does not quantitatively measure oil and grease adsorbed to solids, and an alternate technique must be used for particle-bound oil and grease. However, this is not important for this study because no particles were added to the tap water when testing for oil and grease removal.

C.2 METAL DIGESTION

Samples for metals analysis were prepared by digesting ~ 0.4 grams of used motor oil in 10 ml concentrated nitric acid for 25 minutes using a microwave unit (CEM Corp., Mathews, NC). This is a modified method from SW Method 3051A (US EPA, 1999). Due to the build-up of high pressure from heated motor oil, a specialized digestion vessel, OMNI™, was used for this purpose. The sample initially was heated to 200°C (in 15 min.) and hold at 200°C for 10 min. After cooling, the digested samples were filtered, diluted to 50 ml and analyzed using a using an inductively coupled plasma-mass spectrophotometer (ICP-MS). Appropriate blanks and standards were used to insure quality control.

FloGard Catch Basin Insert Filter

Inlet Filtration

Removes pollutants from runoff prior to entering waterways

Efficient
catches pollutants where they are easiest to catch, at the inlet.

Variable Design
applications with the ability to be retrofitted or used in new projects.

Treatment Train
can be incorporated as part of a "Treatment Train".

No Standing Water
helps to minimize vector, bacteria and odor problems.

Focused Treatment
removes petroleum hydrocarbons, trash, and TSS.

Maximum Flexibility
available in a variety of standard sizes to fit round and square inlets.

Economical
Receive a higher return on investment.

Two-part insert to filter solids and oil/grease

Easy to install, inspect and maintain, even on small and confined sites

By the Numbers*:

- Filter shall remove 80% of total suspended solids (TSS)
- Capture at least 70% of oil and grease and 40% of total phosphorus (TP) associated with organic debris.

approx. for urban street application

Catch Basin Filter Test Results Summary

Testing Agency	% TSS Removal	% Oil & Grease Removal	% PAH Removal
UCLA	80	70 to 80	
U of Auckland Tonking & Taylor, Ltd. (for City of Auckland)	78 to 95		
U of Hawaii (for city of Honolulu)	80		20 to 40

Oldcastle Stormwater Solutions™

Multipurpose Catch Basin Insert designed to capture sediment, debris, trash & oils/grease from low (first flush) flows, even during the most extreme weather conditions.

The FloGard® Catch Basin Insert Filters provide solids filtration through a filter screen of filter liner, and hydrocarbon capture shall be effected using a non-leaching absorbent material contained in a pouch or similar removable restraint. They are recommended for areas subject to silt and debris as well as low-to-moderate levels of petroleum hydrocarbons (oils and grease). Examples of such areas are vehicle parking lots, aircraft ramps, truck and bus storage yards, business parks, residential and public streets.

Catch Basin Filter Competitive Feature Comparison

Evaluation of Catch Basin Filters (Based on flow-comparable units) (Scale 1-10)	Oldcastle Stormwater	Other Insert Filter Types**
Flow Rate	10	7
Removal Efficiency*	80%	45%
Capacity - Sludge & Oil	7	7
Service Life	10	3
Installation - Ease of Handling / Installation	8	6
Ease of Inspections & Maintenance	7	7
Value	**10**	**2**

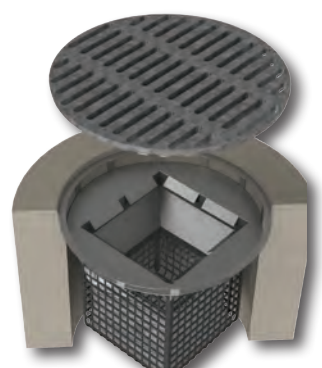
*approximate, based on field sediment removal testing in urban street application **average

Long-Term Value Comparison (Based on flow-comparable units) (Scale 1-10)	Oldcastle Stormwater	Other Insert Filter Types
Unit Value - Initial ($/cfs treated)	10	4
Installation Value ($/cfs treated)	10	7
Absorbant replacement (annual avg ($/cfs treated)	10	2
Materials replacement Value (annual avg ($/cfs treated)	10	10
Maintenance Value (annual avg ($/cfs treated)	10	7
Total first yr ROI ($/cfs treated)	10	5
Total Annual Avg Value ($/cfs treated, avg over 20 yrs)*	**10**	**5**

Combination Inlet

Flat Grated Inlet

Captured debris from the Catch Basin Filter, Dana Point, CA



Circular Frame Catch Basin

Grate Inlet Skimmer Box/Round Curb Inlet Basket - Removal Efficiencies

Numeric Reductions (mg/L)

Location	Total Suspended Solids mg/L			Total Phosphorus mg/L			Total Nitrogen mg/L		
	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
Site Evaluation - Reedy Creek			74%			57%	24.3	10.4	57%
Creech Engineering Report			73%			79%			79%
Witman's Pond	978	329	66%	18.6	0.452	98%	48.08	9.86	79%
Universal Engineering - 2007 (100 Microns) LATEST REPORT			86%						

Location	Zinc mg/L			Lead mg/L			Copper mg/L		
	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
UC Irvine						99%			
Longo Toyota	13.7	0.73	95%	1.5	0.2	87%	1.9	0.1	95%

Location	Ammonia, Salicylate mg/L			Fecal Coliform CFU/100 mL			Cadmium		
	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
Site Evaluation - Reedy Creek	0.38	0.23	39%						
UC Irvine						33%			94%

Location	Hydrocarbons mg/L		
	Inlet	Outlet	Removal Efficiency
UC Irvine			90%
Longo Toyota	199	10.43	95%

Reedy Creek - Site Evaluation of a Grate Inlet Skimmer Box for Debris, Sediment, and Oil & Grease Removal - 1999 - Independent Test

Creech Engineering Report - Pollutant Removal Testing for a Grate Inlet Skimmer Box - 2001

Witman's Pond - Restoration Project - Massachusetts Dept of Environmental Management - 1998 -Independent Test

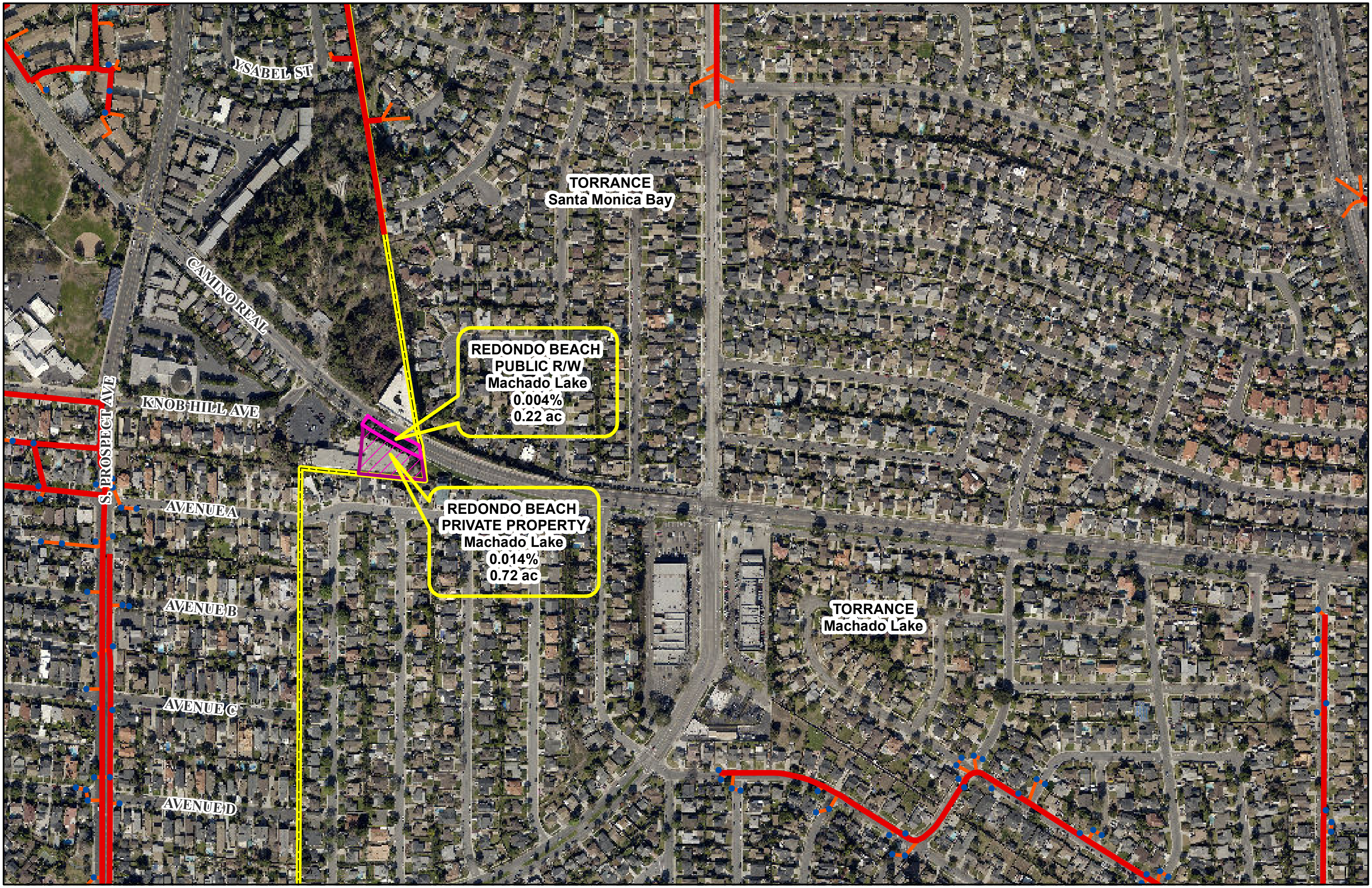
UC Irvine - Optimization of Stormwater Filtration at the Urban/Watershed Interface - Dept of Environmental Health - 2005 - Independent Test

Longo Toyota - Field Test - City of El Monte - 2002 - Independent Test

Universal Engineering Sciences - Suspended Soils Retention Study - 2007 -Independent Test

Appendix C

City of Redondo Beach Area Located within Machado Lake Watershed



N
W E
S

0 250 500 1,000
Feet

Machado Lake Watershed

City Limit

Storm Drain

CatchBasin

More To Sea℠
redondo
BEACH

Appendix D

City of Redondo Beach Tributary to Machado Lake

Machado Lake Watershed

- City of Redondo Beach Trib to Machado Lake
- City Limit
- Storm Drain
- CatchBasin

N S W E

0 250 500 1,000 Feet

More To Sea redondo BEACH

Appendix E

City of Redondo Beach Request for Withdrawal and/or Exemption from Machado Lake Trash TMDL—Region 4

redondo BEACH

Engineering and Building Services Department

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

Building 310 318-0636
Engineering 310 318-0661
fax 310 374-4828

October 31, 2007

Ms. Jeanine Townsend
State Water Resources Control Board
1001 I Street
Sacramento, California 95814

**Subject: Machado Lake Trash TMDL – Region 4
City of Redondo Beach Request for Withdrawal and/or Exemption**

Dear Ms. Townsend:

The City of Redondo Beach respectfully requests to be withdrawn and exempted from the Machado Lake Trash TMDL as adopted by the Los Angeles Regional Water Quality Control Board (Resolution R4-2007-0060). The subject TMDL document lists the City of Redondo Beach as one of the responsible agencies in this watershed. However, due to the following factors, the City does not believe it should be included:

1. The negligible amount of Redondo Beach flow that drains into the Machado Lake watershed (Table 5 of the Final Staff Report date July 11, 2007 lists the tributary area for Redondo Beach as 0.00 sq. miles);
2. The insignificant waste load allocation given to Redondo Beach (Table 5 of the Final Staff Report allocated 18.16 gallons/per year or 0.02% of total allocation); and
3. The City does not own any catch basins or storm drains that drain into the watershed.

The cost/benefit of the City being a responsible agency is significant. As such, we believe Redondo Beach should be removed from the list of responsible agencies.

Other responsible agencies, as listed in Table 5 of the staff report, are the City of Los Angeles, Caltrans, the County of Los Angeles, the cities of Carson, Lomita, Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates, and Torrance. The issue of this request was discussed at a group meeting where the group's consent was obtained.

The subject TMDL describes the watershed as:

"Machado Lake is a receiving body of urban and storm water runoff from the storm drain system covering an approximately 20-square mile watershed. The Wilmington Drain collects runoff from the surrounding cities of Lomita, Torrance, Carson, and Los Angeles, and then discharges over 50 percent of the watershed into Machado Lake at the northeast corner. The rest of the waters enter the lake through other storm drains including the Project No. 77 channel, the Harbor City Relief Drain located at the west end of the lake, the City of Los Angels drains for runoff from streets, and the Harbor Park Municipal Golf Course. The Wilmington Drain Project 77 and the Harbor City Relief Drain collect storm water from the communities of Harbor City, Lomita, Carson, Torrance, and Wilmington, and from the Walteria lake drainage area. In addition, two project 643 outlets discharge to the wetlands area. During the dry season, Machado Lake is replenished via a City of Los Angles Department of Water And Power (LADWP) potable water pipeline and dry weather runoff."

As noted above and as addressed in the TMDLs, the City of Redondo Beach has no direct discharges into the lake and as listed in the Table 5, the City has 0 (zero) point source area miles, which should indicate the waste allocation should be calculated as zero (currently listed to be 18.16 gallons/year).

The portion of the City shown in the subject TMDL document as the potential contributory drainage area consists of no catch basins or storm drains that drain into Machado Lake.

Therefore, the City requests to be exempted from the obligations associated with this TMDL for the following reasons:

1. The City's drainage area is listed to be 0 (zero) square miles.
2. Even if there is a small fraction of land area included in the watershed, this is exceptionally small and would have negligible impact. The cost benefit of the spent resources to be involved in the subject TMDL cannot be justified.
3. The City of Redondo Beach is a proactive member of the Santa Monica Bay Bacteria (SMBB) TMDL, and as such the City has developed an integrated Implementation Plan with a goal of potentially reducing multiple pollutants of concern. The City has been and will continue to be intimately involved with implementing the tasks listed in the Plan to ensure pollutants such as trash have been fully addressed.
4. It would be more reasonable for the City to focus its resources to implement the SMBB TMDL and other upcoming SMBB TMDLs only. The majority of the City land area discharges into the Santa Monica Bay, which would make it more feasible and cost effective to pool all the resources set aside for these types of projects together in order to develop one monitoring, and one implementation plan. The small area draining into the Machado Lake would be subject to the same control measures of the implementation plan developed for the SMBB TMDL. As the result, this area would benefit from the appropriate BMPs designed for the entire City.

5. The City has installed many CDS systems in various high priority locations, which have been proven to collect trash and reduce their discharges into the Strom Drain systems

City of Redondo Beach is concerned that any aspects of the Machado Lake TMDL involving the City would jeopardize these potential resources, which could be spent on TMDLs mainly focused in the Santa Monica Bay.

We at the City appreciate all the efforts of your team in developing the TMDLs, and rely on our mutual understanding of working with limited budgets to implement these costly programs. If you have any questions or comments, I can be contacted by telephone at (310) 318-0661, extension 2455, or via email at Mike.Shay@redondo.org.

Sincerely,

Michael Shay, Principal Civil Engineer

CC: Eric Wu, State Water Resources Control Board

Appendix F

Machado Lake Trash TMDL – Redondo Beach Watershed Contribution

redondo
BEACH

Engineering and Building Services Department

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

Building 310 318-0636
Engineering 310 318-0661
fax 310 374-4828

December 18, 2008

Mr. Eric Wu
California Regional Water Quality Control Board
320 4th Street, Suite 200
Los Angeles, CA 90013

Subject: Machado Lake Trash TMDL – Redondo Beach Watershed Contribution

Dear Mr. Wu:

The letter from Ms. Tracy Egoscue, dated December 9, 2008, regarding the Machado Lake Trash TMDL Monitoring and Reporting Plan specified the City of Redondo Beach shall provide a detailed map demonstrating no trash is discharged from a catch basin within the City premises into Machado Lake. Attached is said map, per her request.

As indicated in previous correspondence, the City requests it be removed as a responsible agency under the subject TMDL because: 1) no catch basin discharges into the Machado Lake watershed from Redondo Beach; and 2) the amount of land area in Redondo Beach which drains into Machado Lake in negligible.

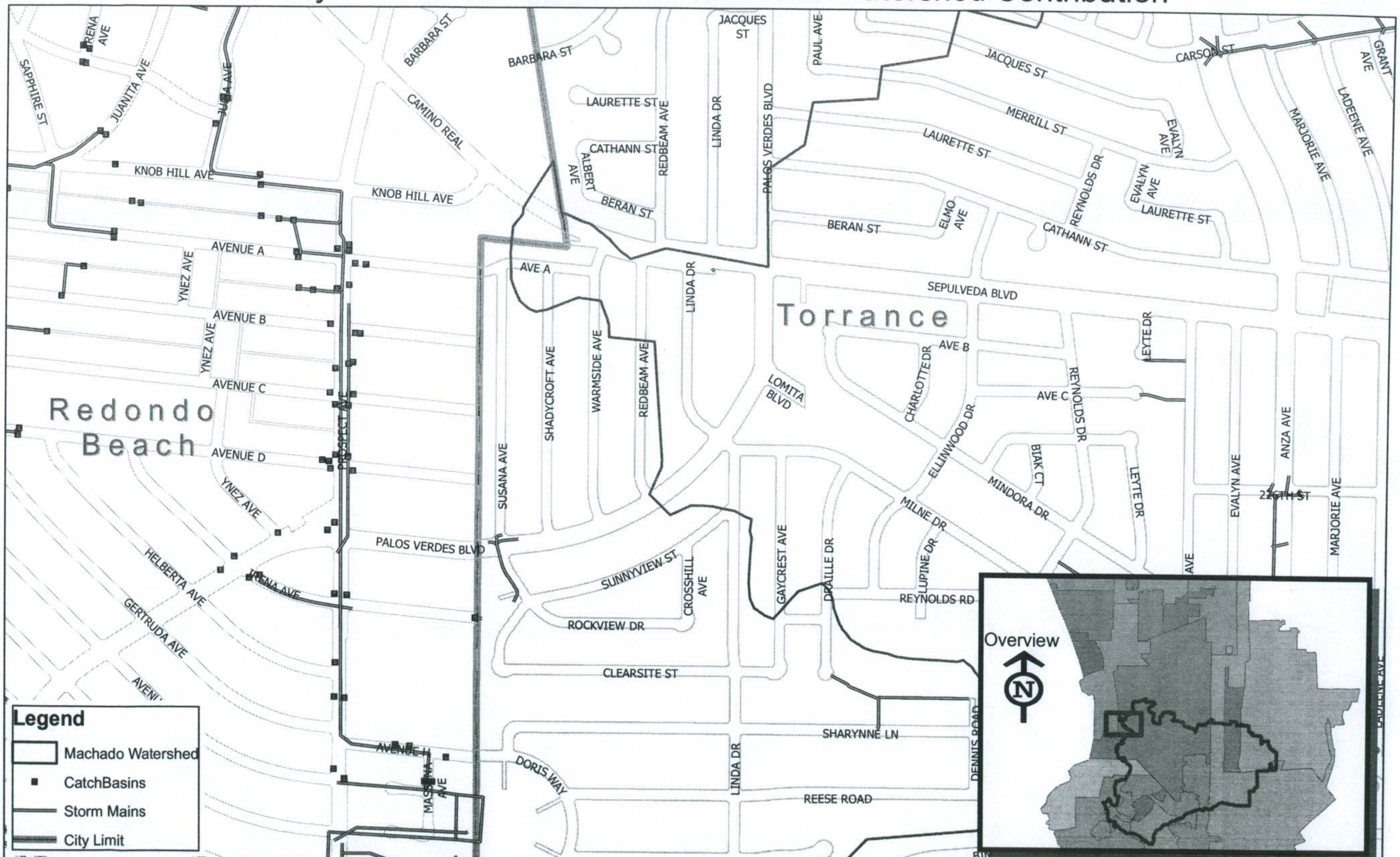
Once you have had a chance to review the attached map, we would be glad to meet with you to discuss this matter further if you deem it necessary. Please contact me at (310) 319-0661, extension 2455, or via email at Mike.Shay@redondo.org if you have questions or are in need of any additional information.

Sincerely,

Michael Shay

Michael Shay, Principal Civil Engineer

City of Redondo Beach Machado Lake Watershed Contribution



Appendix G

Background Information on the LACFCD

This attachment provides background information pertaining to the Los Angeles County Flood Control District (LACFCD), and their involvement in the Beach Cities Enhanced Watershed Management Program (EWMP) Plan.

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

Unlike cities and counties, the LACFCD does not own or operate any municipal sanitary sewer systems, public streets, roads, or highways. The LACFCD operates and maintains storm drains and other appurtenant drainage infrastructure within its service area. The LACFCD has no planning, zoning, development permitting, or other land use authority within its service area. The Permittees that have such land use authority are responsible under the MS4 Permit for inspecting and controlling pollutants from industrial and commercial facilities, development projects, and development construction sites. (MS4 Permit, Part II.E, page 17.)

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

Consistent with the role and responsibilities of the LACFCD under the MS4 Permit, the EWMPs and Coordinated Integrated Monitoring Programs (CIMPs) reflect the opportunities that are available for the LACFCD to collaborate with Permittees having land use authority over the subject watershed area. In some instances, the opportunities are minimal, however the LACFCD remains responsible for compliance with certain aspects of the MS4 Permit as discussed above.

In some instances, in recognition of the increased efficiency of implementing certain programs regionally, the LACFCD has committed to responsibilities above and beyond its obligations under the 2012 MS4 Permit. For example, although under the 2012 MS4 Permit the Public Information and Participation Program (PIPP) is a responsibility of each Permittee, the LACFCD is committed to implementing certain regional elements of the PIPP on behalf of all Permittees at no cost to the Permittees. These regional elements include:

- Maintaining a countywide hotline (888-CLEAN-LA) and website (www.888cleanla.com) for public reporting and general stormwater management information at an estimated annual cost of $250,000. Each Permittee can utilize this hotline and website for public reporting within its jurisdiction.
- Broadcasting public service announcements and conducting regional advertising campaigns at an estimated annual cost of $750,000.
- Facilitating the dissemination of public education and activity specific stormwater pollution prevention materials at an estimated annual cost of $100,000.
- Maintaining a stormwater website at an estimated annual cost of $10,000.

The LACFCD will implement these elements on behalf of all Permittees starting July 2015 and through the MS4 Permit term. With the LACFCD handling these elements regionally, Permittees can better focus on implementing local or watershed-specific programs, including student education and community events, to fully satisfy the PIPP requirements of the 2012 MS4 Permit.

Similarly, although water quality monitoring is a responsibility of each Permittee under the 2012 MS4 Permit, the LACFCD is committed to implement certain regional elements of the monitoring program. Specifically, the LACFCD will continue to conduct monitoring at the seven existing mass emissions stations required under the previous Permit. The LACFCD will also participate in the Southern California Stormwater Monitoring Coalition's Regional Bioassessment Program on behalf of all Permittees. By taking on these additional responsibilities, the LACFCD wishes to increase the efficiency and effectiveness of these programs.

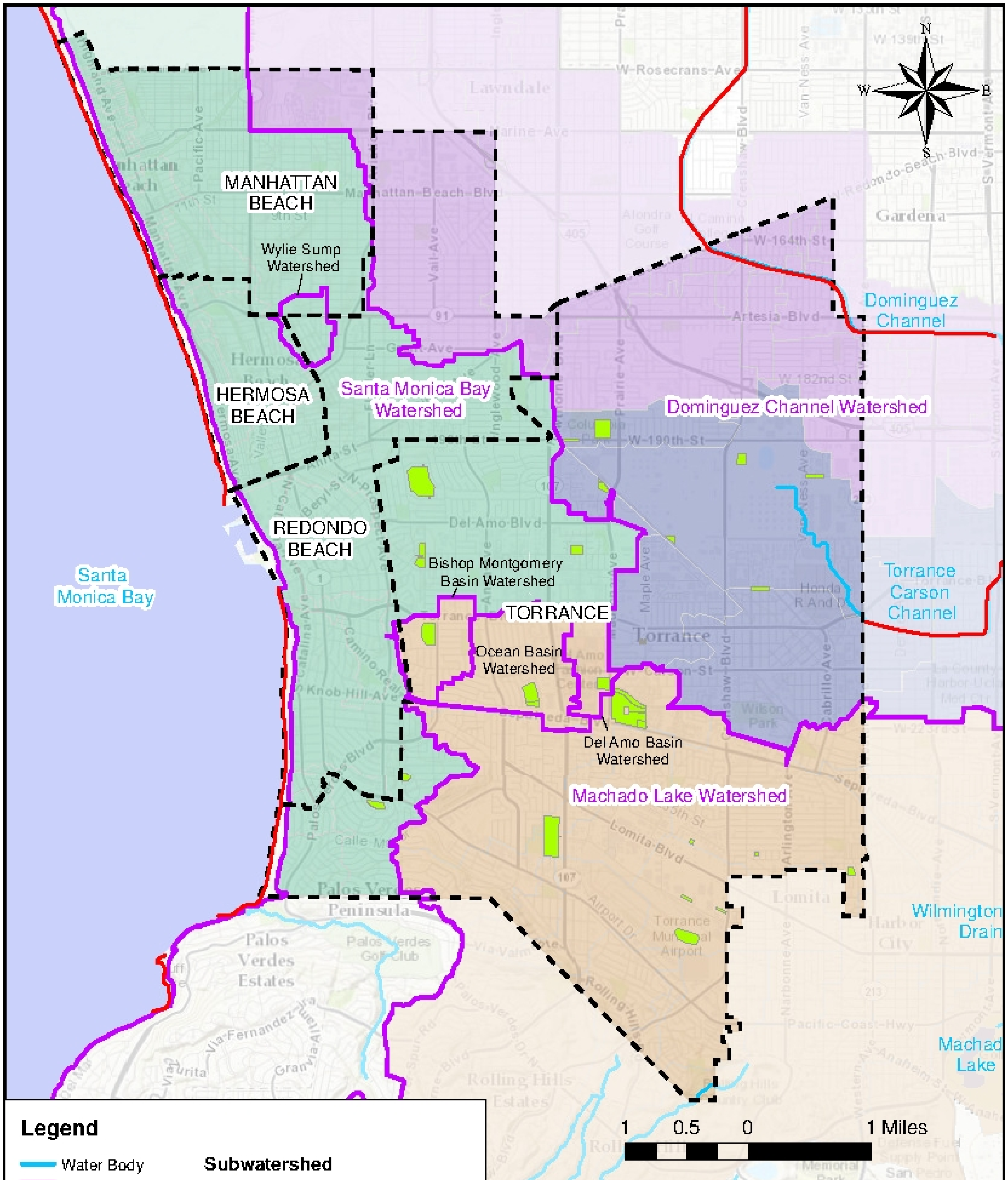


Figure ES-1
Beach Cities WMG Area
Beach Cities EWMP WP

June 2014

Appendix H

Approach to Addressing Receiving Water Exceedances

APPROACH TO ADDRESSING RECEIVING WATER EXCEEDANCES

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

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

Figure H-1 illustrates this process.

Water Body-Pollutant Combinations Addressed by a TMDL

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

303(d)-listed Water Body-Pollutant Combinations

303(d)-listed water body-pollutant combinations are equivalent to the identified Category 2 combinations. Category 2 pollutants that will be addressed by the EWMP are limited to indicator bacteria in Dominguez Channel.[1] However, with the understanding that water body-pollutant combinations may be added to the Category 2 list based on future monitoring data, an approach to address both types of 303(d)-listed water body-pollutant combinations is provided below.

Pollutants in the same class as those identified in a TMDL

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

- Demonstrate that the BMPs selected to achieve the applicable TMDL provisions will also adequately address MS4 contributions of the pollutant(s) within the same class. Assumptions and requirements of the corresponding TMDL provisions must be applied to the additional pollutant(s), including interim and final requirements and deadlines for

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

their achievement, such that the MS4 discharges of the pollutant(s) will not cause or contribute to exceedances of receiving water limitations.
- Perform a RAA for this water body-pollutant combination.
- Identify milestones and dates for their achievement consistent with those in the applicable TMDL.

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

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

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

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

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

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

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

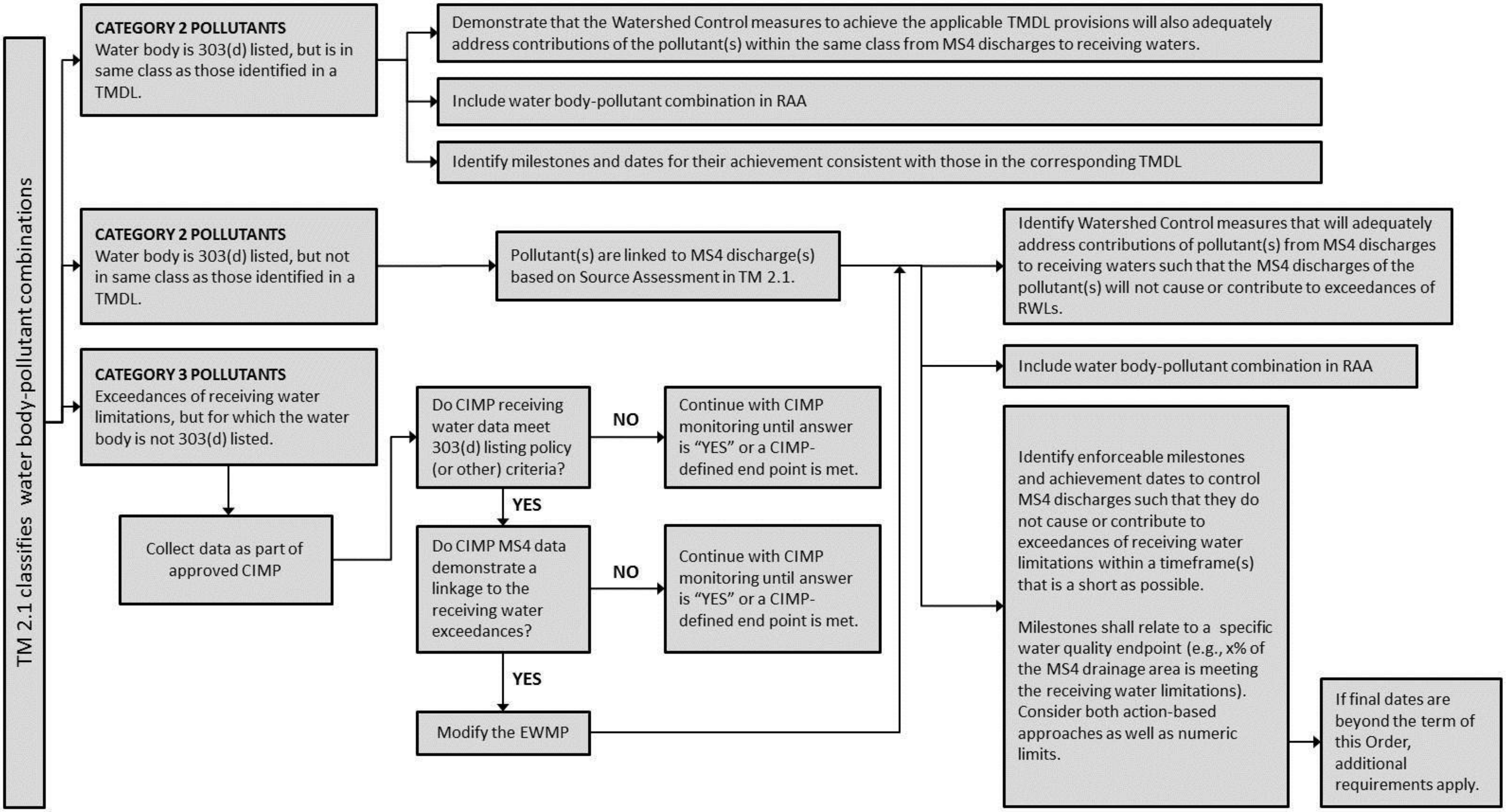
- BMPs will be identified to address contributions of the pollutant(s) from MS4 discharges to the receiving water(s), such that the MS4 discharges of the pollutant(s) will not cause or contribute to the exceedance of the receiving water limits.
- A RAA will be conducted for the water body-pollutant combination(s).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

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

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

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

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



Appendix I

Land Use-Based Wet Weather Event Mean Concentrations

Table I-1. Proposed SBPAT EMCs for Beach Cities WMG Watersheds – Arithmetic Estimates of the Lognormal Summary Statistics (means with standard deviations in parentheses)[a]

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

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

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

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

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

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

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

Appendix J

BMP Effluent Concentrations

Table J-1 summarizes the number of effluent data points (individual storm events) and percent non-detects for the pollutants and BMP types of interest for which sufficient data were available. A large percentage of non-detects can bias the effluent statistics derived from the dataset (e.g., total lead for bioretention shows a 60% non-detect ratio).

Table J-2 summarizes arithmetic averages and Table J-3 summarizes the arithmetic standard deviations of the BMP effluent concentrations that will be used in the RAA.

Consistent with IBD documentation (WWE and Geosyntec, 2007), BMP effluent concentrations are assumed to be limited by an "irreducible effluent concentration," or a minimum achievable concentration (Schuler, 1996). Lower limits are currently set at the 10th percentile effluent concentration of BMP data in the IBD for each modeled BMP type for which the BMP data show statistically significant reductions between influent and effluent means. If the differences are not statistically significant or there is a statistically significant increase, the 90th percentile is used as the minimum achievable effluent concentration, which essentially assumes no treatment except when influent to the BMP is very high. Table J-4 summarizes the irreducible effluent concentration estimates that are used in SBPAT to prevent treatment from occurring when influent concentrations are equal to or below these values.

Table J-1. Summary of Number of Data Points and Percent Non-Detects for BMP Effluent Concentration Data from the International BMP Database

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

Table J-2 International BMP Database Arithmetic Mean Estimates of BMP Effluent Concentrations

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

[1] Based on retention pond IBD category (basis per Geosyntec 2008)

[2] Based on combined wetland basin and retention pond IBD categories (basis per Geosyntec 2008)

[3] Strictly detention basin category from the IBD

[4] From Geosyntec, 2008

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

Table J-3. International BMP Database Arithmetic Standard Deviations of BMP Effluent Concentrations

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

Table J-4. International BMP Database Arithmetic Irreducible of BMP Effluent Concentrations

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

Appendix K

Sample RAA Calculations

Santa Monica Bay Watershed

Bacteria

To better illustrate the TLR calculation process, the following example scenario was developed for CML 5-02 for TMDL year 1995.

Steps 1-4: Calculate the exceedance frequency and allowable discharge days

The monitoring data in the receiving water of the analysis region draining to CML 5-02 was evaluated for exceedances of the TMDL FIB limits over all samples and only samples taken during days with precipitation greater than 0.1 inches. To determine the allowable discharge days for SMB-5-02, the 17 TMDL allowable exceedance days was divided by the exceedance frequency of samples taken during days with precipitation greater than 0.1 inches. The results of this analysis are shown in the table below.

Historical Exceedance Frequency (All events)	Historical Exceedance Frequency (Daily Rainfall > 0.10")	Allowable Discharge Days (Based on exceedance frequency with daily rainfall > 0.10")
50%	68%	17

Steps 5 - 6: Model the analysis region in SBPAT and size a retention BMP to only bypass during the allowable discharge days

The analysis region was modeled in SBPAT and resulted in 46 discharge days (i.e., midnight – midnight 24-hour periods where discharge occurred). To reduce the baseline 46 discharge days to the allowable 25 discharge days, the diversion flowrate to a hypothetical retention BMP was iteratively sized until these two numbers were equal. This process resulted in a retention BMP with a diversion flowrate of 54 cubic feet per second (cfs).

Steps 7: Model the hypothetical retention BMP and the baseline condition in SBPAT and compare the FC loads to determine the TLR

The baseline condition for the SMB-5-02 analysis region and the hypothetical retention BMP with a diversion flowrate of 54 cfs were modeled in SBPAT for the TMDL year 1995. The table below shows the results of this modeling.

Average MS4 Baseline FC Load (10^12 MPN)	Average FC Load assuming hypothetical retention BMP (10^12 MPN)	MS4 Baseline FC Load Reduced (10^12 MPN)	% MS4 Baseline FC Load Reduced
535	287	248	46%

Dominguez Channel Watershed

Bacteria

To better illustrate the bacteria TLR calculation process, the following provides a more detailed example of the calculations used for the Dominguez portion of for Beach Cities EWMP area in TMDL year 1995.

Steps 1-4: Calculate the exceedance frequency and allowable discharge days

A wet weather day is defined as a calendar day with precipitation greater than 0.1 inches, and the three days following such day. A high flow suspension (HFS) day is a day with greater than 0.5 inches of rain and the day following such a day. Because the allowable number of exceedance days is 10% of wet days, but high flow suspension days do not count as exceedances, the allowable number of exceedance days is calculated by multiplying the number of non-HFS wet weather days by 10%. The results of this analysis are shown in the table below.

Number of wet weather days in TMDL year 1995	Number of HFS days in TMDL year 1995	Number of non-HFS wet weather days in TMDL year 1995	Allowable Exceedance Days (Based on wet weather exceedance frequency of 10%)
73	19	54	5

Steps 5-6: Model the analysis region in SBPAT and size a retention BMP to only bypass during the allowable discharge days

The analysis region was modeled in SBPAT and resulted in 20 non-HFS discharge days (i.e., midnight – midnight 24-hour periods when discharge occurred), and the bacteria concentration in each one exceeded 4000 MPN/100mL. To reduce the baseline 20 non-HFS discharge days to the allowable 5 discharge days, the diversion flowrate to a hypothetical retention BMP was iteratively sized until 5 non-HFS discharge days occurred in the model. Note that discharges still occurred on HFS days, but these are not exceedances. This process resulted in a retention BMP with a diversion flow rate of 470 cubic feet per second (cfs).

Steps 7: Model the hypothetical retention BMP and the baseline condition in SBPAT and compare the FC loads to determine the TLR

The baseline condition analysis region and the hypothetical retention BMP with a diversion flow rate of 470 cfs were modeled in SBPAT for TMDL year 1995. The table below shows the results of this modeling.

Average baseline FC load (10^12 MPN)	Average FC load assuming hypothetical retention BMP (10^12 MPN)	Target Load Reduction (10^12 MPN)	Target Load Reduction (%)
1,523	721	802	53%

Metals - Copper

To better illustrate the metal TLR calculation process, the following example scenario was developed for the copper. The analysis was similar for all three metals.

Steps 1-2: Model the analysis region in SBPAT to estimate the baseline load

The analysis region was modeled in SBPAT from 11/1/2002 to 10/31/2012 to obtain daily flow, and loads for each wet day. Since SBPAT only includes wet weather flows, the days that SBPAT had any non-zero flow on were considered a wet day.

Steps 3: Find the 90th percentile load day and calculate allowable load

The 90th percentile load day was in that 10-year period was found and the load and volume on that day were recorded. The 90th percentile load day for copper was 11/30/2007. The allowable load was calculated by multiplying the WQBEL for copper (9.7 ug/L) by the runoff volume on that day. The runoff volume on 11/30/2007 was 301 acre feet.

Step 4: Compare the allowable load to the baseline load and compute TLR

The TLR is computed as the baseline load on the 90th percentile load day minus the allowable load. The table below shows the computation results:

Baseline Load (lb)	Allowable Load (lb)	Target Load Reduction (lb)	Target Load Reduction (%)
21.1	8.0	13.2	62%

Example BMP Performance

As discussed in the Beach Cities EWMP, BMPs were modeled in SBPAT in order to demonstrate a reasonable assurance of achieving the estimated target load reductions for each analysis region. Modeled BMPs included programmatic, distributed, and regional BMPs, as discussed in Sections 2.6 and 3.6 of the EWMP. Although a variety of BMPs are modeled in SBPAT, the different BMPs achieve pollutant load reduction by one of two primary methods: (e.g., via capture and use, infiltration, and/or evapotranspiration) or volume treatment (e.g., via filtration). Both types of BMPs were modeled as part of the Beach Cities EWMP.

An example of daily influent and effluent[1] BMP performance results is provided here for a flow-through-based BMP (modeled within the Dominguez Channel Watershed for wet days between 2003 and 2012) and an infiltration-based BMP (modeled within the Santa Monica Bay Watershed for the 90th percentile critical year, 1995). Flow volume, pollutant concentration, and load results were generated from the quantification analysis component of the SBPAT model, which:

- Calculates and tracks inflows to BMPs, treated discharge, bypassed flows, evaporation, and infiltration at each 10 minute time step;
- Distinguishes between individual runoff events by defining six-hour minimum inter-event time in the rainfall record, yet tracks inter-event antecedent conditions;
- Tracks volume through BMPs and summarizes and records these metrics by storm event; and
- Produces a table of each BMP's hydrologic performance, including concentration and load metrics by storm event, and consolidates these outputs on an annual basis.

Figure K-1 shows the modeled influent and effluent total zinc results for the Artesia Blvd and Hawthorne Blvd Filtration flow-through BMP, which is proposed to treat the DC-RB/MB analysis region (See Section 3.6.4). Similarly, Figure K-2 shows the modeled influent and effluent fecal coliform results for the infiltration-based Manhattan Beach Infiltration Trench scenario, which is proposed to treat the SMB-5-02 analysis region (See Section 2.6.4). These are the controlling pollutants for each of the analysis regions shown in this example.

The flow-through BMP example (Figure K-1) demonstrates that pollutant load reduction here is primarily achieved through concentration reduction (i.e., treatment), with minor contribution from volume reduction (the only volume loss is due to soil storage and evapotranspiration). The infiltration-based BMP example (Figure K-2) demonstrates that pollutant load reduction here is primarily due to volume reduction achieved through infiltration (which completely removes this water volume and associated pollutant mass). In these figures, concentrations are shown as zero

[1] Effluent results are a combination of treated BMP effluent and untreated bypass for each BMP. The determination of what flows are treated and what flows are bypassed is a function of BMP design parameters, rainfall-runoff patterns, and antecedent conditions.

when there is no volume (for example, when influent is completely infiltrated for a storm such that there is no effluent discharge from the BMP).

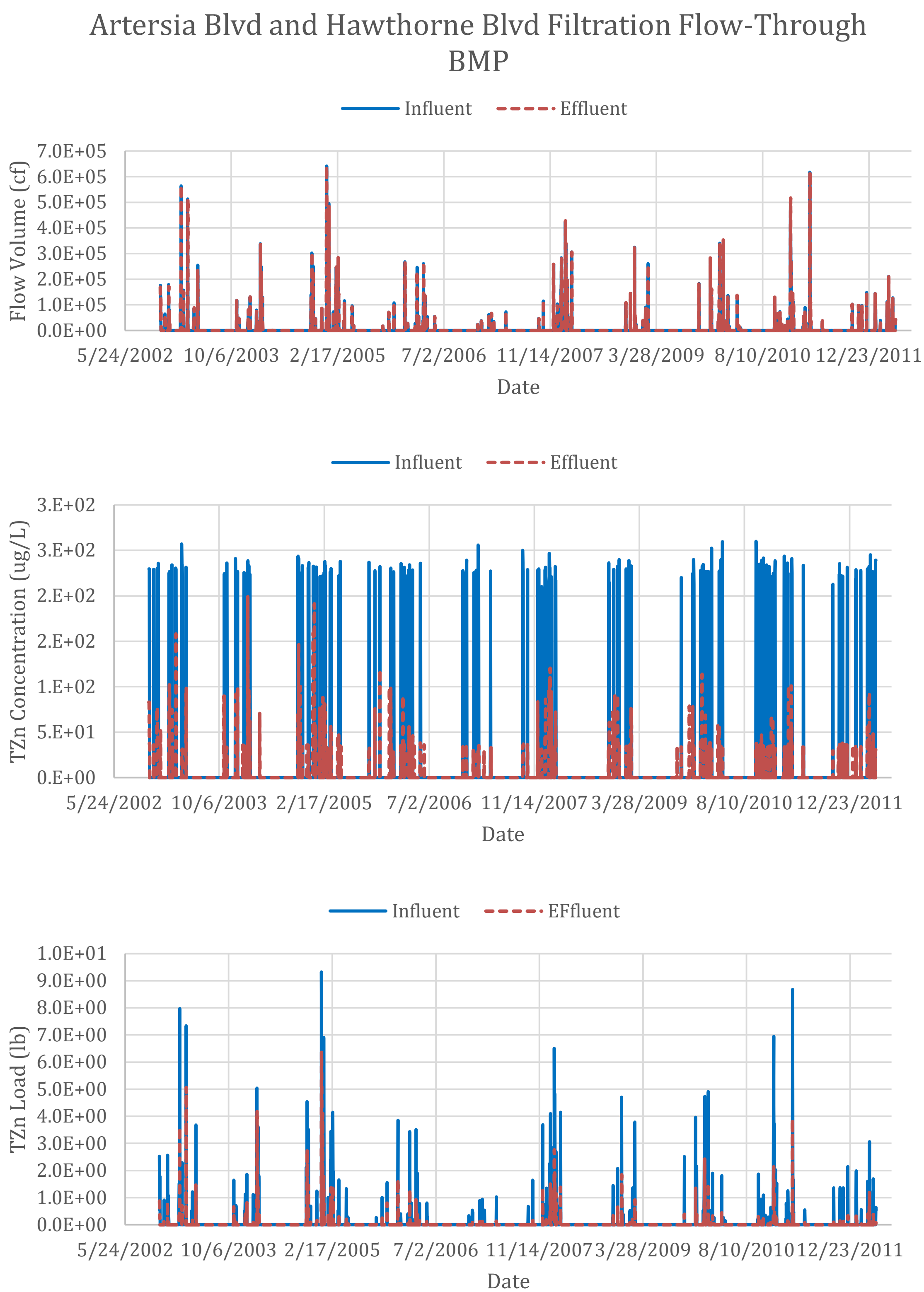


Figure K-1. Time-Series Results of Flow-Through Regional BMP Proposed for DC-RB/MB Analysis Region

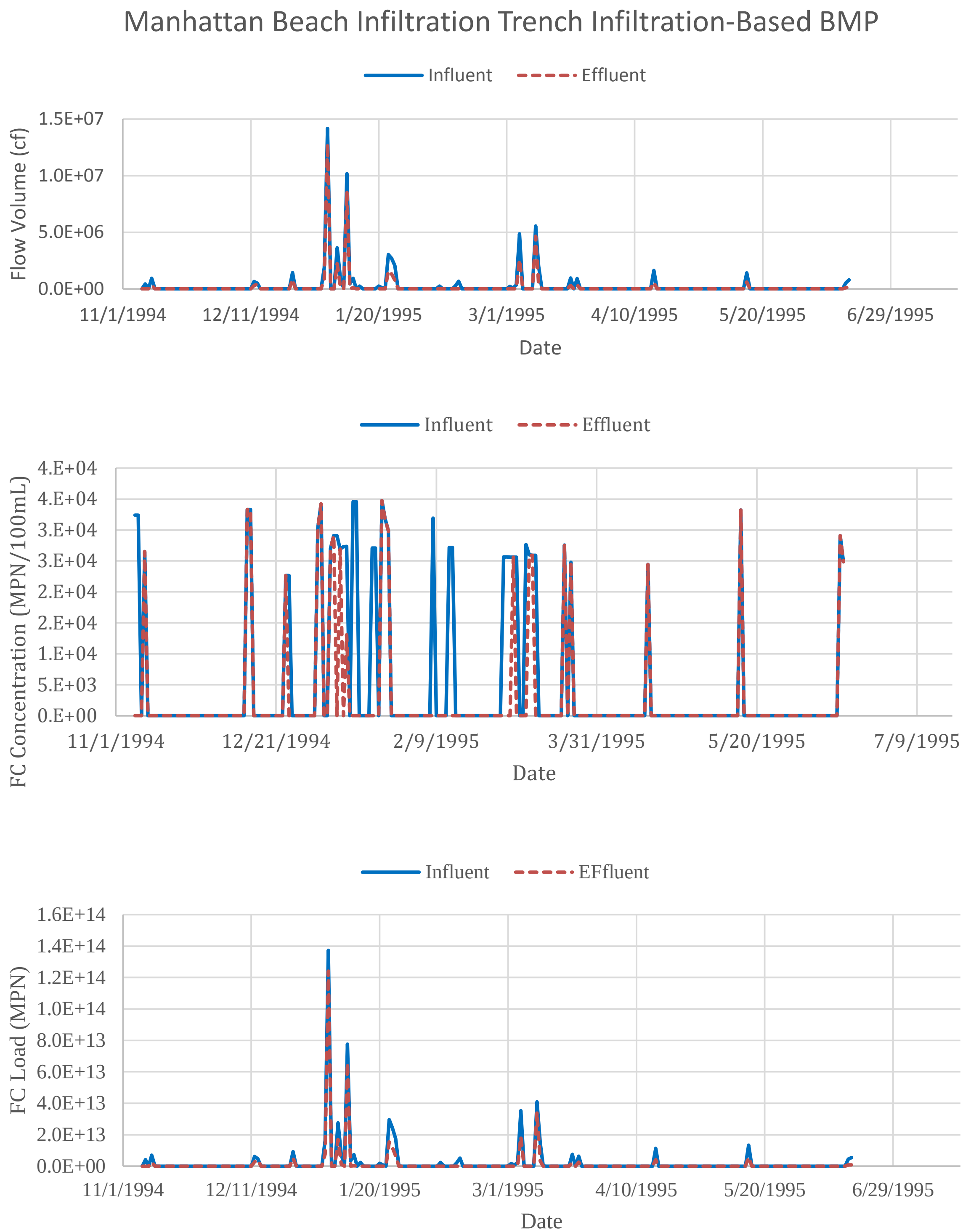


Figure K-2. Time-Series Results of Infiltration-based BMP Proposed for SMB-5-02 Analysis Region

Example Compliance Demonstration

Figures K-3 and K-4 provide example illustrations of the volume, pollutant load, and concentration reductions achieved by the total combination of existing and proposed structural and non-structural BMPs in the Beach Cities EWMP Area for Santa Monica Bay and Dominguez Channel, respectively. On the far left side of Figures K-3 and K-4, the modeled runoff volume, pollutant load, and pollutant concentration for the baseline condition in the SMB-5-02 and DC-RB/MB analysis regions are presented, respectively. Moving to the right along the x-axis of Figures K-3 and K-4, each set of bars demonstrates the cumulative effectiveness of the various BMP types on effluent volume, concentration, and load. For example, since a 5 percent pollutant load and concentration reduction is assumed for the non-modeled programmatic BMPs in the Beach Cities EWMP Area, the second set of bars demonstrates a 5 percent reduction in pollutant concentration and load, while the runoff volume remains unchanged. Moving to the next set of bars, the cumulative effect of the public retrofit incentives and redevelopment BMPs results in a slight reduction in runoff volume, pollutant concentration, and pollutant load.

For analysis regions SMB-5-02 and DC-RB/MB, the examples demonstrate that the estimated allowed load (i.e., the baseline load minus the target load reduction) is achieved during the critical period by the cumulative effect of the modeled BMPs as described in Section 2.7 and 3.7 of the Beach Cities EWMP, respectively. Programmatic BMPs, public incentives and redevelopment, existing/planned BMPs, and proposed BMPs are all expected to reduce runoff volume, bacteria concentrations, and bacteria loads in SMB-5-02 and runoff volume, zinc concentration, and zinc loads in DC-RB/MB, as compared to existing (baseline) conditions, with the largest percent concentration and load reduction achieved by the proposed BMPs.

The order of the BMPs in Figures K-3 and K-4 does not represent a proposed schedule or suggested order of implementation, but is provided as an example to demonstrate how all BMPs collectively achieve pollutant load reduction until compliance demonstration is achieved (i.e., when the target load reductions are met or exceeded by the modeled BMP load reductions).

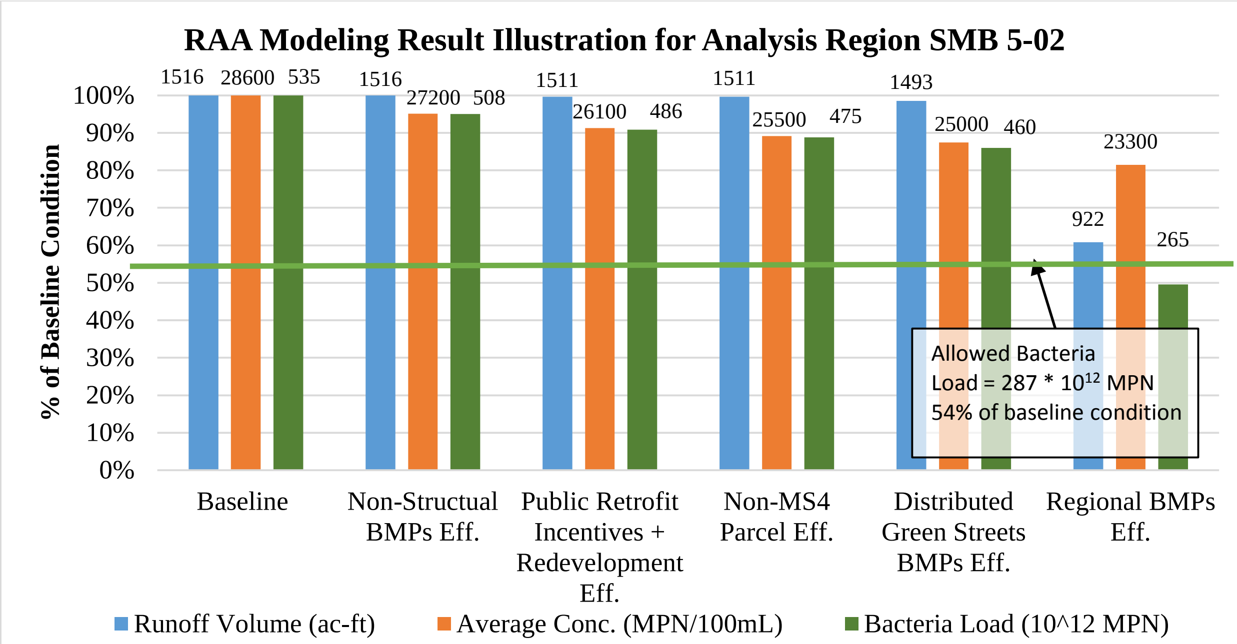
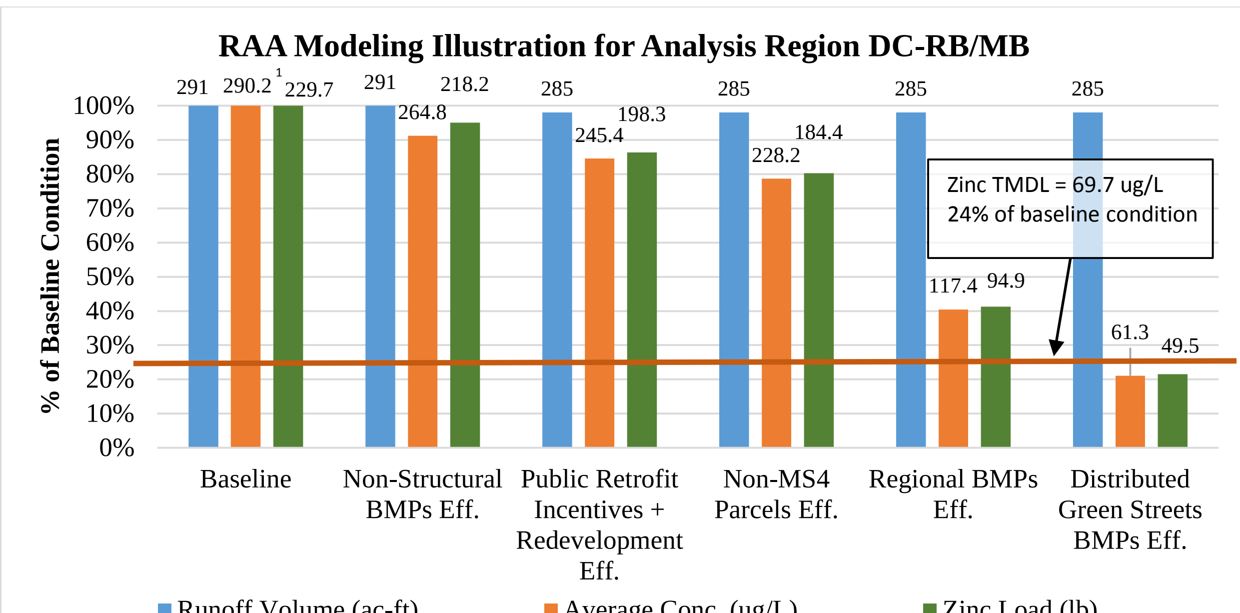


Figure K-3. RAA Modeling Example Illustration for Santa Monica Bay Analysis Region SMB 5-02: Total Annual Volumes, Annual Average Concentrations, and Total Annual Loads Shown for Multiple Modeled BMP Scenarios



[1] Baseline Zinc concentration is a direct model output. All other interim zinc concentrations are calculated as zinc load divided by runoff volume.

Figure K-4. RAA Modeling Example Illustration for Dominguez Channel Analysis Region DC-RB/MB: Total Annual Volumes, Annual Average Concentrations, and Total Annual Loads Shown for Multiple Modeled BMP Scenarios

Appendix L

MCM Customization Summary

Table L-1. Enhancements to MCMs

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
D.2 Progressive Enforcement (Applies D.6, D.7, D.8, and D.10)					
Develop and maintain a Progressive Enforcement Policy					Torrance Muni Code and City Charter Division 1 - Administration >> Chapter 1 - General provisions >> Article 2 - Penal Provisions and Division 1 - Administration >> Chapter 2 - Administration >> Article 3 - Environmental Quality Enforcement
Conduct follow-up inspection within 4 weeks of date of initial inspection					Yes
Take progressive enforcement					Any reported illicit discharges within the City will receive an incident number and the responsible party will receive a warning letter along with proper BMPs for the first offense. Second offense may receive a notice of violation and/or fines.
Retain records					Yes
Refer violations to LARWQCB					Yes
Investigate complaints from LARWQCB					Yes
Assist LARWQCB with Enforcement Actions					Yes
D.5 Public Information and Participation Program (PIPP)					
Participate in a Countywide PIPP, WMP PIPP, or individual PIPP that measurably increases knowledge and changes behavior, and involves a diversity of socio economic and ethnic communities					Attends quarterly Public Outreach Strategy meetings at LADPW or via webcast
Maintain reporting hotline					A resident or staff member can contact the City's Fire Prevention/NPDES Division who can provide general information, expedite the request by referring them to the appropriate department (i.e.: Fire if potentially hazardous illicit discharge, Public Works if a sewer overflow or to assist with clean-up of non-hazardous spill, or refer the caller to the countywide hotline, 888-CLEANLA).
Publish hotline info on web, telephone book					
ID staff/department that serve as the contact (publish this info)					

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Organize events (e.g., clean ups)		The Public Works Department coordinates and staffs an environmental booth at the 2013 two-day Hometown Fair and at the City's annual Earth Day festival. The community hosts the annual Coastal Cleanup Day event site at the Manhattan Beach Pier. The Roundhouse Aquarium co-sponsored the event, and coordinated approximately 300 volunteers.	Hosts annual Household Hazardous Waste Roundup, and annual compost giveaway events. The Public Works Department coordinates and staffs an environmental booth at the Public Safety Fair.	Hosts annual Household Hazardous Waste Roundup, and annual compost giveaway events. The City also hosts an annual Coastal Cleanup Day cleanup at Hermosa Pier.	Hosts Annual Environmental Fair, Hazardous Waste Roundups, Plastic Bag Exchange and Coastal Cleanup Day at Torrance Beach.
Residential Outreach (Individually or with group):	The Beach Cities promote and often host local Ocean Friendly Landscaping Workshops in cooperation with the South Bay Environmental Services Center (a non-profit center established by the South Bay Council of Governments), West Basin Municipal Water District and Surfrider Foundation.	The City has installed and maintains twenty-four (24) pet waste collection stations equipped with disposable bags for collecting and disposing of pet waste (Mutt Mitts®). These pet waste stations are located in municipal parks, along the Strand, and the linear greenbelt with a high frequency of use by residents with dogs. Three of the City's parks include off-leash dog runs equipped with pet waste stations. The City Newsletter is distributed quarterly to all residents in the City and is also available online--the newsletter provides environmental resource information and program updates to the community.	All City parks and the Esplanade are equipped with pet waste collection stations. The City Newsletter is distributed quarterly to residents in the City and is also available online--the newsletter provides various environmental resource information and program updates to the community.	All City parks and the linear greenbelt are equipped with pet waste collection stations and as well as along The Strand.	City Parks are equipped with pet waste collections stations. City participates in Ocean and Drought Friendly Landscaping Workshops. The City website provides environmental resource information and program updates to residents.
Public Service Announcements		Plastic bag ban effective in 2012. Ban on take-out/restaurant polystyrene food service ware became effective October 2013. Existing smoking ban was expanded/revised August 2014.	City has "Prohibition of smoking in beaches and recreational areas" Ordinance.	Ban on take-out/restaurant polystyrene food service ware became effective March 2013. Smoking Ban effective March 2012.	Smoking Ban effective 2012
(Develop) Public education materials on: vehicle fluids; household waste; construction waste; pesticides, fertilizers, and integrated pest management (IPM); green wastes; and animal wastes		Single and multi-family residents can participate in HHW collection as part of their base refuse rate (per household or unit), and receive unlimited scheduled pick-ups throughout the year at no additional charge. A free pharmaceutical drop off box is located in the Police/Fire lobby available for all residents to dispose controlled and uncontrolled pharmaceuticals. Battery recycling collection containers are located at 4 city facilities to provide residents with a convenient means for proper disposal of used batteries.		Project Pollution Prevention brochures on disposing of paint, oil, swimming pool chemicals and the like have been developed.	BMP brochures include automotive maintenance and car care, landscaping, roadwork and paving, general construction and brochures for proper disposal of paint & electrical items, cigarette waste, dog waste, oil, and pool chemicals have been developed and are made available at City outreach and environmental events and public counters.

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Distribute public education materials at points of purchase	Clean Bay Restaurant Program brochure distributed through participating restaurants to encourage public support for certified restaurants.		Project Pollution Prevention brochures are provided to residents and contractors at the public counter when they purchase permits.	Project Pollution Prevention brochures are provided to residents and contractors at the public counter when they purchase permits.	Clean Bay Restaurant Program brochure distributed through participating restaurants to encourage public support for certified restaurants. Pollution prevention brochures are made available at public counter for residents and contractors.
Maintain stormwater website	Jurisdictional Groups 5 & 6 as part of SMBBB TMDL Implementation established www.southbaystormwaterprogram.com	The City maintains an integrated environmental program "Going Green" web page that is accessible from the home page of the City's website. There, residents can stay abreast of local environmental initiatives and workshops (http://www.citymb.info/city-services/going-green). To specifically target measures to prevent runoff from residential properties, the City provides resources on Ocean-Friendly Gardens on its website: http://www.citymb.info/city-services/going-green/ocean-friendly-garden-sustainable-landscape, and continues to promote Sustainable Landscaping principles in its Green Code planning requirements for new projects or significant remodels. The Public Works Department frequently updates its webpage with environmental program information http://www.citymb.info/city-officials/public-works/environmental-programs and current issues of interest.		City has a Go Green Sustainability page on its website: http://www.hermosabch.org/index.aspx?page=332 Beach and Ocean Resources are featured on: http://www.hermosabch.org/index.aspx?page=477	City provides link to Jurisdictional 5 & 6 website, in addition to updates of environmental programs information and ocean/drought friendly landscaping workshops.
Provide schools with materials to educate children (K-12); can use state produced materials		Grades of Green program at Manhattan Beach elementary schools: http://www.gradesofgreen.org. The Roundhouse Marine Studies Lab and Aquarium located at the end of the Manhattan Beach Pier provides outreach to thousands of students through hands-on pollution and ocean awareness classes.		Grades of Green program at Hermosa Beach schools: http://www.gradesofgreen.org	The Stormwater Education Coordinator (Community Development), Waste Management Coordinator (Public Works) visit local schools to educate students at every age level regarding stormwater pollution prevention, recycling and conduct interactive, hands-on presentations and workshops. The students are also provided information and made aware of opportunities to volunteer or receive community service by attending a City sponsored cleanup event.
D.6 Industrial/ Commercial					

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Track Critical Sources - maintain inventory (watershed based or lat/long recorded)					Yes
Educate - notify critical sources of BMP requirements					Yes
Implement a Business Assistance Program for select sectors or small businesses - technical assistance, and distribute materials to specific sectors	Clean Bay Restaurant Program in partnership with Santa Monica Bay Restoration Commission	The City of Manhattan Beach and its franchise solid waste hauler successfully launched the Green Business Program to recognize businesses that incorporate sustainability into their daily business practices with the objective of reducing waste. The City's franchise solid waste hauler offers businesses free commercial waste audits to assess areas of improvement for the reduction of waste. Outreach to businesses continues via canvasing, program materials, flyers, FAQ, website updates, decals and press releases and green business audits. The City also offers a Green Business certification through the California Green Business Network for local businesses that meet certain criteria to reduce impacts on the environment. Businesses that participate in the City's program incorporate practices to reduce waste, save water, or reduce energy consumption. In 2014, eight (8) new businesses were added to the program.			Torrance distributes flyers, "Environmental Resources for Businesses and "Get Green" brochures to the local businesses. The Torrance Chamber of Commerce distributes the Clean Bay Certification program brochure to local restaurants and maintains a supply at their public counter, and features articles on ocean pollution prevention in their quarterly magazine. Clean Bay Restaurant Program in partnership with the Santa Monica Bay Restoration Commission.
Inspect Commercial Sources	Restaurants inspected annually instead of twice during 5-year permit. The food service establishments are inspected against a comprehensive 34-point storm water inspection checklist that requires 100% compliance in order for the facility to be awarded a Clean Bay Restaurant Certificate by the Santa Monica Bay Restoration Commission.				Commercial facilities including Nurseries, Automotive are inspected every other year instead of twice during 5-year permit. Food service establishments are inspected annually against a 26 point storm water inspection checklist that requires 100% compliance in order for the facility to be awarded a Clean Bay Restaurant Certificate by the Santa Monica Bay Restoration Commission.
Inspect Industrial Sources - Initial mandatory inspection		N/A -- No industrial facilities in Manhattan Beach		N/A -- No industrial facilities in Hermosa Beach	Industrial are inspected every other year instead of twice during 5-year permit.
Secondary mandatory inspection					Yes

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
No Exposure - evaluate and conduct 2nd inspection at 25% of facilities					
As needed, conduct Progressive Enforcement follow-up inspections (see Part VI.D.2)					Yes
D.7 Planning and Land Development					
Update ordinance/design standards to conform with new requirements (LID and Hydromod)				Hermosa LID ordinance requires all new development projects to implement LID, no minimum size threshold whereas MCM in permit has size threshold.	LID ordinance requires all new development projects to implement LID and Green Street Policy.
Optional: Establish alternative compliance for technical infeasibility, e.g., allow onsite biofiltration or offsite infiltration or gw replenishment or retrofit					
Optional if allowing offsite mitigation: Develop a prioritized list of offsite mitigation projects					
Optional if allowing offsite mitigation: Develop a schedule for completion of offsite projects (must be with 4 yrs of the Certificate of Occupancy of the first project that contributed funds)					
Optional if allowing offsite mitigation: Notice offsite projects to RB website					
Optional if allowing offsite mitigation: List of mitigation projects descriptions and estimated pollutant and flow reductions					
Optional if allowing offsite mitigation: Provide aggregated comparison of alternative compliance to results that would have been expected with on site retention of the SWQDv					
Optional: Submit documentation that a previously adopted LID ordinance provides equivalent pollutant loading and flow reduction					
Plan Review process - check LID and BMP sizing, etc.,			Any development in the Coastal Zone that requires a Coastal Development Permit is required to meet the LID standards.	Since 2010, the City has been requiring LID BMPs for residential projects through the plan review process.	City requires LID BMPs for development projects through the plan review process.
Establish internal agreements with structure for communication and authority for departments overseeing plan approval and project construction					
Require O&M plan for LID, treatment and hydromod BMPs					
Implement tracking and enforcement program for LID, treatment and hydromod BMPs					
Inspect all development sites upon completion and prior to occupancy certificates					
Verify O&M of BMPs operated by Permittee through inspection					
Develop maintenance inspection checklist					

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Require private parties that operate BMPs to submit verification of O&M; enforce as needed					
As needed, conduct Progressive Enforcement follow-up inspections (see Part VI.D.2)					
D.8 Development Construction Program					
Update erosion and sediment control ordinance/procedures to conform with new requirements				These requirements have been in place for years prior to adoption of the 2012 MS4 Permit: An Owner's Certification listing Minimum BMPs for All Construction Sites with signatures by Architect/Engineer of Record and Landowner are required for all building permits. Contractors are required to submit plans with appropriate construction BMPs identified. Standard notes incorporated into plans include provisions regarding Water Quality Requirements. Contractors are required to review the City's Storm Water Ordinance, guidelines for minimum construction BMPs and sign a statement acknowledging this and agreeing to comply with these rules and regulations. Projects disturbing one acre or more of soil must submit a Storm Water Pollution Prevention Plan (SWPPP) and obtain coverage under the statewide General Stormwater Permit for Construction Activities.	Projects disturbing one acre or more of soil must submit a Storm Water Pollution Prevention Plan (SWPPP) and obtain coverage under the statewide General Stormwater Permit for Construction Activities.
Sites < 1 acre; inspect based upon water quality threat				A building/grading site is inspected on average about 12 times and each time the inspector is on site, the condition of stormwater BMPs is noted by the inspector and, if necessary, corrections required.	
Establish priority inspection process					Inspection for compliance with construction BMPs are made in the course of every site visit during the construction. Building Inspectors thoroughly go through the site's BMP checklist at every inspection and spot checks are done before, during, and after storm events to ensure correct placement of erosion control measures where required.
Site < 1 acre; Require sites with soil disturbing activities to implement minimum BMPs					

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Require construction sites to prepare erosion sediment control plan(ESCP); review and approve (≥ 1 acre)					
Verify construction sites coverage under the CGP and 401 cert					
Develop/implement ESCP review checklist					
Require construction sites to adhere to standards and make standards readily available					
Conduct inspections at public and private sites (at least 1x/2 weeks for high threat sites (more frequently when rain is predicted or occurs; at least monthly for lower threat; also must inspect during all phases of construction - at least 3 times)					
Develop/implement SOPs/inspection checklist					
Track number of inspections for inventoried sites and verify minimum inspections are completed					
As needed, conduct Progressive Enforcement follow-up inspections (see Part VI.D.2)					
Train plan review staff and inspectors				City inspectors received CGP QSD/P training by a certified Trainer of Record, not simply "equivalent" training.	City Inspectors have or are required to get QSD/P training by a certified trainer.
Staff must be knowledgeable in QSD/P key objectives, local BMPs standards					
D.9 Public Agency Activities					
Require public construction sites to implement Planning and Land Development requirements, implement Erosion and Sediment Control BMPs, and obtain Construction General Permit coverage					The Building (Grading) and Development Review Divisions use a boilerplate during Plan Check and Construction design phase to make all developments aware of the BMP requirements
Maintain inventory of Permittee owned facilities (including parks and recreation faclities,)					Yes
Update inventory					Yes
Develop retrofit opportunity inventory; evaluate and rank		The City has retrofit 130,000 square feet of porous concrete paving on seven (7) municipal parking lots. The Manhattan Village Soccer Park is surfaced in synthetic turf which eliminates the need for fertilizer, pesticides or irrigation thereby reducing pollutant loads and nuisance flows from recreational areas. These playing surfaces are maintained via dry methods (vacuuming).			The Torrance Soccer Park is surfaced in synthetic turf which eliminates the need for fertilizer, pesticides or irrigation thereby reducing pollutant loads and nuisance flows from recreational areas. These playing surfaces are maintained via dry methods. The City is in the process of retrofitting all catch basins with automatic retractable grates which prevent trash from entering the stormwater system.

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Cooperate with private land owners to encourage site specific retrofitting; includes pilot projects and outreach					N/A
Obtain IGP coverage for public facilities where appropriate					N/A
Develop procedures to assess impact of flood mgt projects on water quality of receiving waters; evaluate to determine if retrofitting is feasible					N/A
Evaluate existing structural flood control facilities to determine if retrofitting facility to provide additional pollutant removal is feasible					N/A
Implement source control BMPs at Permittee owned facilities/activities					Yes
Require city-hired contractors to implement source control BMPs					Yes
Prevent vehicle/equipment washing discharges to the MS4, including fire fighting and emergency response vehicles					Departments receive targeted training in applying BMPs to prevent spills or runoff when washing vehicles and cleaning equipment. Fire Stations and City Facilities are equipped with clarifiers. The City Yard is equipped with an automated car washing system that is covered and contained.
Ensure new/redeveloped/replaced wash facilities are plumbed to the sanitary sewer or self contained.					Yes
Implement IPM program				Hermosa Beach has designated a pesticide free zone along the Valley Drive/Ardmore greenbelt and thus uses no pesticides in maintaining this swath of public recreational area which runs the length of the City.	Yes
Ordinances, policies, and procedures reflect IPM techniques and include commitments and schedules to reduce the use of pesticides that cause impairments					Non-pesticide remedies are considered and used prior to pesticide/fertilizer application.
Annually update in inventory of pesticides used by agency; quantify pesticides used by staff and contractors; demonstrate IPM alternatives to reduce pesticide use					Park Services maintains an inventory of pesticides, fertilizers, and chemicals used and is currently implementing greener, safer alternatives.

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Use SOPs for pesticide application					Public Works/Streetscape & Community Services/Parks Services protocol or "SOP" calls for impacted landscape maintenance personnel to: 1) Apply minimum amounts of each significant material 2) Avoid application during storm events or impending storm events 3) Use of pesticides and/or fertilizers allowed after inspection of area and/or plants.
Ensure no application of pesticides or fertilizers when two or more days with a 50% chance of rain is predicted by NOAA; within 48 hrs of 1/2 inch of rain; or when water is flowing off the site					Yes
Ensure staff applying pesticides are certified or working under supervision of a certified applicator in the appropriate category					Yes
Update catch basin map add GPS locations and update priority					Yes
Inspect/Clean catch basin in areas not subject to Trash TMDL- Priority A: 3x during wet season, 1x during dry 1x; Priority B: 1x during wet 1x and 1x during dry; Priority C: 1x per yr. Maintain records.				Only applies to Dominguez Channel areas and other areas prior to retrofit with trash excluders.	
Required trash management at public events				The City of Hermosa Beach has instituted a matrix of requirements for special events in the City. The requirements are phased in over three years and are tiered based on the size of the event. The requirements include measures to: 1) Reduce waste and single-use items, 2) Limit and reduce the size of handouts and flyers, 3) Control litter, contain wastes and prohibit hosing of surfaces 4) Increase recycling and solid waste diversion rates, and 5) Provide educational outreach to the public.	Provides both trash and recycling containers at City sponsored events, and provides educational outreach to the public to maximize recycling.
Place and maintain trash receptacles/capture devices at newly identified high trash generating areas		The City of Manhattan Beach maintains more than 450 trash receptacles in municipal parks and the public right-of-way. The City also maintains more than 125 additional receptacles for recyclable glass, plastic and aluminum beverage containers.	Redondo Beach maintains trash receptacles in public access areas throughout the City.	In addition to placement of refuse containers at transit stops and in parks, the City has placed over 100 recycling bins for beverage containers throughout the City, at all bus stops, in heavily-used pedestrian areas and parks.	In addition to placement of refuse containers at transit stops and in the parks, the City has placed recycling bins at bus stops and parks.

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Label storm drains					Inspects the legibility of the catch basin stencil or labels. Illegible stencils recorded and re-stenciled or re-labeled within 180 days of inspection
Inspect labels prior to each wet season					
Record and relabel illegible labels within 180 days of inspection					Yes
Post signs at access points to water bodies (open channels, creeks; lakes)					Yes
In areas not subject to the Trash TMDL, install trash excluders on catch basins or outfalls in areas defined as Priority A, or implement substantially equivalent BMPs		Ten (10) CDS® gross pollutant hydrodynamic separators have been installed on major storm drains within the City and has also installed approximately sixty (60) debris screens on catch basin openings that have historically required frequent cleaning (Priority A).	Redondo Beach has five CDS units in operation throughout the City removing trash and debris from entering the waterways.	Debris excluders are installed on 35 high priority catch basins owned by LACFCD within the City. The City has installed certified trash full capture exclusion devices on 14 City-owned catch basins in the City's commercial district along Hermosa Avenue and Pier Avenue--this was done years in advance of the Santa Monica Bay debris TMDL requirements.	Debris excluders are installed on high priority catch basins owned by LACFCD within the City--this was done years in advance of the Santa Monica Bay debris TMDL requirements.
Inspect and Remove trash and debris from open channels and other drainage structures 1x/yr before rainy season.					Yes
Eliminate discharge of contaminants during MS4 maintenance					Yes
Implement controls to limit infiltration of seepage from sanitary sewers to the storm drains					Yes
Implement routine preventative maintenance for both systems, survey sanitary sewer and MS4. May use SSO General WDR to fulfill this requirement.					Yes
Implement inspection and maintenance program for Permittee owned BMPs					Yes
Manage residual water in treatment control BMPs removed during maintenance					Yes
Street sweeping - Priority A: 2x/mo; B: 1x/mo; C: as needed, not less than 1x/yr		Streets are swept weekly and posted with no parking signs on street sweeping days.	Streets are swept weekly and posted with no parking signs on street sweeping days.	Streets are swept weekly and posted with no parking signs on street sweeping days--this exceeds the frequency even of Priority A areas in the permit for all areas in the City.	Streets are swept weekly and posted with no parking signs on street sweeping days.
Implement road construction maintenance BMPs (e.g., restrict paving activity to exclude periods of rain)					Yes

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Inspect and/or clean Permittee owned parking lots 2x/mo					Sweeping of City-owned parking lots twice a month. Trash receptacles in most City controlled public parking lots and at City sponsored events.
Train employees and contractors on stormwater requirements					All NPDES Municipal General Information Training is conducted in-house by the NPDES Analyst. In addition, NPDES training in trade specific and program specific areas is continuously conducted Citywide. Information to Training Resources is provided at these meetings. The Torrance Fire Department also conducts in-house training for staff regarding NPDES inspections, enforcement procedures and review of BMP's.
Train employees and contractors on pesticide use					Yes
D.10 Illicit Connections and Illicit Discharges Elimination					
Continue IC/ID program		Manhattan Beach adopted a strict water conservation ordinance that became effective July 2, 2009. The City of Manhattan Beach has also adopted the California Water Efficient Landscape ordinance applicable to new landscapes as well as CalGreen Code provisions for landscaping and irrigation.	Redondo Beach has a Landscape Regulations included in the Municipal Code, including water conservation.	Hermosa Beach adopted a Water Conservation and Drought Management Plan Ordinance and a Water Efficient Landscape Ordinance. The City enforces the water conservation ordinance as part of the Illicit Connections Illicit Discharge program.	The City is adopting a Water Conservation and Drought Management Program and has an ongoing Illicit Connections and Illicit Discharge Program.
Written procedures for conducting investigations and eliminations					Torrance Spill Procedure (Policy 10) and NPDES Ordinance posted on the City's website, detailing the progressive enforcement process.
Initiate investigation within 72 hours from becoming aware of the discharge					Fire Department is the first responder to spills, run-off and illicit discharges, and upon initial contact, responds to site within 15 minutes. Follow-up investigations are conducted within 48 hours.

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Implement solutions to eliminate discharge; conduct follow-up investigation to verify elimination; follow Progressive Enforcement Plan (see Part VI.D.2)		Three low flow diversions are operational within the City to eliminate dry weather discharge and divert to the sanitary sewer. The Greenbelt Infiltration Trench project utilizes the linear greenbelt parkland which runs through the City of Manhattan Beach (City) to intercept and infiltrate dry weather and wet weather low flows from 55 acres of existing residential development. Trash enclosures for new commercial facilities are required to be covered, enclosed and plumbed to the sanitary sewer.	A low flow diversion to a Filterra system with infiltration is operational at the Saphire stormdrain and a low flow and stormwater runoff diversion at the Alta Vista stormdrain is operational within the City, thereby eliminating polluted runoff from reaching our waterbodies.	Hermosa Strand Infiltration Trench diverts dry weather flows year-round from the 76-acre drainage area of the Pier Avenue Storm drain in the City's downtown commercial area. Pier Avenue Improvement Project is a “green” multi-benefit streetscape improvement which retrofits the City’s main street to capture and treat stormwater/urban runoff in the downtown corridor (36-acre drainage area).The Public Works Department implements green street retrofits whenever the opportunity arises as part of capital improvement projects through installation of infiltration boxes within the public right-of-way along the curb-and-gutter. These infiltration boxes designed by the City’s engineering staff intercept, filter, and infiltrate low flows prior to entry into catch basins.	The City has completed a Stormwater Basin Enhancement Project to maximize infiltration of dry weather and wet weather runoff and to reduce and biologically treat flows and pollutants to Santa Monica Bay.
When discharge originates upstream of jurisdiction, notify the upstream jurisdiction and LARWQCB within 30 days					
Initiate investigation within 21 days for illicit connection					
Permit or document illicit connection that only discharge stormwater or allowed non-stormwater					
Eliminate illicit connection within 180 days of investigation					
Facilitate public reporting via hotline					City of Torrance Community Development Department, 310-618-5990 City of Torrance Fire Prevention, 310- 618- 2973 during regular business hours, 24 hr contact Fire Dispatch for emergencies (911) (spills or discharges, complaints) at 310-781-7042. Complaints are entered into system and assigned case #.
Signage adjacent to open channels provide info re: public reporting					
Document calls and actions associated with hotline					Complaints are entered into system and assigned case # for staff follow up

2012 Permit Requirement	General Beach Cities MCM Enhancement (all agencies)	City-Specific MCM Enhancement			
		City of Manhattan Beach	City of Redondo Beach	City of Hermosa Beach	City of Torrance
Implement procedures on responding to complaints; evaluate and update procedures					**Fire/Hazardous Materials Division-** An incident number is assigned to every response. Staff can refer back to the incident number to track repeat illicit discharges.. The City's GIS system creates maps to document illicit discharges and spill locations. **CDD/PW-** illicit discharge or connection the information is recorded and maintained in a database. Each incident or case is given as tracking number and as enforcement actions are taken or inspections occur, the activity is documented in the system.
Implement a spill response plan					PW and Fire both maintain a spill prevention protocol to address illicit discharge control: "*Torrance Spill Policy & Procedure (Policy 10)*". The policy is posted on the City website.
Train staff and contractors on ID/IC					Annual training is provided to the respective departments and divisions that incorporates an ID/IC video and discussion. PW and Fire both maintain a spill prevention protocol to address illicit discharge control.
Create a list of positions and contractors that require ID/IC training					

Appendix M

LID Ordinances

ORDINANCE NO. _______

AN ORDINANCE RELATING TO LOW IMPACT DEVELOPMENT AND STORMWATER MANAGEMENT AND POLLUTION CONTROL AND AMENDING THE HERMOSA BEACH MUNICIPAL CODE AND REPEALING CONFLICTING OR REDUNDANT PROVISIONS OF THE GREEN BUILDING STANDARDS

The City Council of the City of Hermosa Beach does ordain as follows:

Section 1. Chapter 8.44 of Title 8 of the Hermosa Beach Municipal Code is amended in its entirety to read as follows:

Chapter 8.44
STORMWATER AND URBAN RUNOFF POLLLUTION CONTROL REGULATIONS

Sections:

8.44.010 Title

This Chapter shall be known as the "City of Hermosa Beach Storm Water Management and Pollution Control Ordinance".

8.44.020 Findings

A. The Congress of the United States (hereinafter "Congress") has determined that pollutants contained in storm water and dry weather runoff are responsible for the environmental degradation of oceans, lakes, rivers, and other waters of the United States.

B. Congress, in 1987, amended the Clean Water Act of 1972 to reduce pollutants discharged into the waters of the United States by extending National Pollutant Discharge Elimination System (hereinafter "NPDES") requirements to regulate storm water and dry weather runoff discharge into municipal storm drain systems.

C. Storm water and dry weather runoff flows from individual properties onto streets, then through storm drains to coastal waters along the City of Hermosa Beach.

D. The City of Hermosa Beach is a co-permittee under the "Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4" (Order No. R4-2012-0175), NPDES Permit No. CAS004001, effective December 28, 2012, issued by the California Regional Water Quality Control Board - Los Angeles Region, which also serves as a NPDES permit under the Federal Clean Water Act. As a co-permittee, the City is required to maintain adequate legal authority within its respective jurisdiction to control pollutant discharges and to require the use of control measures to prevent or reduce the discharge of pollutants into the MS4 to achieve water quality standards.

E. In order to control, in a cost-effective manner, the quantity and quality of storm water and dry weather runoff to the maximum extent practicable, the adoption of reasonable regulations, as set forth herein, is essential.

F. It is the intent of this ordinance to simplify and streamline the Hermosa Beach municipal code with respect to stormwater low impact development provisions for new development and redevelopment projects by incorporating the substantive elements of the storm water provisions of Chapter 15.48 Green Building Standards of the Hermosa Beach Municipal Code into this Chapter.

G. The City of Hermosa Beach is small in geographic area, comprising 1.4 square miles. Accordingly, it is reasonable to simplify the determination of the storm water quality design volume for new development and redevelopment projects by adopting a single design storm depth applicable to all project sites within the city while meeting the intent of the Municipal NPDES Permit. The stormwater quality design volume is defined by the Municipal NPDES Permit as the greater of either the runoff from the 0.75 inch, 24-hour rain event or the 85th percentile, 24-hour storm as determined from the Los Angeles County 85th percentile precipitation isohyetal map. According to the referenced map, the largest 85th percentile, 24-hour rain event within the City of Hermosa Beach is approximately 0.77 inches. Thus to simplify regulatory requirements and streamline the project review process, the City of Hermosa Beach has determined to define the stormwater quality design volume as the runoff from the 0.8 inch, 24-hour rain event for all new development and redevelopment projects subject to low impact development requirements of Section 8.44.095 of this Chapter.

8.44.030 Purpose and Intent

A. The purpose of this Chapter is to comply with the Federal Clean Water Act, the California Porter-Cologne Water Quality Control Act, and the Municipal NPDES Permit where the City has jurisdictional authority by:

   1. Reducing pollutants in storm water discharges to the maximum extent practicable;

   2. Regulating illicit connections and illicit discharges and thereby reducing the level of contamination of storm water and dry weather runoff into the MS4; and

   3. Regulating non-storm water discharges to the MS4.

B. This chapter is also intended to provide the City with the legal authority necessary to implement and enforce the requirements contained in 40 CFR § 122.26(d)(2)(i)(A-F) and in the Municipal NPDES Permit to the extent they are applicable in the City, to control discharges to and from those portions of the MS4 over which it has jurisdiction as required by the Municipal NPDES Permit, and to hold dischargers to the MS4 accountable for their contributions of pollutants and flows.

C. This Chapter also sets forth requirements for the construction and operation of certain "commercial and industrial Facilities," "new development" and "redevelopment" projects, and other activities (as further defined herein), which are intended to ensure compliance with the storm water mitigation measures prescribed in the current version of the Municipal NPDES Permit, which is on file in the office of the City Clerk of this City. This Chapter authorizes the Authorized Enforcement Officer to define and adopt applicable Best Management Practices (BMPs) and other storm water pollution control measures, to grant emergency self-waivers from Municipal NPDES Permit requirements, as provided herein, to cite infractions, and to impose fines pursuant to this Chapter. Except as otherwise provided herein, an Authorized Enforcement Officer shall administer, implement, and enforce the provisions of this Chapter.

8.44. 040 Definitions

Except as specifically provided herein, any term used in this Chapter shall be defined as that term is defined in the current Municipal NPDES Permit, or if it is not specifically defined in the Municipal NPDES Permit, then as such term is defined in the Federal Clean Water Act, as amended, and/or the regulations promulgated thereunder. The following definitions apply to this Chapter only:

“Authorized Enforcement Officer" means the City Manager, Public Works Director, Community Development Director, Fire Chief or Police Chief, or the designees of those individuals.

"Automotive Service Facilities" means a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 5511, 7532-7534, or 7536-7539.

"Best Management Practices (BMPs)" means practices or physical devices or systems designed to prevent or reduce pollutant loading from storm water or non-storm water discharges to receiving waters, or designed to reduce the volume of storm water or non-storm water discharged to the receiving water. Examples of BMPs may include public education and outreach, proper planning of development projects, proper cleaning of catch basin inlets, and proper sludge or waste-handling and disposal, among others."

"City" means the City of Hermosa Beach.

"Commercial Development" means any development on private land that is not heavy industrial or residential. The category includes, but is not limited to: hospitals, laboratories and other medical facilities, government facilities, educational and religious institutions, recreational facilities, plant nurseries, multi-apartment buildings, car wash facilities, mini-malls and other business complexes, shopping malls, hotels, office buildings, public warehouses and other light industrial complexes.

"Construction" means any construction or demolition activity, clearing, grading, grubbing, excavation, or any other activity that results in land disturbance. Construction does not include routine maintenance activities required to maintain the integrity of structures by performing minor repair and restoration work, original line and grade, hydraulic capacity, or original purpose of facility; emergency construction activities required to immediately protect public health and safety (including fire prevention); clearing and grubbing of vegetation for landscape maintenance which is not associated with a larger construction project; interior remodeling with no outside exposure of construction material or construction waste to storm water; mechanical permit work; or sign permit work. See “Routine Maintenance” definition below. Where clearing, grading, or excavating of underlying soil takes place during a repaving operation, Construction General Permit coverage is required if one acre or more is disturbed or the activities are part of a larger plan of construction.

"Construction General Permit" means the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ (NPDES No. CAS000002), adopted September 2, 2009, and any successor permit to that permit.

"Control" means to minimize, reduce, eliminate, or prohibit by technological, legal, contractual or other means, the discharge of pollutants from an activity or activities.

"Development" means any construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail and other non-residential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Directly Adjacent" means situated within 200 feet of the contiguous zone required for the continued maintenance, function, and structural stability of the environmentally sensitive area.

"Discharge" means when used without qualification the "discharge of a pollutant."

"Discharging Directly" means outflow from a drainage conveyance system that is composed entirely or predominantly of flows from the subject property, development, subdivision, or industrial facility, and not commingled with the flows from adjacent lands.

"Discharge of a Pollutant" means any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source" or, any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. The term discharge includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

"Discretionary Project" is defined in the same manner as Section 15357 of the Guidelines For Implementation Of The California Environmental Quality Act contained in Title 14 of the California Code Of Regulations, as amended, and means a project which requires the exercise of judgment or deliberation when the City decides to approve or disapprove a particular activity, as distinguished from situations where the City merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations.

"Disturbed Area" means an area that is altered as a result of clearing, grading, and/or excavation.

"Dry Weather Runoff" means surface water flow produced by non-storm water resulting from residential, commercial, and industrial activities involving the use of potable and non-potable water.

"Environmentally Sensitive Area (ESA)" means an area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments (California Public Resources Code § 30107.5). Areas subject to storm water mitigation requirements are areas designated as Significant Ecological Areas by the Hermosa Beach Coastal Land Use Plan; an area designated as a Significant Natural Area by the California Department of Fish and Game's Significant Natural Areas Program, provided that area has been field verified by the Department of Fish and Game; an area listed in the Water Quality Control Plan - Los Angeles Region - Basin Plan for the Coastal Watersheds of Los

Angeles and Ventura Counties as supporting the Rare, Threatened, or Endangered Species (RARE) beneficial use; and an area identified by the City as environmentally sensitive.

"Good Housekeeping Practices" means common practices related to the storage, use, or cleanup of materials, performed in a manner that minimizes the discharge of pollutants. Examples include, but are not limited to, purchasing only the quantity of materials to be used at a given time, use of alternative and less environmentally harmful products, cleaning up spills and leaks, and storing materials in a manner that will contain any leaks or spills.

"Hillside" means property located in an area with known erosive soil conditions, where the development contemplates grading on any natural slope that is twenty-five percent or greater and where grading contemplates cut or fill slopes.

"Illicit Connection" means any human-made conveyance that is connected to the MS4 without a permit, excluding roof-drains and other similar type connections. Examples include channels, pipelines, conduits, inlets, or outlets that are connected directly to the storm drain system.

"Illicit Discharge" means any discharge into the MS4 or from the MS4 into a receiving water that is prohibited under local, state or federal statutes, ordinances, codes or regulations. The term illicit discharge includes all non-storm water discharge except authorized non-storm water discharges; conditionally exempt non-storm water discharges; and non-storm water discharges resulting from natural flows specifically identified in the Municipal NPDES Permit.

"Infiltration" means the downward entry of water into the surface of the soil.

"Inspection" means the entry and conducting of an on-site review of a facility and its operations, at reasonable times, to determine compliance with specific municipal or other legal requirements. The steps involved in performing an inspection, include, but are not limited to:

1) Pre-inspection documentation research;
2) Request for entry;
3) Interview of facility personnel;
4) Facility walk-through;
5) Visual observation of the condition of facility premises;
6) Examination and copying of records as required;
7) Sample collection (if necessary or required);
8) Exit conference (to discuss preliminary evaluation); and,
9) Report preparation, and if appropriate, recommendations for coming into compliance.

“Low Impact Development (LID)” means building or landscape features designed to retain or filter storm water runoff.

"Municipal NPDES Permit" means the "Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4" (Order No. R4-2012-0175), NPDES Permit No. CAS004001, effective December 28, 2012, issued by the California Regional Water Quality Control Board - Los Angeles Region, and any successor permit to that permit.

"Municipal Separate Storm Sewer System" or "MS4" means a conveyance or system of conveyances (consisting of roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

1) Owned or operated by a state, city, town borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of the Clean Water Act that discharges to waters of the United States;
2) Designed or used for collecting or conveying storm water;
3) Which is not a combined sewer; and
4) Which is not part of a Publicly Owned Treatment Works (POTW) as defined in 40 Code of Federal Regulations122.2.

"New Development" means land disturbing activities; structural development, including construction or installation of a building or structure, demolition of existing development and construction of a new building or structure, creation of impervious surfaces; and land subdivision.

"Non-Storm Water Discharge" means any discharge to an MS4 or from the MS4 into a receiving water that is not composed entirely of storm water.

"NPDES permit" means any waste discharge requirements issued by the California Regional Water Quality Control Board - Los Angeles Region or the State Water Resources Control Board as an NPDES permit pursuant to California Water Code Section 13370 (other than the Municipal NPDES Permit).

"Parking Lot" means land area or a facility for the temporary parking or storage of motor vehicles used for business, for industry, for commerce, for government, for nonprofit enterprises or for personal use, with a parking lot size of five thousand (5,000) square feet or more, or with twenty-five (25) or more parking spaces.

"Pollutant" means those "pollutants" defined in Section 502(6) of the federal Clean Water Act (33 U.S.C. §1362(6)), or incorporated into California Water Code Section 13373. Examples of pollutants include, but are not limited to the following:

1) Commercial and industrial waste (such as fuels, solvents, detergents, plastic pellets, hazardous or toxic substances, fertilizers, pesticides, slag, ash, and sludge);
2) Metals such as cadmium, lead, zinc, copper, silver, nickel, chromium; and non-metals such as phosphorus and arsenic;
3) Petroleum hydrocarbons (such as fuels, lubricants, surfactants, waste oils, solvents, coolants and grease);
4) Excessive eroded soils, sediment and particulate materials in amounts which may adversely affect the beneficial use of the receiving waters, flora or fauna of the State;
5) Animal wastes (such as discharge from confinement facilities, kennels, pens, recreational facilities,);

6) Substances having characteristics such as pH less than 6 or greater than 9, or unusual coloration or turbidity, or excessive levels of fecal coliform, or fecal streptococcus, or enterococcus;

"Project" means all development, redevelopment, and land disturbing activities.

"Redevelopment" means the creation, addition, or replacement of impervious surfaces on an already developed site. Redevelopment includes, but is not limited to, the following activities that meet the minimum standards set forth in this definition: (1) the expansion of a building footprint, an addition, or replacement of a structure; (2) development of a structure, including an increase in impervious area (3) replacement of impervious surface that is not part of a routine maintenance activity; and (4) land disturbing activities related to structural or impervious surfaces. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health safety.

"Regional Board" means the California Regional Water Quality Control Board-Los Angeles Region.

"Restaurant" means a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption. (SIC code 5812 Establishments primarily engaged in the retail sale of prepared food and drinks for on-premise or immediate consumption. Caterers and industrial and institutional food service establishments are also included in this industry.).

"Retail Gasoline Outlet" means any facility engaged in selling gasoline and lubricating oils.

“Routine Maintenance” includes, but is not limited to, projects conducted to:

1) Maintain the original line and grade, hydraulic capacity, or original purpose of the facility;
2) Perform as needed restoration work to preserve the original design grade, integrity and hydraulic capacity of flood control facilities;
3) Includes road shoulder work, regrading dirt or gravel roadways and shoulders and performing ditch cleanouts;
4) Update existing lines (including replacing existing lines with new materials or pipes) and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity; and
5) Repair leaks.

Routine maintenance does not include construction of new lines or facilities resulting from compliance with applicable codes, standards and regulations. New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

"Runoff" means any runoff including storm water and dry weather flows from a drainage area that reaches a receiving water body or subsurface. During dry weather it is typically comprised of base flow either contaminated with pollutants or uncontaminated, and nuisance flows.

“Significant Ecological Area” (SEA) means an area that is determined to possess an example of biotic resources that cumulatively represent biological diversity, for the purposes of protecting biotic diversity, as part of the Hermosa Beach Coastal Land Use Plan. Areas are designated as SEAs, if they possess one or more of the following criteria:

1) The habitat of rare, endangered, and threatened plant and animal species;

2) Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind, or are restricted in distribution on a regional basis;

3) Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind or are restricted in distribution in Los Angeles County;

4) Habitat that at some point in the life cycle of a species or group of species, serves as a concentrated breeding, feeding, resting, migrating grounds and is limited in availability either regionally or within Los Angeles County;

5) Biotic resources that are of scientific interest because they are either an extreme in physical/ geographical limitations, or represent an unusual variation in a population or community;

6) Areas important as game species habitat or as fisheries;

7) Areas that would provide for the preservation of relatively undisturbed examples of natural biotic communities in Los Angeles County; and

8) Sensitive coastal resource areas defined in California Public Resources Code Section 30116 as: "[s]pecial marine and land habitat areas, wetlands, lagoons, and estuaries as mapped and designated in Part 4 of the coastal plan."

"Simple LID BMP" means a BMP constructed above ground on a single-family residential home that can be readily inspected by a homeowner or inspector. Simple LID BMPs do not require an operation and maintenance plan per the Municipal NPDES Permit. Examples of such BMPs include, but are not limited to, vegetated swales, rain barrels and above ground cisterns, rain gardens, and pervious pavement.

"Site" means the land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity.

"Source Control BMP" means any schedule of activities, prohibition of practices, maintenance procedures, managerial practices or operational practices that aim to prevent storm water pollution by reducing the potential for contamination at the source of pollution.

"Storm event" means a rainfall event that produces more than 0.1 inch of precipitation in 24 hours unless specifically stated otherwise.

"Storm water" means storm water runoff and surface runoff and drainage related to precipitation events (pursuant to 40 Code of Federal Regulations § 122.26(b)(13); 55 Federal Register 47990, 47996 (Nov. 16, 1990)).

"Storm Water Runoff" means that part of precipitation (rainfall or snowmelt) which travels via flow across a surface to the MS4 or receiving waters from impervious, semi-pervious or pervious surfaces. When all other factors are equal, runoff increases as the perviousness of a surface decreases.

"Structural BMP" means any structural facility designed and constructed to mitigate the adverse impacts of storm water and dry weather runoff pollution (e.g. canopy, structural enclosure). Structural BMPs may include both Treatment Control BMPs and Source Control BMPs.

"Treatment" means the application of engineered systems that use physical, chemical, or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media adsorption, biodegradation, biological uptake, chemical oxidation and UV radiation.

"Treatment Control BMP" means any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media absorption or any other physical, biological, or chemical process.

8.44.050 Construction and Application

This Chapter shall be construed to assure consistency with the requirements of the federal Clean Water Act and the California Porter-Cologne Water Quality Control Act, and acts amendatory thereof or supplementary thereto, applicable implementing regulations, and the Municipal NPDES Permit, and any amendment, revision or reissuance thereof.

8.44.060 Prohibited Activities

A. Illicit Discharges and Connections. It is prohibited to establish, use, maintain, or continue illicit connections to the MS4, or to commence or continue any illicit discharges to the MS4. This prohibition against illicit connections is expressly retroactive and applies to connections made in the past but excludes permitted improvements to real property over which uncontaminated storm water runoff flows.

B. Littering. It is prohibited to throw, deposit, place, leave, maintain, keep, or permit to be thrown, deposited, placed, left, or maintained or kept, any refuse, rubbish, garbage, or any other discarded or abandoned objects, articles or accumulations, in or upon any street, alley, sidewalk, walk street, driveway, storm drain, inlet, catch basin conduit or drainage structure, business place, or upon any private plot of land in the City, so that the same might be or become a pollutant or be discharged to or through the MS4. No person shall throw or deposit litter in any fountain, pond, lake, stream, or other body of water within the City. This subsection shall not apply to refuse, rubbish, garbage or recyclables deposited in containers, bags, or other appropriate receptacles which are placed in designated locations for regular solid waste pick up and disposal.

C. Disposal of Landscape Debris. It is prohibited to intentionally dispose of leaves, dirt, or other landscape debris into the MS4.

D. Non-Storm Water Discharges. All non-storm water discharges into the MS4 are prohibited unless those flows are: in compliance with a separate NPDES permit; pursuant to a discharge exemption by the Regional Board, the Regional Board's Executive Officer, or the State Water Resources Control Board; associated with emergency firefighting activities (i.e., flows necessary for the protection of life or property); natural flows as defined in the Municipal NPDES Permit; conditionally exempt non-storm water discharges as defined in accordance with the Municipal NPDES Permit; or authorized as a temporary non-storm water discharge by U.S. Environmental Protection Agency (USEPA) pursuant to Sections 104(a) or 104(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Prohibited discharges include, but are not limited to:

   1. The discharge of wash waters to the MS4 when gas stations, auto repair garages, or other type of automotive service facilities (including those located at automotive dealerships) are cleaned;

   2. The discharge of wastewater to the MS4 from mobile auto washing, steam cleaning, mobile carpet cleaning, and other such mobile commercial and industrial operations;

   3. Discharges to the MS4 from areas where repair of machinery and equipment, including motor vehicles, which are visibly leaking oil, fluid or antifreeze, is undertaken;

4. Discharges of runoff to the MS4 from storage areas of materials containing grease, oil, or other hazardous substances (e.g. motor vehicle parts), and uncovered receptacles containing hazardous materials;
5. The discharge of chlorinated/brominated swimming pool water and filter backwash or swimming pool water discharges that contain any detergents, wastes, or algaecides, or any other chemicals including salts from pools commonly referred to as "salt water pools" in excess of applicable water quality objectives;
6. Discharges of runoff from the washing of toxic materials from paved or unpaved areas to the MS4;
7. Discharges to the MS4 from washing impervious surfaces in industrial/commercial areas which results in a discharge of runoff to the MS4, unless specifically required by the State's, or the City's, or Los Angeles County's health and safety codes and conducted utilizing BMPs specified in the Municipal NPDES Permit, or permitted under a separate NPDES permit;
8. Discharges from the washing out of concrete trucks, pumps, tools, and equipment into the MS4;
9. Discharges to the MS4 of any pesticide, fungicide, or herbicide, banned by the USEPA or the California Department of Pesticide Regulation;
10. The disposal of hazardous wastes into trash or recycling containers used for municipal solid waste disposal, or placed for removal by municipal solid waste disposal or permitted collector, where such disposal causes or threatens to cause a direct or indirect discharge to the MS4;
11. Discharge of any food or food processing wastes; and
12. Discharge of any fuel and chemical wastes, animal wastes, garbage, batteries, and other materials that have potential adverse impacts on water quality.

E. Discharges in Violation of the Municipal NPDES Permit. Any discharge that would result in or contribute to a violation of the Municipal NPDES Permit, either separately or in combination with other discharges, is prohibited. Liability for any such discharge shall be the responsibility of the person(s) causing or responsible for the discharge, and such person(s) shall defend, indemnify, and hold harmless the City from all losses, liabilities, claims, or causes of actions in any administrative or judicial action relating to such discharge.

F. Industrial Activities. No person shall conduct any industrial activity in the City without obtaining all permits required by state or federal law, including a NPDES general industrial activity storm water permit when required. Persons conducting industrial activities within the City shall refer to the most recent edition of the Industrial/Commercial Stormwater Best Management Practices Handbook, produced and published by the California Stormwater Quality Association, for specific guidance on selecting BMPs for reducing pollutants in storm water discharges from industrial activities.

8.44.070 Exempted Discharges and Conditionally Exempted Discharges

Discharges from those activities specifically identified in, or pursuant to the Municipal NPDES Permit as being Exempted Discharges or Conditionally Exempted Discharges shall not be considered a violation of this Chapter, provided that any applicable BMPs developed pursuant to the Municipal NPDES Permit are implemented to minimize any adverse impacts from such identified sources and that required conditions outlined in the Municipal NPDES Permit are met prior to discharge.

8.44.080 Good Housekeeping Provisions

Owners and occupants of property within the City shall implement Best Management Practices to prevent or reduce the discharge of pollutants to the MS4 to the maximum extent practicable. Treatment and structural BMPs shall be properly operated and maintained to prevent the breeding of vectors. Implementation includes, but is not limited to:

A. Septic Waste. No person shall leave, deposit, discharge, dump, or otherwise expose or create the potential to expose any chemical or septic waste to precipitation.

B. Use of Water. Runoff of water used for irrigation purposes shall be minimized to the maximum extent practicable. Runoff of water from the conditionally exempt washing down of paved areas shall be minimized to the maximum extent practicable utilizing BMPs specified in the Municipal NPDES Permit including sweeping and collection of debris for trash disposal. Conditionally exempt non-storm water discharges of roadway/driveway wash water only include those discharges resulting from use of high pressure, low volume spray washing using only potable water with no cleaning agents. Conditionally exempt non-storm water discharges of roadway/driveway wash water do not include hosing of any driveway or roadway with a garden hose with a pressure nozzle. Water used for irrigation purposes is also subject to Chapter 8.56 of this Code.

C. Storage of Materials, Machinery, and Equipment. Machinery or equipment that is to be repaired or maintained in areas susceptible to or exposed to storm water, shall be placed in a manner so that leaks, spills and other maintenance-related pollutants are not discharged to the MS4.

D. Removal and Disposal of Oil, Chemicals, Debris, or Other Pollutionable Materials from Industrial/Commercial Motor Vehicle Parking Lots. Industrial/commercial motor vehicle parking lots with more than twenty-five (25) parking spaces that are located in areas potentially exposed to storm water shall be swept regularly (including use of absorbent material if necessary) or other equally effective measures shall be utilized, to remove oil, chemicals, debris, or other pollutionable materials from such parking lots.

E. Food Wastes. Food wastes generated by non-residential food service and food distribution sources shall be properly disposed of and in a manner so such wastes are not discharged to the MS4.

F. Best Management Practices. BMPs shall be used in areas exposed to storm water for the removal and lawful disposal of all fuels, chemicals, fuel and chemical wastes, animal wastes, landscape debris, garbage, batteries, and hazardous, toxic, or other materials which have potential adverse impacts on water quality.

8.44.090 Requirements for Industrial/Commercial and Construction Activities

A. Each industrial discharger, discharger associated with construction activity, or other discharger described in any general storm water permit addressing such discharges, as may be issued by the U.S. Environmental Protection Agency, the State Water Resources Control Board, or the Regional Board, shall comply with all requirements of such permit. Each discharger identified in an individual NPDES permit shall comply with and undertake all activities required by such permit. Proof of compliance with any such permit may be required in a form acceptable to the Director of Community Development prior to the issuance of any grading, building, or occupancy permits, or any other type of permit or license issued by the City.

B. Storm water runoff containing sediment, construction materials, or other pollutants from the construction site and any adjacent staging, storage, or parking areas shall be reduced to the maximum extent practicable. The following shall apply to all construction projects within the City, regardless of project size, and shall be required from the time of land clearing, demolition, or commencement of construction until receipt of a Certificate of Occupancy:

1. Sediment, construction wastes, trash and other pollutants from construction activities shall be reduced to the maximum extent practicable.

2. Structural controls such as sediment barriers, plastic sheeting, detention ponds, filters, berms, and similar controls shall be utilized to the maximum extent practicable in order to minimize the escape of sediment and other pollutants from the site.

3. All excavated soil shall be located on the site in a manner that minimizes the amount of sediment running onto the street, drainage facilities, or adjacent properties. Soil piles not actively in use shall be bermed or covered with plastic or similar materials until the soil is either used or removed from the site.

4. No washing of construction or other vehicles is permitted adjacent to a construction site. No water from the washing of construction vehicles or equipment on the construction site is permitted to run off the construction site and enter the MS4.

5. Solid waste receptacles must be situated at convenient locations on construction sites and must be maintained in such a manner that trash and litter and construction waste does not accumulate on the site nor migrate off site. Receptacles must be securely covered at the end of each business day and during rain events.

6. Erosion from slopes and channels must be controlled through the effective combination of BMPs.

C. The owner or authorized representative of the owner must certify in a form acceptable to the Director of Community Development, or designee, that BMPs to control runoff from construction activity at all construction sites as required under this Chapter will be implemented prior to the issuance of any Demolition, Building or Grading Permit.

D. In addition to the provisions of Subsection B and C above, construction sites covering less than one acre must implement an effective combination of erosion and sediment control BMPs from the Municipal NPDES Permit to prevent erosion and sediment loss, and the discharge of construction wastes, to the satisfaction of the Community Development Director, or designee.

E. In addition to the provisions of Subsection B above, construction sites covering 1 (one) acre or more must adhere to the requirements set forth in the Municipal NPDES Permit and the Construction General Permit. A Storm Water Pollution Prevention Plan (SWPPP) shall be developed by a Qualified SWPPP Developer (QSD) for construction sites one acre or more consistent with the Municipal NPDES Permit. Such plans must be submitted to the Director of Community Development, or designee, for review and approval prior to the issuance of Building or Grading Permits. The SWPPP must include all elements required by the Construction General Permit. SWPPPs must be prepared in accordance with their calculated risk level per the Construction General Permit. BMPs selected for erosion and sediment control shall be detailed in the SWPPP. BMPs shall be selected from the Municipal NPDES Permit, as applicable, and, at a minimum, shall include those BMPs specified in Attachments A, C, D, and/or E of the Construction General Permit (or any equivalent attachments in a later amended permit) based on the project type or risk level. Selected BMPs must be selected, designed, implemented, and maintained in accordance with the BMP technical standards presented in the latest version of the

California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook for Construction; or Caltrans Stormwater Quality Handbook, Construction Site Best Management Practices Manual and addenda.

F. Roadway paving and repair projects must implement at a minimum the BMPs listed in the Municipal NPDES Permit for such projects. Roadway paving or repair projects 1 (one) acre or more in size shall also abide by the Construction General Permit, and implement all necessary BMPs as required for coverage under the Construction General Permit.

8.44.095 Low Impact Development Requirements for New Development and Redevelopment Projects

A. Projects Required to Comply. All new development and the following types of redevelopment projects are required to comply with the New Development and Redevelopment Project Performance Criteria set forth in the Municipal NPDES Permit:

  1. All redevelopment projects, including single or multi-family residential projects, adding or replacing more than 5,000 square feet of impervious surface area;
  2. Industrial parks or sites with 5,000 square feet or more of surface area;
  3. Commercial malls or sites with 5,000 square feet or more of surface area;
  4. Automotive Service facilities (SIC 5013, 5014, 5511, 5541, 7532-7534 and 7536-7539) with 5,000 square feet or more of surface area;
  5. Retail gasoline outlets with 5,000 square feet or more of surface area;
  6. Restaurants (SIC 5812) with 5,000 square feet or more of surface area;
  7. Parking lots with five thousand (5,000) square feet or more of impervious surface area or with twenty-five (25) or more parking spaces (cumulative on the project site);
  8. Any redevelopment project located in or directly adjacent to or discharging directly into a Significant Ecological Area (as defined herein), where the development will:
     a. Discharge storm water and dry weather runoff that is likely to impact a sensitive biological species or habitat; and
     b. Create 2,500 square feet or more of impervious surface area.

B. The following do not constitute new development or redevelopment and are not required to comply with the New Development and Redevelopment Project Performance Criteria set forth in the Municipal NPDES Permit:

  1. Routine maintenance activities conducted to maintain original line and grade, hydraulic capacity, original purpose of facility, or emergency redevelopment activity required to protect public health and safety;
  2. Discretionary permit projects or phased project applications which have been deemed complete by the effective date of this Chapter; and.
  3. Discretionary permit projects with a valid vesting tentative map.

C. Where redevelopment results in an alteration to more than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-development storm water quality control requirements, the entire Project must comply with the New Development/Redevelopment Project Performance Criteria in the Municipal NPDES Permit.

D. Where redevelopment results in an alteration to less than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-development storm water quality control requirements, only the alteration must comply with the New Development/Redevelopment Project Performance Criteria in the Municipal NPDES Permit, and not the entire development.

E. Street and road construction of 5,000 square feet or more of impervious surface area shall follow USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets (December 2008 EPA-833-F-08-009) to the maximum extent practicable. Street and road construction applies to standalone streets, roads, alleys, and highways, and also applies to streets, roads and alleys within larger projects.

F. Incorporation of Low Impact Development Program Requirements into Project Plans.

1. New development and redevelopment projects are required to control pollutants and runoff volume from the project site by minimizing the impervious surface area through effective site design and use of water permeable surfaces (e.g., permeable paving or landscaping) to the extent it is technically feasible on not less than fifty percent of exterior surface areas excluding building footprints, and controlling runoff through infiltration, bio-retention, and/or rainfall harvest and use, in accordance with the standards set forth in the Municipal NPDES Permit.

2. An application for a new development or a redevelopment Project identified in paragraph A of this Section shall incorporate into the project plans a Storm Water Mitigation Plan ("SWMP"), which includes those BMPs necessary to control storm water pollution from the completed project. Structural or Treatment Control BMPs (including, as applicable, post-construction Treatment Control BMPs) set forth in project plans shall meet the design standards set forth in the Municipal NPDES Permit.

3. Hillside new development or redevelopment projects identified in paragraph A of this Section shall implement mitigation measures where applicable to:

   a. Conserve natural areas;

   b. Protect slopes and channels from erosion;

   c. Provide storm drain system stenciling and signage;

   d. Divert roof runoff to vegetated or other permeable areas before discharge unless the diversion would result in slope instability; and

   e. Direct surface flow to vegetated or other permeable areas before discharge unless the diversion would result in slope instability.

4. New Development/Redevelopment Project Performance Criteria: Post-construction Treatment Control BMPs are required for all new development and redevelopment projects identified in Paragraph A of this Section unless alternative measures are allowed as provided in the Municipal NPDES Permit. BMPs must be implemented to retain on-site the Stormwater Quality Design Volume (SWQDv), defined as runoff from the 0.80 inch, 24-hour rain event.

5. BMPs shall meet the design specifications and on-site retention potential described in the Municipal NPDES Permit.

   For projects unable to retain 100% of the SWQDv on-site due to technical infeasibility as defined in the Municipal NPDES Permit, the projects must implement alternative compliance measures in accordance with the Municipal NPDES Permit.

6. The following categories of projects which otherwise do not require compliance with this Section 8.44.095, but which the Director of Community Development, or designee, has determined may potentially have adverse impacts on post-development storm water quality, shall be designed to include post-construction Treatment Control BMPs to mitigate the adverse impacts on post-development storm water quality to the maximum extent practicable and must implement a site-specific plan to mitigate post-development storm water. Projects where one or more of the following project characteristics exist are deemed to potentially have adverse impacts on post-development storm water quality:

   a. Vehicle or equipment fueling areas;

   b. Vehicle or equipment maintenance areas, including washing and repair;

   c. Commercial or industrial waste handling or storage;

   d. Outdoor handling or storage of hazardous materials;

   e. Outdoor manufacturing areas;

   f. Outdoor food handling or processing;

   g. Outdoor animal care, confinement, or slaughter; or

   h. Outdoor horticulture activities.

G. Issuance of Discretionary Permits. No discretionary permit may be issued for any new development or redevelopment project identified in paragraph A of this Section or projects listed in Paragraph F.6 until the Director of Community Development, or designee, confirms that the project plans comply with the applicable storm water mitigation plans, BMP requirements and enumerated design criteria requirements set forth in this Chapter.

H. Issuance of Certificates of Occupancy. As a condition for issuing a Certificate of Occupancy for new development or redevelopment projects identified in paragraph A of this Section or projects listed in Paragraph F.6, the Director of Community Development, or designee, shall require facility operators and/or owners to build all the storm water pollution control BMPs and Structural or Treatment Control BMPs that are shown on the approved project plans and to submit a signed Certification Statement stating that the site and all Structural or Treatment Control BMPs will be maintained in compliance with the Municipal NPDES Permit and other applicable regulatory requirements.

   Project owners shall provide an operation and maintenance plan, monitoring plan if required by the Director of Community Development, or designee, and verification of ongoing maintenance provisions for LID practices, Structural or Treatment Control BMPs, and Hydromodification Control BMPs including but not limited to: final map conditions, legal agreements, recorded covenants, conditions or restrictions, CEQA mitigation requirements, conditional use permits, and/ or other legally binding maintenance agreements to the satisfaction of the Director, or designee. These maintenance records must be kept on site for treatment BMPs implemented on single family residences.

B. Transfer of Properties Subject to Requirement for Maintenance of Structural and Treatment Control BMPs.

   1. The transfer or lease of a property subject to a requirement for maintenance of Structural and/or Treatment Control BMPs shall include conditions requiring the transferee and its successors and assigns to either (a) assume responsibility for maintenance of any existing Structural or Treatment Control BMP, or (b) to replace an existing Structural or Treatment Control BMP with new control measures or BMPs meeting the then-current standards of the

City and the Municipal NPDES Permit. Such requirement shall be included in any sale or lease agreement or deed for such property. The condition of transfer shall include a provision that the successor property owner or lessee conduct maintenance inspections of all Structural or Treatment Control BMPs at least once a year and retain proof of inspection by the City for a minimum of five (5) years.

2. For residential properties where the Structural or Treatment Control BMPs are located within a common area which will be maintained by a homeowner's association, language regarding the responsibility for maintenance shall be included in the project’s conditions, covenants, and restrictions (CC&Rs). Printed educational materials will be required to accompany the first deed transfer to highlight the existence of the requirement and to provide information on what storm water management facilities are present, signs that maintenance is needed, and how the necessary maintenance can be performed. The transfer of this information shall also be required with any subsequent sale of the property.

3. If Structural or Treatment Control BMPs are located within an area proposed for dedication to a public agency, they will be the responsibility of the developer until the dedication is accepted.

C. California Environmental Quality Act. Provisions of this Section shall be complimentary to, and shall not replace, any applicable requirements for storm water mitigation required under the California Environmental Quality Act (CEQA).

8.44.100 Inspection Authority

A. Authority to Enforce. The City's Authorized Enforcement Officers and designees thereof, are authorized and directed to enforce all provisions of this Chapter.

B. Right of Entry. Whenever necessary to make an inspection to enforce any of the provisions of this Chapter, or whenever an Authorized Enforcement Officer has reasonable cause to believe that there exists in any building or upon any premises any condition which constitutes a violation of the provision of this Chapter, an Authorized Enforcement Officer may enter such building or premises at all reasonable times to inspect the same or perform any duty imposed upon the officer by this Chapter; provided, that: (i) if such building or premises be occupied, he or she shall first present proper credentials and request entry; and (ii) if such building or premises be unoccupied, he or she shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. Any such request for entry shall state that the property owner or occupant has the right to refuse entry and that in the event such entry is refused, inspection may be made only upon issuance of an inspection warrant. In the event the owner and/or occupant refuses entry after such request has been made, the Officer may seek assistance from any court of competent jurisdiction in obtaining such entry.

C. Authority to Carry Out Inspections, Conduct Samplings, and Establishing Sampling Devices. An Authorized Enforcement Officer may carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with the Municipal NPDES Permit, including the prohibition of non-storm water discharges into the MS4 and receiving waters. With the consent of the owner or occupant or pursuant to an inspection warrant, any Authorized Enforcement Officer may establish on any property such devices as necessary to conduct sampling and monitoring activities necessary to determine the concentrations of pollutants in storm water and/or non-storm water runoff. The inspections provided for herein may include but are not limited to:

1. Inspecting efficiency or adequacy of construction or post construction BMPs;
2. Inspection, sampling, and testing any area runoff, soils in areas subject to runoff, and/or treatment system discharges;
3. Inspection of the integrity of all storm drain and sanitary sewer systems, including the use of smoke and dye tests and video survey of such pipes and conveyance systems;
4. Inspection of all records of the owner, contractor, developer or occupant of public or private property relating to BMP inspections conducted by the owner, contractor, developer or occupant and obtaining copies of such records as necessary;
5. Identifying points of storm water discharge from the premises whether surface or subsurface and locating any illicit connection or discharge.

D. Requirement to Sample or Monitor. Any Authorized Enforcement Officer may order that any person engaged in any activity and/or owning or operating any facility which may cause or contribute to storm water pollution or contamination, illicit discharges, and/or discharge of non-storm water to the MS4, undertake such monitoring activities and/or analyses and furnish such reports as the officer may specify. All costs incurred for such activity shall be borne by the party ordered to do the sampling. In the event the owner or operator of a facility subject to a monitoring and/or analyses order fails to conduct required monitoring and/or analyses and furnish the required reports in the form required, an Authorized Enforcement Officer may cause such monitoring and/or analyses and the cost, therefore, including the reasonable additional administrative costs incurred by the City shall be borne by the owner of the property and the cost thereof shall be invoiced to the owner of the property. If the invoice is not paid within sixty (60) days of the issuance thereof, the costs shall be a lien upon and against the property and continue in existence until the same shall be paid. If the lien is not satisfied by the owner of the property within three (3) months after the completion by an Authorized Enforcement Officer of the required monitoring and/or analyses and reports, the property may be sold in satisfaction thereof in a like manner as other real property is sold under execution.

E. Facility Inspections. The Director of Public Works, or designee, may periodically inspect every commercial and industrial facility as defined under the Municipal NPDES Permit at least twice during the term of the Municipal NPDES Permit and as often as necessary to insure compliance with this Chapter as the Director of Public Works, or designee, deems appropriate.

8.44.110 Violations of Storm Water and Dry Weather Runoff Pollution Control Regulations

A. Violations.
1. Violations of the provisions of this Chapter are subject to the administrative penalty provisions of Chapter 1.10. Each day that a violation continues shall constitute a separate offense.
2. Concealment. Causing, permitting, aiding, abetting, or concealing a violation of any provision of this Chapter shall constitute a violation of such provision

B. Public Nuisance

1. In addition to being subject to the administrative penalty provisions:

    (a) Any action or inaction or condition caused or permitted to exist in violation of:

        (i) Any of the provisions of this Chapter; or

(ii) Any requirement of either the Municipal NPDES Permit, the Construction General Permit, an approved Storm Water Mitigation Plan, an approved SWPPP with respect to a property, the Industrial General Permit; or

(b) Any false certification or verification, or any failure to comply with a certification or verification provided by a project applicant or the applicant's successor in interest; or

(c) Any failure to properly operate and maintain any Structural or Treatment Control BMP on a property in accordance with an approved Storm Water Mitigation Plan or the Municipal NPDES Permit,

is hereby determined to be a threat to the public health, safety and welfare, is declared and deemed a public nuisance, and may be abated or restored by the Authorized Enforcement Officer, and a civil or criminal action to abate, enjoin or otherwise compel the cessation of such nuisance may be brought by the City. Nuisance abatement is government by Chapter 8.28 of this Code.

2. The cost of public nuisance abatement and restoration shall be assessed against the property, as set forth in Chapter 8.28 of this Code.

3. If any violation of this Chapter constitutes a seasonal or recurring nuisance, either the Community Development Director or Public Works Director, or their designee, shall so declare and provide notice to the address of the property via certified mail. The failure of any person to take appropriate annual or seasonal precautions required by the notice shall constitute a public nuisance and a violation of this Chapter.

C. Enforcement Procedure for Public Nuisance.

1. For the first failure to comply with any provision contained in this Chapter that will be prosecuted as a nuisance, rather than enforced pursuant to the City's administrative penalty provisions, an Authorized Enforcement Officer shall issue to the violator a written notice which includes the following information: (i) a description of the violation being committed; (ii) a specified time within which the violation must be corrected or within which the violator may file a written response to the Officer disputing the existence of a violation; and (iii) a description of the penalties which may be imposed for continued noncompliance.

2. If the violator demonstrates that the violation does not exist, or has been corrected, no further action need be taken. If, however, the violation exists and is not corrected within the prescribed time, the Authorized Enforcement Officer may thereafter pursue any of the enforcement remedies described below in this Section.

3. Notice is only required under this Section in the first instance for failure to comply with any provision of this Chapter and is not required for subsequent violations of the same or substantially similar activity.

4. Notice under this provision is not required before the City may pursue an administrative penalty under Chapter 1.10.

D. Civil Actions. In addition to any other remedies provided in this section, any violation of this Chapter may be enforced by civil action brought by the City. In any such action, the City may seek, as appropriate, any or all of the following remedies:

1. A temporary and/or permanent injunction.

2. Assessment of the violator for the costs of any investigation, inspection, or monitoring survey which led to the establishment of the violation, and for the reasonable costs of preparing and bringing legal action under this subsection.
3. Costs incurred in removing, correcting, or terminating the adverse effects resulting from violation.
4. Compensatory damages for loss, damage or destruction of water quality, wildlife, fish, or aquatic life.

E. Administrative Enforcement Powers. In addition to the other enforcement powers and remedies established by this Chapter, the Authorized Enforcement Officers have the authority to utilize the following administrative remedies:

1. Cease and Desist Orders. When an Authorized Enforcement Officer finds that a violation of this Chapter has taken plan or is likely to take place, the Officer may issue an order to cease and desist such discharge, or practice, or operation likely to cause such violation and direct that those persons not complying shall: (i) comply with the requirement, (ii) comply with a time schedule for compliance, or (iii) take appropriate remedial or preventive action to prevent a specified violation from recurring.
2. Notice to Clean. Whenever an Authorized Enforcement Officer finds any oil, earth, debris, grass, weeds, dead trees, rubbish, refuse, waste, container or any other material of any kind, in or upon the sidewalk abutting or adjoining any parcel of land, or upon any parcel of land or grounds, which may result in pollutants entering the MS4 or a non-storm water discharge to the MS4, he or she may give notice to the owner or occupant of the adjacent property to remove such oil, earth, debris, grass, weeds, dead trees, rubbish, refuse, waste, container or other material, in any manner that the Officer may reasonably direct. The recipient of such notice shall undertake the activities as described in the notice.

F. Permit Revocation. To the extent the City makes a provision of this Chapter or any identified BMP a condition of approval to the issuance of a permit or license, any person in violation of such condition is subject to the permit revocation procedures set forth in this Code.

G. Remedies. Remedies specified in this Chapter are in addition to and do not supersede or limit any and all other remedies, civil, or criminal, including remedies under the Federal Clean Water Act and/or Porter-Cologne Act. The remedies provided for in this Section shall be cumulative and not exclusive.

H. Citizen Reporting. Members of the public are encouraged to report possible violations of this Chapter to the City's Public Works Department.

8.44. 120 No Taking

The provisions of this Chapter shall not be construed or operated to deprive any property owner of substantially all of the market value of such owner's property or otherwise constitute an unconstitutional taking without compensation.

Section 2. The following Sections modifying the CalGreen Code in Section 15.48.020 of Chapter 15.48 of Title 15 of the Hermosa Beach Municipal Code are repealed: Section A4.106.4; Section A5.106.2; Section A5.106.2.1; Section A5.106.2.2; Section A5.106.3; Section A5.106.3.1; and Section A.5.106.3.2.

PASSED, APPROVED AND ADOPTED this __day of _____________, 2015.

____
MAYOR

Attest:

____
City Clerk

Chapter 5.84 – Storm Water and Urban Runoff Pollution Control

Sections:

5.84.010 - Purpose and intent.

A. The purpose of this Chapter is to comply with the Federal Clean Water Act, the California Porter-Cologne Water Quality Control Act, and the Municipal National Pollutant Discharge Elimination System (NPDES) Permit by:

1. Reducing pollutants in storm water discharges to the maximum extent practicable;
2. Regulating illicit connections and illicit discharges, thereby reducing the level of contamination of storm water and urban runoff into the Municipal Separate Storm Sewer System (MS4) of the City of Manhattan Beach (City); and
3. Regulating non-storm water discharges to the MS4.

B. The intent of this Chapter is to provide the City with the legal authority necessary to implement and enforce the requirements contained in 40 CFR § 122.26(d)(2)(i)(A-F) and in the Municipal NPDES Permit to the extent that they are applicable in the City, to control discharges to and from those portions of the MS4 over which the City has jurisdiction as required by the Municipal NPDES Permit, and to hold dischargers to the MS4 accountable for their contributions of pollutants and flows.

C. This Chapter authorizes the Authorized Enforcement Officer to define and adopt applicable Best Management Practices (BMPs) and other storm water pollution control measures, to cite infractions, to impose fines pursuant to this Chapter, and to grant emergency self-waivers from Municipal NPDES Permit requirements in order to conduct repairs of essential public service systems and infrastructure in emergency situations. Except as otherwise provided herein, the Authorized Enforcement Officer shall administer, implement, and enforce the provisions of this Chapter.

D. This Chapter authorizes the Authorized Enforcement Officer to carry out inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with the provisions of this Chapter and the Municipal NPDES Permit, including the prohibition of non-storm water discharges into the MS4. This includes the authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into the City's MS4.

5.84.020 - Definitions.

Except as specifically provided herein, any term used in this Chapter shall have the same meaning as that term is defined in the Municipal NPDES Permit; or, if it is not specifically defined in the Municipal NPDES Permit, then as such term is defined in the Federal Clean Water Act, as amended, and/or the regulations promulgated thereunder. The following words and phrases shall have the following meanings when used in this Chapter:

"Area susceptible to runoff" means any surface directly exposed to precipitation or in the path of runoff caused by precipitation.

"Authorized Enforcement Officer" means the City Manager or his or her designee and any City official authorized to issue citations under the municipal Code.

"Best Management Practices (BMPs)" means practices or physical devices or systems designed to prevent or reduce pollutant loading from storm water or non-storm water discharges to receiving waters or designed to reduce the volume of storm water or non-storm water discharged to the receiving water.

"City" means the City of Manhattan Beach.

"Construction" means any construction or demolition activity, clearing, grading, grubbing, excavation, or any other activities that result in soil disturbance. Construction includes structure teardown and demolition. It does not include routine maintenance activities required to maintain the integrity of structures by performing minor repair and restoration work, original line and grade, hydraulic capacity, or original purpose of facility; emergency construction activities required to immediately protect public health and safety; interior remodeling with no outside exposure of construction material or construction waste to storm water; mechanical permit work; or sign permit work. See "Routine Maintenance" definition below.

"Construction General Permit" means the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ (NPDES No. CAS000002), adopted September 2, 2009, and any successor permit to that permit.

"Development" means any construction, rehabilitation, redevelopment, or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail and other non-residential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Directly Adjacent" means situated within two hundred feet of the contiguous zone required for the continued maintenance, function, and structural stability of the environmentally sensitive area.

"Discharging directly" means outflow from a drainage conveyance system that is composed entirely or predominantly of flows from the subject, property, development, subdivision, or industrial facility, and not commingled with the flows from adjacent lands.

"Disturbed Area" means an area that is altered as a result of clearing, grading, and/or excavation.

"Environmentally Sensitive Area (ESA)" means an area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments (California Public Resources Code § 30107.5). Areas subject to storm water mitigation requirements are areas designated as Significant Ecological Areas by the County of Los Angeles (Los Angeles County Significant Areas Study, Los Angeles County Department of Regional Planning (1976) and amendments); an area designated as a Significant Natural Area by the California Department of Fish and Game's Significant Natural Areas Program, provided that area has been field verified by the Department of Fish and Game; an area listed in the Basin Plan as supporting the Rare, Threatened, or Endangered Species (RARE) beneficial use; and an area identified by the City as environmentally sensitive.

"Good housekeeping practices" means common practices related to the storage, use, or cleanup of pollutionable materials, performed in a manner that minimizes the discharge of pollutants. Examples include, but are not limited to, use of alternative and less environmentally harmful products, spill prevention, promptly cleaning up spills and leaks, and storing pollutionable materials in a manner that will contain any leaks or spills.

"Hillside" means property located in an area with known erosive soil conditions, where the development contemplates grading on any natural slope that is twenty-five percent or greater and where grading contemplates cut or fill slopes.

"Illicit connection" means any human-made conveyance that is connected to the storm drain system without a permit, excluding roof-drains and other similar type connections. Examples include channels, pipelines, conduits, inlets, or outlets that are connected directly to the storm drain system.

"Illicit discharge" means any discharge to the storm drain system that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. This includes all non-storm water discharges except discharges pursuant to a separate NPDES permit; discharges that are exempted or conditionally exempted in accordance with the Municipal NPDES Permit; and non-storm water discharges resulting from natural flows specifically identified in the Municipal NPDES Permit.

"Infiltration" means the downward entry of water into the surface of the soil.

"Inspection" means the entry and conducting of an on-site review of structures and devices on a property, at reasonable times, to determine compliance with specific municipal or other legal requirements. The steps involved in performing an inspection include but are not limited to:

1. Pre-inspection documentation research;
2. Request for entry;
3. Interview of property owner, resident and/or occupant(s);
4. Property walk-through;
5. Visual observation of the condition of property;
6. Examination and copying of records as required;
7. Sample collection (if necessary or required);
8. Exit discussion (to discuss preliminary evaluation) as appropriate; and
9. Report preparation, and if appropriate, recommendations for coming into compliance.

“Low Impact Development (LID)” means building or landscape features designed to retain or filter storm water runoff.

"Municipal NPDES Permit" means the "Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4" (Order No. R4-2012-0175), NPDES Permit No. CAS004001, effective December 28, 2012, issued by the California Regional Water Quality Control Board—Los Angeles Region, and any successor permit to that permit.

"Municipal separate storm sewer system (MS4)" means a conveyance or system of conveyances (consisting of roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

1. Owned or operated by a state, city, town borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;
2. Designed or used for collecting or conveying storm water;
3. Which is not a combined sewer; and
4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined in 40 CFR 122.2.

"New development" means land disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision.

"Non-storm water discharge" means any discharge to an MS4 that is not composed entirely of storm water.

“NPDES” means National Pollutant Discharge Elimination System.

"NPDES permit" means an authorization, license, or equivalent control document issued by U.S. Environmental Protection Agency (USEPA) or the State Water Resources Control Board or Regional Board to implement the requirements of Parts 122, 123 and 124 of the Code of Federal Regulations pursuant to sections 318, 402, and 405 of the Clean Water Act, and includes any NPDES general permit. “Permit” does not include any permit which has not yet been the subject of final agency action, such as a “draft permit” or a “proposed permit”.

"Pollutant" means those pollutants defined in Section 502(6) of the Federal Clean Water Act (33 U.S.C. Section 1362(6)), or incorporated into California Water Code Section 13373. Examples of pollutants include but are not limited to the following:

1. Commercial and industrial waste (such as fuels, solvents, detergents, plastic pellets, hazardous substances, fertilizers, pesticides, slag, ash, and sludge);
2. Metals such as cadmium, lead, zinc, copper, silver, nickel, chromium; and non-metals such as phosphorus and arsenic;

3. Petroleum hydrocarbons (such as fuels, lubricants, surfactants, waste oils, solvents, coolants and grease);
4. Excessive eroded soils, sediment and particulate materials in amounts which may adversely affect the beneficial use of the receiving waters, flora or fauna of the State;

5. Animal wastes (such as discharge from confinement facilities, kennels, pens, recreational facilities, stables, and show facilities);
6. Substances having characteristics such as pH less than six (6) or greater than nine (9), or unusual coloration or turbidity, or excessive levels of fecal coliform, or fecal streptococcus, or enterococcus.

"Redevelopment" means land-disturbing activity that results in the creation, addition, or replacement of 5,000 square feet or more of impervious surface area on an already developed site for all project categories except single family projects. For existing single family dwelling and accessory structures, redevelopment is the creation, addition, or replacement of 10,000 square feet or more of impervious surface. Redevelopment includes but is not limited to: the expansion of a building footprint; addition or replacement of a structure; replacement of impervious surface area that is not part of a routine maintenance activity; and land disturbing activities related to structural or impervious surfaces. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Regional Board" means the California Regional Water Quality Control Board - Los Angeles Region.

“Routine Maintenance” includes, but is not limited to, projects conducted to:

1. Maintain the original line and grade, hydraulic capacity, or original purpose of the facility;
2. Perform as needed restoration work to preserve the original design grade, integrity, and hydraulic capacity of flood control facilities;
3. Carry out road shoulder work, regrading dirt or gravel roadways and shoulders, and performing ditch cleanouts;
4. Update existing lines and facilities, including the replacement of existing lines with new materials or pipes, to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity;
5. Repair leaks; and
6. Conduct landscaping activities without changing existing or natural grades.

Routine maintenance does not include construction of new lines or facilities resulting from compliance with applicable codes, standards, and regulations. New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

"Significant Ecological Area (SEA)" means an area that is determined to possess an example of biotic resources that cumulatively represent biological diversity, for the purposes of protecting biotic diversity, as part of the Los Angeles County General Plan. Areas are designated as SEAs if they possess one or more of the following criteria:

1. The habitat of rare, endangered, and threatened plant and animal species;
2. Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind, or are restricted in distribution on a regional basis;
3. Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind or are restricted in distribution in Los Angeles County;
4. Habitat that at some point in the life cycle of a species or group of species, serves as a concentrated breeding, feeding, resting, migrating grounds and is limited in availability either regionally or within Los Angeles County;
5. Biotic resources that are of scientific interest because they are either an extreme in physical/ geographical limitations, or represent an unusual variation in a population or community;
6. Areas important as game species habitat or as fisheries;
7. Areas that would provide for the preservation of relatively undisturbed examples of natural biotic communities in Los Angeles County; and
8. Special areas.

"Simple LID BMP" means a BMP constructed above ground on a single-family residential home that can be readily inspected by a homeowner or inspector. Simple LID BMPs do not require an operation and maintenance plan per the Municipal NPDES Permit. Examples of such BMPs include but are not limited to vegetated swales, rain barrels and above ground cisterns, rain gardens, and pervious pavement.

"Site" means the land or water area where any "structure or activity" is physically located or conducted, including adjacent land used in connection with the structure or activity.

"Storm water runoff" means that part of precipitation (rainfall or snowmelt) which travels via flow across a surface to the MS4 or receiving waters from impervious, semi-pervious, or pervious surfaces. When all other factors are equal, runoff increases as the perviousness of a surface decreases.

"Structural BMP" means any structural facility designed and constructed to mitigate the adverse impacts of storm water and dry weather runoff pollution (e.g. canopy, structural enclosure). Structural BMPs may include both treatment control BMPs and source control BMPs.

"Treatment" means the application of engineered systems that use physical, chemical, or biological processes to remove pollutants. Such processes include but are not limited to filtration, gravity settling, media adsorption, biodegradation, biological uptake, chemical oxidation, and UV radiation.

"Treatment control BMP" means any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media adsorption, or any other physical, biological, or chemical process.

5.84.030 - Construction and application.

This Chapter shall be construed to assure consistency with the requirements of the Federal Clean Water Act and acts amendatory thereof or supplementary thereto; applicable implementing regulations; and the Municipal NPDES Permit and any amendment, revision, or reissuance thereof.

5.84.040 - Prohibited activities.

A. **Illicit Discharges and Connections**. It is a violation of this Chapter to commence, establish, use, maintain, or continue any illicit connections to the MS4 or any illicit discharges to the MS4. This prohibition against illicit connections applies to the use, maintenance, or continuation of any illicit connection, whether that connection was established prior to or after the effective date of this Chapter.

B. **Littering**. No person shall throw, deposit, place, leave, maintain, keep, or permit to be thrown, deposited, placed, left, maintained, or kept, any refuse, rubbish, garbage, or any other discarded or abandoned objects, articles, or accumulations, in or upon any street, alley, sidewalk, storm drain, inlet, catch basin conduit or drainage structure, business place, or upon any public or private plot of land in the City, so that the same might be or become a pollutant. No person shall throw or deposit litter in any fountain, pond, lake, stream, or other body of water within the City. This subsection shall not apply to refuse, rubbish, or garbage deposited in containers, bags, or other appropriate receptacles that are placed in designated locations for regular solid waste pick up and disposal.

C. **Disposal of Landscape Debris**. No person shall intentionally dispose of leaves, dirt, or other landscape debris into the MS4.

D. **Non-Storm Water Discharges**. All non-storm water discharges into the MS4 are prohibited unless those flows are in compliance with a separate NPDES Permit; pursuant to a discharge exemption by the Regional Board, the Regional Board's executive officer, or the State Water Resources Control Board; associated with emergency firefighting activities (i.e. flows necessary for the protection of life or property); natural flows as defined in the Municipal NPDES Permit; conditionally exempt non-storm water discharges as defined in accordance with the Municipal NPDES Permit; or authorized as a temporary non-storm water discharge by the USEPA pursuant to sections 104(a) or 104(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Prohibited discharges include but are not limited to:

1. The discharge of wash waters to the MS4 from commercial auto washing or when gas stations, auto repair garages, or other type of automotive service facilities are cleaned;
2. The discharge of wastewater to the MS4 from mobile auto washing, steam cleaning, mobile carpet cleaning, and other such mobile commercial and industrial operations;
3. Discharges to the MS4 from areas where repair of machinery and equipment, including motor vehicles, which are visibly leaking oil, fluid, or antifreeze, is undertaken;
4. Discharges of runoff to the MS4 from storage areas of materials containing grease, oil, or other hazardous substances, and uncovered receptacles containing hazardous materials;
5. Discharges of commercial/residential swimming pool filter backwash to the MS4;
6. Discharges of runoff from the washing of toxic materials from paved or unpaved areas to the MS4;
7. Discharges to the MS4 from washing impervious surfaces in industrial/commercial areas, unless specifically required by the State's, or the City's, or Los Angeles County's health and safety codes, or permitted under a separate NPDES permit;
8. Discharges to the MS4 from the washing out of concrete or cement laden wash water from concrete trucks, pumps, tools, and equipment;
9. Discharges to the MS4 of any pesticide, fungicide, or herbicide banned by the USEPA or the California Department of Pesticide Regulation or a product registered under the Federal Insecticide, Fungicide and Rodenticide Act to any waste stream that may ultimately be released to waters of the United States unless specifically authorized under an NPDES permit. This requirement is not applicable to products used for lawn and agricultural purposes.
10. The disposal of hazardous wastes into trash containers used for municipal trash disposal where such disposal causes or threatens to cause a direct or indirect discharge to the MS4.

E. **Discharges in Violation of the Municipal NPDES Permit**. Any discharge that would cause or contribute to a violation of the Municipal NPDES Permit, either separately or in combination with other discharges, is prohibited. Liability for any such discharge shall be the responsibility of the person(s) causing or responsible for the discharge, and such person(s) shall defend, indemnify, and hold harmless the City from all losses, liabilities, claims, or causes of actions in any administrative or judicial action relating to such discharge.

5.84.050 - Exempted discharges or conditionally exempted discharges.

Discharges from those activities specifically identified in or pursuant to the Municipal NPDES Permit as being exempted discharges or conditionally exempted discharges shall not be considered a violation of this Chapter, provided that all required conditions, including applicable BMPs pursuant to the Municipal NPDES Permit, are implemented prior to discharge to minimize any adverse impacts from such identified sources and that any required municipal permits are obtained prior to discharge.

5.84.060 - Good housekeeping provisions.

Owners and occupants of property within the City shall comply with the following requirements:

A. **Septic Waste.** No person shall leave, deposit, discharge, dump, or otherwise expose any chemical or septic waste to precipitation.

B. **Use of Water.** Runoff of water used for irrigation purposes shall be minimized in accordance with the City's Water Conservation Ordinance as codified in Chapter 7.44 of the City's Municipal Code. Runoff of water from the conditionally exempt washing down of paved areas shall be minimized to the maximum extent practicable. Conditionally exempt non-storm water discharges of roadway/driveway wash water only include those discharges resulting from use of high pressure, low volume spray washing using only potable water with no cleaning agents. Sweeping and collection of debris for trash disposal instead of or prior to use of water should be utilized whenever possible.

C. **Storage of Materials, Machinery, and Equipment.** Machinery or equipment that is to be repaired or maintained in areas susceptible to or exposed to storm water, shall be placed in a manner so that leaks, spills, and other maintenance-related pollutants are not discharged to the MS4.

D. **Storage of Oil or Oily Material, Chemicals, Refuse, or Other Pollutionable Materials**. Oil or oily material, chemicals, refuse, or other pollutionable materials shall not be stored or deposited by any person in areas where they may be picked up by rainfall and carried off of the property and/or discharged to the MS4. Any such spill of such materials shall be contained and removed immediately.

E. **Removal and Disposal of Debris from Industrial/Commercial Motor Vehicle Parking Lots.** Industrial or commercial motor vehicle parking lots with more than twenty-five (25) parking spaces that are located in areas potentially exposed to storm water shall be swept regularly or other equally effective measures shall be utilized to remove oil, chemicals, debris, or other pollutionable materials from such parking lots, so as to prevent or minimize pollutants or debris from running off the parking lot into the MS4.

F. **Food Wastes.** Food wastes generated by non-residential food service and food distribution sources shall be properly disposed of and in a manner so such wastes are not discharged to the MS4. For example: restaurant kitchen mats may not be washed or rinsed into the street or alley.

G. **Best Management Practices.** BMPs shall be used in areas exposed to storm water for the removal and lawful disposal of all fuels, chemicals, fuel and chemical wastes, animal wastes, garbage, batteries, or other materials which have potential adverse impacts on water quality.

5.84.070 - Requirements for industrial/commercial and construction activities.

A. Each industrial discharger, discharger associated with construction activity, or other discharger described in any general storm water permit addressing such discharges, as may be issued by the USEPA, the State Water Resources Control Board, or the Regional Board, shall comply with all requirements of such permit. Each discharger identified in an individual NPDES permit shall comply with and undertake all activities required by such permit. Proof of compliance with any such permit may be required in a form acceptable to the Authorized Enforcement Officer prior to the issuance of any grading, building, or occupancy permits, or any other type of permit or license issued by the City.

B. Non-storm water discharges to the MS4 from industrial, commercial, or construction activities are prohibited.

C. Industrial and commercial dischargers and dischargers associated with construction activities must implement effective BMPs, including source control BMPs, in accordance with the Municipal NPDES Permit to reduce pollutants in storm water from such sites to the maximum extent practicable.

5.84.080 - Inspection authority.

A. **Authority to Inspect.** The Authorized Enforcement Officer, City's Director of Public Works, building officials, community services officers, and any other representatives thereof, are authorized and directed to enforce all provisions of this Chapter.

B. **Right of Entry.** Whenever necessary to make an inspection to enforce any of the provisions of this Chapter, or whenever an Authorized Enforcement Officer has reasonable cause to believe that there exists in any building or upon any premises any condition which constitutes a violation of the provisions of this Chapter, the officer may enter such building or premises at all reasonable times to inspect the same or perform any duty imposed upon the officer by this Chapter; provided, that: (i) if such building or premises be occupied, he or she shall first present proper credentials and request entry; and (ii) if such building or premises be unoccupied, he or she shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. Any such request for entry shall state that the property owner or occupant has the right to refuse entry and that in the event such entry is refused, inspection may be made only upon issuance of an inspection warrant. In the event the owner and/or occupant refuses entry after such request has been made, the officer is hereby empowered to seek assistance from any court of competent jurisdiction in obtaining such entry.

C. **Authority to Conduct Samplings and Establishing Sampling Devices.** With the consent of the owner or occupant or pursuant to an inspection warrant, any Authorized Enforcement Officer may establish on any property such devices as necessary to conduct sampling and monitoring activities necessary to determine the concentrations of pollutants in storm water and/or non-storm water runoff. During the inspections as provided herein, the Authorized Enforcement Officer may take any samples deemed necessary.

D. **Requirement of Sample or Monitor.** Any Authorized Enforcement Officer may order that any person engaged in any activity and/or owning or operating any facility which may cause or contribute to storm water pollution or contamination, illicit discharges, and/or discharge of non-storm water to the storm water system, undertake such monitoring activities and/or analyses and furnish such reports as the officer may specify. All costs incurred for such activity shall be borne by the party ordered to do the sampling. In the event the owner or operator of a facility subject to a monitoring and/or analyses order fails to conduct required monitoring and/or analyses and furnish the required reports in the form required, the Authorized Enforcement Officer may cause such monitoring and/or analyses to be conducted and the cost, therefore, including the reasonable additional administrative costs incurred by the City, shall be borne by the owner of the property and the cost thereof shall be, after notice and an opportunity for hearing, invoiced to the owner of the property. If the invoice is not paid within sixty (60) days of the issuance thereof, the costs shall be a lien upon and against the property and continue in existence until the same shall be paid. If the lien is not satisfied by the owner of the property within three (3) months after the completion by an Authorized Enforcement Officer of the required monitoring and/or analyses and reports, the property may be sold in satisfaction thereof in a like manner as other real property is sold under execution.

E. **Industrial and Commercial Inspections.** The Public Works Director, Authorized Enforcement Officer, or authorized staff or contractor, shall conduct industrial and commercial facility compliance inspections to confirm that storm water and non-storm water BMPs are effectively implemented in compliance with this Chapter and the Municipal NPDES Permit. These inspections shall be at a frequency sufficient to be in compliance with the Municipal NPDES Permit. Inspections shall be conducted no less than twice during the term of the Municipal NPDES Permit and as often as the Director of Public Works deems appropriate to verify compliance with this Chapter.

5.84.090 - Enforcement.

A. **Enforcement Procedure.**

1. For the first failure to comply with any provision contained in this Chapter, the Director of Public Works or any Authorized Enforcement Officer shall issue to the violator a written notice which includes the following information: (i) a description of the violation being committed; (ii) a specified time within which the violation must be corrected or within which the violator may file a written response to the Director disputing the existence of a violation; and (iii) a description of the penalties which may be imposed for continued noncompliance.
2. If the violator demonstrates that the violation does not exist, or has been corrected, no further action need be taken. If, however, the violation exists and is not corrected within the prescribed time, the Director of Public Works may thereafter pursue any of the enforcement remedies described below in this section.

B. **Violation a Misdemeanor.** Violation of this Chapter or the Municipal NPDES Permit shall be punishable as a misdemeanor, punishable as set forth in Section 1.04.010(A) of this Code. Provided, however, that any or all of the first three violations of this Chapter or the Municipal NPDES Permit committed within any consecutive twelve (12) month period may be charged as an infraction at the discretion of the City Prosecutor. Each day that a violation continues shall constitute a separate offense.

C. **Violations Deemed a Public Nuisance.**

1. Any condition caused or permitted to exist in violation of any of the provisions of this Chapter or the Municipal NPDES Permit is hereby determined to be a threat to the public health, safety, and welfare; is declared and deemed a public nuisance and may be abated or restored by any Authorized Enforcement Officer; and a civil or criminal action to abate, enjoin, or otherwise compel the cessation of such nuisance may be brought by the City Attorney.
2. The cost of such abatement and restoration shall be borne by the owner of the property and the cost thereof shall be invoiced to the owner of the property, as provided by law or ordinance for the recovery of nuisance abatement costs.
3. If any violation of this Chapter constitutes a seasonal and recurrent nuisance, the City Manager shall so declare. The failure of any person to take appropriate annual precautions to prevent storm water pollution after written notice of a determination under this paragraph shall constitute a public nuisance and a violation of this Chapter.

D. **Concealment.** Causing, permitting, aiding, abetting, or concealing a violation of any provision of this Chapter shall constitute a separate violation of such provision.

E. **Civil Actions.** In addition to any other remedies provided in this Section, any violation of this Chapter may be enforced by civil action brought by the City. In any such action, the City may seek, as appropriate, any or all of the following remedies:

   1. A temporary and/or permanent injunction;
   2. Assessment of the violator for the costs of any investigation, inspection, or monitoring survey which led to the establishment of the violation, and for the reasonable costs of preparing and bringing legal action under this subsection;
   3. Costs incurred in removing, correcting, or terminating the adverse effects resulting from violation;
   4. Compensatory damages for loss or destruction to water quality, wildlife, fish and aquatic life; and
   5. Attorney fees.

F. **Administrative Enforcement Powers.** In addition to the other enforcement powers and remedies established by this Chapter, the Authorized Enforcement Officer has the authority to utilize the following administrative remedies:

   1. **Cease and Desist Orders**. When an Authorized Enforcement Officer finds that a discharge has taken place or is likely to take place in violation of this Chapter, the officer may issue an order to cease and desist such discharge, or practice, or operation likely to cause such discharge and direct that those persons not complying shall: (i) comply with the requirement, (ii) comply with a time schedule for compliance, and (iii) take appropriate remedial or preventive action to prevent

the violation from recurring. Failure to comply with such an order shall constitute a separate violation of this Chapter.

2. **Notice to Clean**. Whenever an Authorized Enforcement Officer finds any oil, earth, debris, grass, weeds, dead trees, tin cans, rubbish, refuse, waste, or any other pollutionable material of any kind, in or upon the sidewalk abutting or adjoining any parcel of land, or upon any parcel of land or grounds, which may result in pollutants entering the MS4 or a non-storm water discharge to the MS4, he or she may give notice to the owner or occupant of the adjacent property to remove such oil, earth, debris, grass, weeds, dead trees, tin cans, rubbish, refuse, waste, or other pollutionable material, in any manner that he or she may reasonably provide. The recipient of such notice shall undertake the activities as described in the notice. Failure to comply with such a notice shall constitute a separate violation of this Chapter.

G. **Permit Revocation.** To the extent the City makes a provision of this Chapter or any identified BMP a condition of approval to the issuance of a permit or license, any person in violation of such condition is subject to the permit revocation procedures set forth in this Code.

H. **Remedies.** Remedies specified in this Chapter are in addition to and do not supersede or limit any and all other remedies, civil or criminal, including remedies under the Federal Clean Water Act and/or Porter-Cologne Act. The remedies provided for in this Section shall be cumulative and not exclusive.

I. **Citizen Reporting.** Members of the public are encouraged to report possible violations of this Chapter to the City's Public Works Department.

5.84.100 - Planning and Land Development Program requirements for New Development and Redevelopment projects.

A. **Compliance with Municipal NPDES Permit**. The following New Development and Redevelopment projects are required to comply with the Municipal NPDES Permit:

1. All development projects equal to 1 acre or greater of disturbed area and adding more than 10,000 square feet of impervious area;
2. Industrial parks with 10,000 square feet or more of surface area;
3. Commercial malls with 10,000 square feet or more surface area;
4. Retail gasoline outlets with 5,000 square feet or more of surface area;
5. Restaurants (SIC 5812) with 5,000 square feet or more of surface area;
6. Parking lots with 5,000 square feet or more of impervious area or with twenty-five or more parking spaces;

7. Single family hillside residential developments or redevelopments;
8. Street and road construction of 10,000 square feet or more of impervious surface area shall follow USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets (December 2008 EPA-833-F-08-009) to the maximum extent practicable. Street and road construction applies to standalone streets, roads, highways, and freeway projects, and also applies to streets within larger projects;
9. Automotive service facilities (SIC 5013, 5014, 5511, 5541, 7532-7534 and 7536-7539) with 5,000 square feet or more of surface area;
10. Projects located in or directly adjacent to, or discharging directly to a Significant Ecological Area (SEA), where the development will:
    a) Discharge storm water runoff that is likely to impact a sensitive biological species or habitat; and
    b) Create 2,500 square feet or more of impervious surface area;
11. Projects in subject categories that meet Redevelopment thresholds (pursuant to the Municipal NPDES Permit), which include:
    a) Land-disturbing activities which create, add, or replace 5,000 square feet or more of impervious surface area on an already developed site excluding single family dwellings and accessory structures.
    b) Land-disturbing activities which create, add, or replace 10,000 square feet or more of impervious surface area on existing single family dwellings and accessory structures.
    c) Where Redevelopment results in an alteration to more than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-development storm water quality control requirements, the entire Project must be mitigated.
    d) Where Redevelopment results in an alteration to less than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-development storm water quality control requirements, only the alteration must be mitigated, and not the entire development.

EXCEPTIONS: The following do not constitute New Development or Redevelopment:

1. Routine maintenance activities conducted to maintain original line and grade, hydraulic capacity, original purpose of facility, or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area and maintains the original grade and alignment, is considered a routine maintenance activity.

2. Discretionary permit projects or phased project applications which have been deemed complete by June 28,2015 and which have not received an extension of time.
3. Discretionary permit projects with a valid vesting tentative map.

B. **Incorporation of Planning and Land Development Program requirements Into Project Plans**.

1. New Development and Redevelopment projects are required to control pollutants and runoff volume from the project site by minimizing the impervious surface area and controlling runoff through infiltration, bioretention, and/or rainfall harvest and use, in accordance with the standards set forth in the Municipal NPDES Permit.
2. An applicant for a New Development or a Redevelopment Project identified in this Chapter shall incorporate into the applicant's project plans a Post Construction Storm Water Mitigation Plan which includes those Best Management Practices necessary to control storm water pollution from the completed project. Structural or treatment control BMPs (including, as applicable, post-construction treatment control BMPs) set forth in project plans shall meet the design standards set forth in the Municipal NPDES Permit.
3. To the extent that the City may lawfully impose conditions, mitigation measures, or other requirements on the development or construction of a single-family home in a hillside area, a single-family hillside home Development or Redevelopment project shall implement mitigation measures to:
   a) Conserve natural areas;
   b) Protect slopes and channels;
   c) Provide storm drain system stenciling and signage;
   d) Divert roof runoff to vegetated areas before discharge unless the diversion would result in slope instability; and
   e) Direct surface flow to vegetated areas before discharge unless the diversion would result in slope instability.
4. New Development/Redevelopment Project Performance Criteria. Post-construction BMPs to mitigate storm water pollution are required for all New Development and Redevelopment projects identified in this Chapter unless alternative measures are allowed as provided in the Municipal NPDES Permit. BMPs must be implemented to retain on-site the Storm Water Quality Design Volume (SWQDv), defined as runoff from either:
   a) The 0.75 inch, 24-hour rain event; or
   b) The 85^{th} percentile, 24-hour event, as determined from the Los Angeles County 85^{th} percentile precipitation isohyetal map, whichever is greater.

BMPs shall meet the design specifications and on-site retention potential outlined in the Municipal NPDES Permit. Projects unable to retain 100% of the SWQDv on-site due to technical infeasibility as defined in the Municipal NPDES Permit must implement alternative compliance measures in accordance with the Municipal NPDES Permit.

Single family hillside home development projects are exempt from the New Development/Redevelopment Project Performance Criteria of the Municipal NPDES Permit unless they create, add, or replace 10,000 square feet or more of impervious surface area.

Street and road construction projects of 10,000 square feet or more of impervious surface area are exempt from the New Development/Redevelopment Project Performance Criteria of the Municipal NPDES Permit but shall adhere to the City's Green Streets Policy and be consistent with USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets (December 2008 EPA-833-F-08-009) to the maximum extent practicable.

C. **Issuance of Final Approval**. As a condition for issuing final approval for New Development or Redevelopment projects identified in this Chapter, the Authorized Enforcement Officer shall require property owners or their representative(s) to build all the storm water pollution control BMPs and structural or treatment control BMPs that are shown on the approved project plans and to submit a signed certification statement stating that the site and all structural or treatment control BMPs will be maintained in compliance with the Municipal NPDES Permit and other applicable regulatory requirements.

With the exception of Simple LID BMPs (as defined in this Chapter) implemented on single family residences, project owners shall provide an operation and maintenance plan, monitoring plan where required, and verification of ongoing maintenance provisions for LID practices and treatment control BMPs including but not limited to: final map conditions, legal agreements, covenants, conditions or restrictions, California Environmental Quality Act (CEQA) mitigation requirements, conditional use permits, and/or other legally binding maintenance agreements. These maintenance records must be kept on site for treatment BMPs implemented on single family residences.

D. **Transfer of Properties Subject to Requirement for Maintenance of Structural and Treatment Control BMPs**.

1. The transfer or lease of a property subject to a requirement for maintenance of structural and treatment control BMP's shall include conditions requiring the transferee and its successors and assigns to either (a) assume responsibility for maintenance of any existing structural or treatment control

BMP or (b) to replace an existing structural or treatment control BMP with new control measures or BMPs meeting the current standards of the City and the Municipal NPDES Permit. Such requirement shall be included in any sale or lease agreement or deed for such property. The condition of transfer shall include a provision that the successor property owner or lessee conduct maintenance inspections of all structural or treatment control BMPs at least once a year and retain proof of inspection.

2. For residential properties where the structural or treatment control BMPs are located within a common area which will be maintained by the community association, appropriate arrangements shall be made with the association regarding the responsibility for maintenance.
3. If structural or treatment control BMPs are located within an area proposed for dedication to a public agency, they will be the responsibility of the developer until the dedication is accepted.

E. **California Environmental Quality Act**. Provisions of this section shall be complementary to, and shall not replace, any applicable requirements for storm water mitigation required under the CEQA.

ORDINANCE NO.

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF REDONDO BEACH, CALIFORNIA AMENDING IN ITS ENTIRETY CHAPTER 7 OF TITLE 5 OF THE REDONDO BEACH MUNICIPAL CODE REGARDING STORMWATER AND URBAN RUNOFF POLLUTION CONTROL REGULATIONS AND MAKING A DETERMINATION OF EXEMPTION UNDER CEQA

WHEREAS, the federal Clean Water Act provides for the regulation and reduction of pollutants discharged into the waters of the United States by extending National Pollutant Discharge Elimination System ("NPDES") requirements to stormwater and urban runoff discharged into municipal storm drain systems.

WHEREAS, the City of Redondo Beach (the "City") is a co-permittee under the "Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except those Discharges Originating from the City of Long Beach MS4, Order No. R4-2012-0175, NPDES Permit No. CAS00401" ("MS4 Permit") issued by the California Regional Water Quality Control Board—Los Angeles Region, and, as a co-permittee under the MS4 Permit, the City is required to adopt ordinances and implement procedures with respect to discharges into the municipal separate storm sewer system ("MS4").

WHEREAS, the City has previously adopted ordinances to ensure that it possesses the legal authority necessary to control discharges to and from those portions of the MS4 over which it has jurisdiction, in order to comply with the MS4 Permit, and to specifically prohibit certain discharges identified in the MS4 Permit.

WHEREAS, Chapter 7 of Title 5 of the Redondo Beach Municipal Code is being revised in order to comply with the current MS4 Permit.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF REDONDO BEACH, CALIFORNIA DOES HEREBY ORDAIN AS FOLLOWS:

Section 1. Chapter 7 of Title 5 of the Redondo Beach Municipal Code is hereby amended in its entirety to read as follows:

"5-7.101 Title.

This chapter shall be known as the City of Redondo Beach Stormwater Management and Discharge Control Ordinance.

5-7.102 Findings.

A. The federal Clean Water Act (33 U.S.C. Section 1251, *et seq.*,) provides for the regulation and reduction of pollutants discharged into the waters of the United States by extending National Pollutant Discharge Elimination System ("NPDES")

CITY OF REDONDO BEACH CITY ATTORNEY'S OFFICE APPROVED BY LEGAL DEPARTMENT requirements to stormwater and urban runoff discharge into municipal storm drain systems;

B. Stormwater and urban runoff flows from individual properties onto streets, then through storm drains passing through the City and finally into the waters of the United States;

C. The City is a co-permittee under the "Waste Discharge Requirements for Municipal Separate Storm Sewer System ("MS4") discharges within the Coastal Watersheds of Los Angeles County, except those discharges originating from the City of Long Beach MS4, which also serves as a NPDES Permit under the federal Clean Water Act (NPDES No. CAS614001), as well as waste discharge requirements under California law (the Municipal NPDES Permit") and, as a co-permittee under the Municipal NPDES Permit, the City is required to adopt ordinances and implement procedures with respect to the entry of non-stormwater discharges into the municipal stormwater system;

D. Part III, Section A of the Municipal NPDES Permit requires the City to effectively prohibit non-stormwater discharges from within its boundaries, into that portion of the MS4 which it owns or operates and into watercourses, except where such discharges are: (1) in compliance with a separate individual or general NPDES permit, or (2) identified and in compliance with Part III.A (non-stormwater discharges) of the Municipal NPDES Permit, or (3) originate from federal, state or other facilities which the City is preempted from regulating, and further provides that compliance with the terms of the Municipal NPDES Permit through the development and implementation of the programs described in the Municipal NPDES Permit will constitute compliance with the discharge prohibition in the Municipal NPDES Permit;

E. Part VI, Section A.2 of the Municipal NPDES Permit requires the City to establish and maintain the legal authority necessary to control discharges to and from those portions of the MS4 over which it has jurisdiction, so as to comply with the Municipal NPDES Permit and to specifically prohibit certain discharges identified in the Municipal NPDES Permit;

F. The Municipal NPDES Permit contemplates the development of an Enhanced Watershed Management Program in which the City will participate, which will in turn require the development and the implementation of programs for, among other things, the elimination of illicit connections and illicit discharges, development planning, development construction, and public information and education requirements, and which may require the later adoption of additional legal authority to implement such programs as they are developed by the permittees and approved by the Regional Board;

G. In order to control, in a cost-effective manner, the quantity and quality of stormwater and urban runoff to the maximum extent practicable, the adoption of the ordinance codified in this chapter is essential.

5-7.103 Purpose and intent.

A. The purpose of this chapter is to ensure the future health, safety and general welfare of the citizens of the City and the water quality of the receiving waters of the County of Los Angeles and surrounding coastal areas by:

1. Reducing pollutants in stormwater discharges to the maximum extent practicable;

2. Regulating illicit connections and illicit discharges and reducing the level of contamination of stormwater and urban runoff in the municipal stormwater system; and

3. Regulating non-stormwater discharges to the municipal stormwater system.

B. The intent of this chapter is to protect and enhance the quality of watercourses, water bodies, and wetlands within the City in a manner consistent with the federal Clean Water Act, the California Porter-Cologne Water Quality Control Act and the Municipal NPDES Permit.

C. This chapter is also intended to provide the City with the legal authority necessary to control discharges to and from those portions of the municipal stormwater system over which it has jurisdiction as required by the Municipal NPDES Permit, and fully and timely comply with the terms of the Municipal NPDES Permit while the Enhanced Watershed Management Program is being developed by the City as part of the Beach Cities Watershed Management Group, and in contemplation of the subsequent amendment of this chapter or adoption by the City of additional provisions of this chapter to implement the subsequently adopted Enhanced Watershed Management Program, or other programs developed under the Municipal NPDES Permit.

D. This chapter also sets forth requirements for the construction and operation of certain commercial development, new development and redevelopment and other projects (as further defined herein) which are intended to ensure compliance with the stormwater mitigation measures prescribed in the current MS4 Permit. This chapter authorizes the Engineer to define and adopt applicable best management practices and other stormwater pollution control measures, as provided herein, to carry out all inspections including entering entities discharging to the MS4, conduct surveillance, conduct monitoring, cite infractions and to impose fines pursuant to this chapter. Except as otherwise provided herein, the Engineer shall administer, implement and enforce the provisions of this section.

E. The City Council shall approve and enter into interagency agreements as deemed necessary by the City Council to control the contribution of pollutants of the shared MS4.

5-7.104 Definitions.

Except as specifically provided herein, any term used in this chapter shall be defined as that term is defined in the current Municipal NPDES Permit, or if it is not specifically defined in the Municipal NPDES Permit, then as such term is defined in the Federal Clean Water Act, as amended, or the regulations promulgated thereunder. If the definition of any term contained in this section conflicts with the definition of the same term in the current Municipal NPDES Permit, then the definition contained in the Municipal NPDES Permit shall govern. The following words and phrases shall have the following meanings when used in this chapter:

"Area susceptible to runoff" means any surface directly exposed to precipitation or in the path of runoff caused by precipitation which path leads off the parcel on which the surface is located.

"Automotive service facilities" means a facility that is categorized in any one of the following Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes. For inspection purposes, Permittees need not inspect facilities with SIC codes 5013, 5014, 5511, 5541, 7532-7534, and 7536-7539 provided that these facilities have no outside activities or materials that may be exposed to stormwater.

"Basin Plan" means the Water Quality Control Plan, Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, adopted by the Regional Water Board on June 13, 1994 and subsequent amendments.

"Best Management Practices (BMPs)" means practices or physical devices or systems designed to prevent or reduce pollutant loading from stormwater or non-stormwater discharges to receiving waters, or designed to reduce the volume of stormwater or non-stormwater discharged to the receiving water. Examples of BMPs may include public education and outreach, proper planning of development projects, proper cleaning of catch basin inlets, and proper sludge- or waste-handling and disposal, among others.

"Biofiltration" means a LID BMP that reduces stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration. Incidental infiltration is an important factor in achieving the required pollutant load reduction. Therefore, the term "biofiltration" as used in this chapter is defined to include only systems designed to facilitate incidental infiltration or achieve the equivalent pollutant reduction as biofiltration BMPs with an underdrain (subject to approval by the Regional Board's Executive Officer). Biofiltration BMPs include bioretention systems with an underdrain and bioswales.

"Bioretention" means a LID BMP that reduces stormwater runoff by intercepting rainfall on vegetative canopy, and through evapotranspiration and infiltration. The bioretention system typically includes a minimum 2-foot top layer of a specified soil and compost mixture underlain by a gravel-filled temporary storage pit dug into the in-situ soil. As defined in this Ordinance, a bioretention BMP may be designed with an overflow drain, but may not include an underdrain. When a bioretention BMP is designed or constructed with an underdrain it is regulated by the Municipal NPDES Permit as biofiltration.

"Bioswale" means a LID BMP consisting of a shallow channel lined with grass or other dense, low-growing vegetation. Bioswales are designed to collect stormwater runoff and to achieve a uniform sheet flow through the dense vegetation for a period of several minutes.

"City" means the City of Redondo Beach, California.

"Clean Water Act (CWA)" means the Federal Water Pollution Control Act enacted in 1972, by Public Law 92-500, and amended by the Water Quality Act of 1987. The Clean Water Act prohibits the discharge of pollutants to Waters of the United States unless the discharge is in accordance with an NPDES permit.

"Commercial development" means any development on private land that is not heavy industrial or residential. The category includes, but is not limited to: hospitals, laboratories and other medical facilities, educational institutions, recreational facilities, plant nurseries, car wash facilities, mini-malls and other business complexes, shopping malls, hotels, office buildings, public warehouses and other light industrial complexes.

"Commercial Malls" means any development on private land comprised of one or more buildings forming a complex of stores which sells various merchandise, with interconnecting walkways enabling visitors to easily walk from store to store, along with parking area(s). A commercial mall includes, but is not limited to: mini-malls, strip malls, other retail complexes, and enclosed shopping malls or shopping centers

"Construction" means any construction or demolition activity, clearing, grading, grubbing, or excavation or any other activity that result in land disturbance. Construction does not include emergency construction activities required to immediately protect public health and safety or routine maintenance activities required to maintain the integrity of structures by performing minor repair and restoration work, maintain the original line and grade, hydraulic capacity, or original purposes of the facility. See "Routine Maintenance" definition for further explanation. Where clearing, grading or excavating of underlying soil takes place during a repaving operation, State General Construction Permit coverage by the State of California General Permit for Storm Water

Discharges Associated with Industrial Activities or for Stormwater Discharges Associated with Construction Activities is required if more than one acre is disturbed or the activities are part of a larger plan

"Control" means to minimize, reduce, eliminate, or prohibit by technological, legal, contractual or other means, the discharge of pollutants from an activity or activities.

"Development" means any construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single family, multi-unit or planned unit development); industrial, commercial, retail and other nonresidential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Directly adjacent" means situated within two hundred (200) feet of the contiguous zone required for the continued maintenance, function, and structural stability of the environmentally sensitive area.

"Discharge" means when used without qualification the discharge of a pollutant.

"Discharge of a pollutant" means any addition of any pollutant or combination of pollutants to waters of the United States from any point source or, any addition of any pollutant or combination of pollutants to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. The term discharge includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by a state, municipality, or other person which do not lead to treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

"Discharging" directly means outflow from a drainage conveyance system that is composed entirely or predominantly of flows from the subject, property, development, subdivision, or industrial facility, and not commingled with the flows from adjacent lands.

"Discretionary project" is defined in the same manner as Section 15357 of the Guidelines for Implementation of the California Environmental Quality Act contained in Title 14 of the California Code of Regulations, as amended, and means a project which requires the exercise of judgment or deliberation when the City decides to approve or disapprove a particular activity, as distinguished from situations where the City merely has to determine whether there has been conformity with applicable statutes, ordinances or regulations.

"Disturbed area" means an area that is altered as a result of clearing, grading, and/or excavation.

"Engineer" means the City Engineer and persons directed by him or her and under the instruction and supervision of the City Engineer who are assigned to enforce this chapter.

"Environmentally sensitive area (ESA)" means an area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments (California Public Resources Code § 30107.5). Areas subject to storm water mitigation requirements are areas designated as Significant Ecological Areas by the County of Los Angeles (Los Angeles County Significant Areas Study, Los Angeles County Department of Regional Planning (1976) and amendments); an area designated as a Significant Natural Area by the California Department of Fish and Games Significant Natural Areas Program, provided that area has been field verified by the Department of Fish and Game; an area listed in the Basin Plan as supporting the Rare, Threatened, or Endangered Species (RARE) beneficial use; and an area identified by the City as environmentally sensitive.

"Flow-through treatment BMPs" means a modular, vault type "high flow biotreatment" devices contained within an impervious vault with an underdrain or designed with an impervious liner and an underdrain.

"Full Capture System" means any single device or series of devices, certified by the Executive Officer, that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate Q resulting from a one-year, one-hour storm in the sub-drainage area.

"Good housekeeping practices" means common practices related to the storage, use or cleanup of materials, performed in a manner that minimizes the discharge of pollutants. Examples include, but are not limited to, purchasing only the quantity of materials to be used at a given time, use of alternative and less environmentally harmful products, cleaning up spills and leaks, and storing materials in a manner that will contain any leaks or spills.

"General Construction Activities Storm Water Permit (GCASP)" means the general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from construction activities under certain conditions.

"General Industrial Activities Storm Water Permit (GIASP)" means the general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from certain industrial activities under certain conditions.

"Green Roof" means a LID BMP using planter boxes and vegetation to intercept rainfall on the roof surface. Rainfall is intercepted by vegetation leaves and through evapotranspiration. Green roofs may be designed as either a bioretention BMP or as a biofiltration BMP. To receive credit as a bioretention BMP, the green roof system planting medium shall be of sufficient depth to provide capacity within the pore space volume to contain the design storm depth and may not be designed or constructed with an underdrain.

"Hillside" means property located in an area with known erosive soil conditions, where the development contemplates grading on any natural slope that is twenty-five percent (25%) or greater and where grading contemplates cut or fill slopes.

"Illicit connection" means any human-made conveyance that is connected to the storm drain system without a permit, excluding gutters, roof-drains and other similar connections. Examples include channels, pipelines, conduits, inlets or outlets that are connected directly to the storm drain system.

"Illicit discharge" means any discharge to the storm drain system that is prohibited under local, state or federal statutes, ordinances, codes or regulations. This includes all non-stormwater discharges except discharges pursuant to a separate NPDES permit and discharges that are exempted or conditionally exempted in accordance with Part III the Municipal NPDES permit.

"Industrial/Commercial Facility" means any facility involved and/or used in the production, manufacture, storage, transportation, distribution, exchange or sale of goods and/or commodities, and any facility involved and/or used in providing professional and non-professional services. This category of facilities includes, but is not limited to, any facility defined by either the Standard Industrial Classifications (SIC) or the North American Industry Classification System (NAICS). Facility ownership (federal, state, municipal, private) and profit motive of the facility are not factors in this definition.

"Industrial Park" means land development that is set aside for industrial development. Industrial parks are usually located close to transport facilities, especially where more than one transport modalities coincide: highways, railroads, airports, and navigable rivers. It includes office parks, which have offices and light industry.

"Infiltration BMP" means a LID BMP that reduces stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Examples of infiltration BMPs include infiltration basins, dry wells, and pervious pavement.

"Infiltration" means the downward entry of water into the surface of the soil.

"Low Impact Development" or "LID" consists of building and landscape features designed to retain or filter stormwater runoff.

"Material" means any substance including, but not limited to: garbage and debris; lawn clippings, leaves, and other vegetation; biological and fecal waste; sediment and sludge; oil and grease; gasoline; paints, solvents, cleaners, and any fluid or solid containing chemicals.

"Municipal NPDES Permit" means the Waste Discharge Requirements for Municipal Storm Water and Urban Runoff Discharges within the County of Los Angeles, and the Incorporated Cities Therein, Except the City of Long Beach (Order No. R4-2012-0175), NPDES Permit No. CAS00401), issued by the California Regional Water Quality Control Board—Los Angeles Region, and any successor permit to that permit.

"Municipal Separate Storm Sewer System (MS4)" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

1. Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

2. Designed or used for collecting or conveying stormwater;

3. Which is not a combined sewer; and

4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR Section 122.2.

"New development" means land-disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision.

"Non-stormwater discharge" means any discharge to a municipal stormwater system that is not composed entirely of stormwater.

"NPDES permit" means any waste discharge requirements issued by the Regional Board or the State Water Resources Control Board in the form of an NPDES permit pursuant to Water Code Section 13370 (other than the Municipal NPDES Permit).

"Outfall" means a point source as defined by 40 CFR 122.2 at the point where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances with connect segments of the same stream or other waters of the United Sates and are used to convey waters of the United States. (40 CFR Section 122.26(b)(9))

"Parking lot" means land area or a facility for the parking or storage of motor vehicles used for businesses, commerce, industry or personal use with a lot size of five thousand (5,000) square feet or more of surface area, or with twenty-five (25) or more parking spaces.

"Planning priority projects" means those projects specified in Section 18.04.105.C of this chapter that are required to incorporate appropriate storm water mitigation measures into the design plan for their respective projects.

"Pollutant" means those pollutants defined in Section 502(6) of the federal Clean Water Act (33 U.S.C. Section 1362(6)), or incorporated into California Water Code Section 13373. The term "pollutant" shall not include uncontaminated stormwater, potable water or reclaimed water generated by a lawfully permitted water treatment facility.

"Project" means all development, redevelopment, and land disturbing activities. The term is not limited to "Project" as defined under CEQA (California Public Resources Code Section 21065).

"Rainfall Harvest and Use" means a LID BMP system designed to capture runoff, typically from a roof but can also include runoff capture from elsewhere within the site, and to provide for temporary storage until the harvested water can be used for irrigation or non-potable uses. The harvested water may also be used for potable water uses if the system includes disinfection treatment and is approved for such use by the local building department (Order No. R4-2012-0175).

"Receiving Water" means "water of the United States" into which waste and/or pollutants are or may be discharged.

"Redevelopment" means land-disturbing activity that result in the creation, addition, or replacement of 5,000 square feet or more of impervious surface area on an already developed site. Redevelopment includes, but is not limited to: the expansion of a building footprint; addition or replacement of a structure; replacement of impervious surface area that is not part of routine maintenance activity; and land disturbing activity related to structural or impervious surfaces. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Regional Board" means the California Regional Water Quality Control Board—Los Angeles Region.

"Restaurant" means a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption. (SIC Code 5812).

"Retail gasoline outlet" means any facility engaged in selling gasoline and lubricating oils.

"Routine Maintenance" includes, but is not limited to projects conducted to:

1. Maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

2. Perform as needed restoration work to preserve the original design grade, integrity and hydraulic capacity of flood control facilities.

3. Includes road shoulder work, regrading dirt or gravel roadways and shoulders and performing ditch cleanouts.

4. Update existing lines and facilities, which include replacing existing lines with new materials or pipes, to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.

5. Repair leaks.

Routine maintenance does not include construction of new lines or facilities resulting from compliance with applicable codes, standards and regulations. New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

"Runoff" means any runoff including storm water and dry weather flows from a drainage area that reaches a receiving water body or subsurface. During dry weather it is typically comprised of base flow either contaminated with pollutants or uncontaminated, and nuisance flows.

"Significant Ecological Area" means an area that is determined to possess an example of biotic resources that cumulatively represent biological diversity, for the purposes of protecting biotic diversity, as part of the Los Angeles County General Plan. Areas are designated as SEAs, if they possess one or more of the following criteria:

1. The habitat of rare, endangered, and threatened plant and animal species.

2. Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind, or are restricted in distribution on a regional basis or within Los Angeles County.

3. Habitat that at some point in the life cycle of a species or group of species, serves as a concentrated breeding, feeding, resting, migrating grounds and is limited in availability either regionally or within Los Angeles County.

4. Biotic resources that are of scientific interest because they are either an extreme in physical/geographical limitations, or represent an unusual variation in a population or community.

5. Areas important as game species habitat or as fisheries.

6. Areas that would provide for the preservation of relatively undisturbed examples of natural biotic communities in Los Angeles County.

7. Special areas.

"Site" means the land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

"Source control BMP" means any schedule of activities, prohibition of practices, maintenance procedures, managerial practices or operational practices that aim to prevent stormwater pollution by reducing the potential for contamination at the source of pollution.

"Standard urban stormwater mitigation plan" or "SUSMP" means a report submitted by an applicant for approval by the Engineer prior to issuance of a building, grading, planning or similar permit outlining the necessary LID requirements and BMPs which must be incorporated into design plans for development or redevelopment projects.

"Storm Drain System" means any facility or any parts of the facility, including streets, gutters, conduits, natural or artificial drains, channels and watercourse that are used for the purpose of collecting, storing, transporting or disposing of stormwater and are located within the City.

"Stormwater runoff" means that part of precipitation (rainfall) which travels via flow across a surface to the MS4 or receiving waters from impervious, semi-pervious or pervious surfaces. When all other factors are equal, runoff increases as the perviousness of a surface decreases.

"Structural BMP" means any structural facility designed and constructed to mitigate the adverse impacts of stormwater and urban runoff pollution (e.g. canopy, structural enclosure). Structural BMPs may include both treatment control BMPs and source control BMPs.

"Treatment" means the application of engineered systems that use physical, chemical or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media adsorption, biodegradation, biological uptake, chemical oxidation and UV radiation.

"Treatment control BMP" means any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media adsorption or any other physical, biological or chemical process.

"Urban runoff" means surface water flow produced by non-stormwater resulting from residential, commercial and industrial activities involving the use of potable and nonpotable water.

5-7.105 Construction and application.

This chapter shall be construed to assure consistency with the requirements of the federal Clean Water Act and acts amendatory or supplementary to the Federal Clean Water Act, applicable implementing regulations, and the Municipal NPDES Permit, and any amendment, revision or reissuance of the Municipal NPDES Permit.

5-7.106 Inspection.

The Engineer, or his representative, shall be authorized at any reasonable time to enter the premises of any property discharging to the MS4 to determine compliance with the provisions of this chapter; such inspection may include but not be limited to: sampling, monitoring, reviewing, photographing, videotaping and inspecting treatment facilities and discharge location.

5-7.107 Storm drain impact fees.

A. Every applicant for a permit pursuant to Section 9-1.02 of this Code for development construction shall pay a storm drain impact fee.

B. The proceeds of the storm drain impact fee shall be applied to offset the City's costs of enforcing the order as a result of development construction, and the amount of the storm drain impact fee shall not exceed the City's reasonable costs therefor.

C. The amount of the storm drain impact fee shall be established by resolution of the City Council, as amended from time to time, in accordance with the provisions of this section, as amended from time to time.

D. The City Engineer shall administer and collect the storm drain impact fee.

E. Permits issued pursuant to Section 9-1.02 for development construction shall not be issued until payment of the storm drain impact fee.

5-7.108 Critical source of pollution inspection fee.

A. Every person required to obtain a license pursuant to Redondo Beach Municipal Code Section 6-1.06 and also engaged in a business designated in the Municipal NPDES permit as a critical source of pollution shall pay an annual critical source of pollution inspection fee.

B. The proceeds of the critical source of pollution inspection fee shall be applied to offset the City's costs of performing the inspections required by the Municipal NPDES permit and the amount of the critical source of pollution inspection fee shall not exceed the City's reasonable costs therefor.

C. The amount of the critical source of pollution inspection fee shall be established by resolution of the City Council as amended from time to time in accordance with provisions of this section.

D. The License Clerk and Collector shall administer and collect the critical source of pollution inspection fee.

E. No license issued pursuant to Redondo Beach Municipal Code Section 6-1.06 shall be issued or renewed until payment of the critical source of pollution inspection fee is received by the License Clerk and Collector.

5-7.109 Prohibited activities.

A. Illicit Discharges and Connections. It is prohibited to commence, establish, use, maintain or continue any illicit connections to the MS4 or any illicit discharges to the MS4. This prohibition against illicit connections applies to the use, maintenance or continuation of any illicit connection, whether that connection was established prior to or after the effective date of this chapter.

B. Littering. No person shall throw, deposit, place, leave, maintain, keep or permit to be thrown, deposited, placed, left or maintained or kept, any refuse, rubbish, garbage, or any other discarded or abandoned objects, articles or accumulations, in or upon any street, alley, sidewalk, storm drain, inlet, catch basin conduit or drainage structure, business place, or upon any or private plot of land in the City, so that the same might be or become a pollutant. No person shall throw or deposit litter in any fountain, pond, lake, stream, or other body of water within the City. This section shall not apply to refuse, rubbish or garbage deposited in containers, bags or other appropriate receptacles which are placed in designated locations for regular solid waste pick-up and disposal.

C. Disposal of Landscape Debris. No person shall dispose of leaves, dirt, or other landscape debris into the municipal separate stormwater system.

D. Non-stormwater Discharges. The following non-stormwater discharges into the MS4 are prohibited unless in compliance with a separate NPDES permit or pursuant to a discharge exemption by the Regional Board, the Regional Board's Executive Officer, or the State Water Resources Control Board:

1. The discharge of untreated wash waters to the MS4 when gas stations, auto repair garages, or other type of automotive service facilities are cleaned;

2. The discharge of untreated wastewater to the MS4 from mobile auto washing, steam cleaning, mobile carpet cleaning, and other such mobile commercial and industrial operations;

3. To the maximum extent practicable, discharges to the MS4 from areas where repair of machinery and equipment, including motor vehicles, which are visibly leaking oil, fluid or antifreeze, is undertaken;

4. Discharges of untreated runoff to the MS4 from storage areas of materials containing grease, oil, or other hazardous substances, and uncovered receptacles containing hazardous materials;

5. Discharges of commercial/municipal swimming pool filter backwash to the MS4;

6. Discharges of untreated runoff from the washing of toxic materials from paved or unpaved areas to the MS4; provided, however, that nonindustrial and noncommercial activities which incidentally generate urban runoff, such as the hosing of sidewalks, shall be excluded from this prohibition;

7. To the maximum extent practicable, discharges to the MS4 from washing impervious surfaces in industrial/commercial areas which results in a discharge of untreated runoff to the MS4, unless specifically required by state law, or the City's Municipal code, or Los Angeles County's Health and Safety Codes, or permitted under a separate NPDES permit;

8. Discharges from the washing out of concrete trucks into the MS4;

9. Discharges to the MS4 of any pesticide, fungicide or herbicide, banned by the USEPA or the California Department of Pesticide Regulation; or

10. The disposal of hazardous wastes into trash containers used for municipal trash disposal where such disposal causes or threatens to cause a direct or indirect discharge to the MS4.

E. Car Washing. No motor vehicle, boat, trailer, or other type of mobile transportation may be washed, other than at a commercial carwash, unless such vehicle is being washed by:

1. A resident at their residence using a hand-held bucket or a water hose equipped with an automatic shutoff nozzle as long as water does not flow onto streets; or

2. A business that has an approved car wash facility for its fleet vehicles, provided that water does not flow onto streets.

5-7.110 Exempted discharges, conditionally exempted discharges or designated discharges.

A. Discharges from those activities specifically identified in, or pursuant to, Part III.A.1-3 of the Municipal NPDES Permit as being exempted discharges, conditionally exempted discharges or designated discharges shall not be considered a violation of this chapter; provided that, consistent with Part III.A.1-3 of the Municipal NPDES Permit:

1. Any applicable BMPs developed pursuant to the Municipal NPDES Permit are implemented to minimize any adverse impacts from such identified sources;

2. The discharger meets all notification, reporting and recordkeeping requirements; and

3. The discharger has conducted all applicable monitoring requirements.

B. Discharges in Violation of the Municipal NPDES Permit. Any discharge that would result in or contribute to a violation of the Municipal NPDES Permit, either separately or in combination with other discharges, is prohibited. Liability for any such discharge shall be the responsibility of the person(s) causing or responsible for the discharge, and such person(s) shall defend, indemnify and hold harmless the City from all losses, liabilities, claims or causes of actions in any administrative or judicial action relating to such discharge.

5-7.111 Good housekeeping provisions.

Owners and occupants of property within the City shall comply with the following requirements:

A. Septic Waste. No person shall leave, deposit, discharge, dump, or otherwise expose any chemical or septic waste to precipitation in an area where a discharge to City streets or MS4 may or does occur.

B. Use of Water. Runoff of water used for irrigation purposes shall be minimized to the maximum extent practicable. Runoff of water from the permitted washing down of paved areas shall be minimized to the maximum extent practicable.

C. Storage of Materials, Machinery and Equipment. Machinery or equipment that is to be repaired or maintained in areas susceptible to or exposed to stormwater, shall be placed in a manner so that leaks, spills and other maintenance-related pollutants are not discharged to the MS4.

D. Removal and Disposal of Debris from Industrial/Commercial Motor Vehicle Parking Lots. Industrial/commercial motor vehicle parking lots with more than twenty-five (25) parking spaces that are located in areas potentially exposed to stormwater shall be swept regularly or other equally effective measures shall be utilized to remove debris from such parking lots.

E. Food Wastes. Food wastes generated by nonresidential food service and food distribution sources shall be properly disposed of and in a manner so such wastes are not discharged to the MS4.

F. Best Management Practices. Best management practices shall be used in areas exposed to stormwater for the removal and lawful disposal of all fuels, chemicals, fuel and chemical wastes, animal wastes, garbage, batteries, or other materials which have potential adverse impacts on water quality.

G. Maintenance of Structural BMPs. Structural BMPs shall be properly operated and maintained, consistent with the approved SUSMP. Records and documentation of such maintenance shall be provided to the Engineer upon request.

5-7.112 Requirements for industrial/commercial and construction activities.

A. Industrial/Commercial and Construction Related Dischargers Generally. Each discharger associated with industrial/commercial activity or construction activity, or other discharger described in any general NPDES permit addressing such discharges, as may be issued by the U.S. Environmental Protection Agency, the State Water Resources Control Board, or the Regional Board shall comply with all requirements of such NPDES permit and the City's development construction program. Each discharger identified in an individual NPDES permit shall comply with and undertake all activities required by such permit. Proof of compliance with any such NPDES permit and the City's development construction program may be required in a form acceptable to the Engineer prior to the issuance of any grading, building or occupancy permits, or any other type of permit or license issued by the City.

B. Non-stormwater discharges to the MS4 from industrial, commercial or construction activities in violation of any applicable NPDES permit or the City's development construction program are prohibited.

C. Source Control BMPs for Industrial/Commercial Facilities. Industrial/commercial facilities shall implement the effective source control BMPs listed in Table 10 of Part VI.D.6.f. of the Municipal NPDES Permit, unless a particular pollutant generating activity does not occur on a facility's site.

5-7.113 Standard urban stormwater mitigation plan (SUSMP) and low impact development (LID) requirements for new development and redevelopment projects.

A. Objective. Pursuant to Part VI.D.7.b of the Municipal NPDES Permit, the provisions of this section establish requirements for construction activities and facility operations of development and redevelopment projects to comply with the current Municipal NPDES Permit to lessen the water quality impacts of development by using smart growth practices and integrate LID practices and standards for stormwater pollution mitigation through means of infiltration, evapotranspiration, biofiltration, and rainfall harvest and use. Except as otherwise provided herein, the City shall administer, implement and enforce the provisions of this section.

B. Scope. This section contains requirements for stormwater pollution control measures in development and redevelopment projects and authorizes the City to further define and adopt stormwater pollution control measures, and to develop LID principles and requirements, including but not limited to the objectives and specifications for integration of LID strategies. As specified in this section, certain Planning Priority Projects shall meet the requirements of this section through the preparation and submittal of a standard urban stormwater mitigation plan (SUSMP), which shall include the applicable LID requirements set forth in this section as an element of the SUSMP.

C. LID Standards Manual. The Engineer shall prepare, maintain, and update, as deemed necessary and appropriate, a manual ("LID Standards Manual"), which shall include urban and stormwater runoff quantity and quality control development principles and technologies for achieving compliance with the provisions of this section. The LID Standards Manual shall also include technical feasibility and implementation parameters, as well as other rules, requirements, and procedures as the Engineer deems necessary, for implementing the provisions of this Chapter.

D. Applicability – Planning Priority Projects. The following development and redevelopment projects shall be designated as Planning Priority Projects, which are subject to City conditioning and approval for the design and implementation of post-construction controls to mitigate storm water pollution prior to completion of the projects, and shall meet the requirements of this section:

1. New Development Projects.

a. All development projects equal to one (1) acre or greater of disturbed area that adds more than 10,000 square feet of impervious surface area.

b. Industrial parks 10,000 square feet or more of surface area.

c. Commercial malls 10,000 square feet or more of surface area.

d. Retail gasoline outlets with 5,000 square feet or more of surface area.

e. Restaurants (Standard Industrial Classification (SIC) of 5812) with 5,000 square feet or more of surface area.

f. Parking lots with 5,000 square feet or more of impervious surface area, or with 25 or more parking spaces.

g. Streets and roads construction of 10,000 square feet or more of impervious surface area. Street and road construction applies to standalone streets, roads, highways, and freeway projects, and also applies to streets within larger projects.

h. Automotive service facilities (Standard Industrial Classification (SIC) of 5013, 5014, 5511, 5541, 7532-7534 and 7536-7539) 5,000 square feet or more of surface area.

i. Projects located in or directly adjacent to, or discharging directly to an Significant Ecological Area (SEA), where the development will:

(i) Discharge stormwater runoff that is likely to impact a sensitive biological species or habitat; and

(ii) Create 2,500 square feet or more of impervious surface area.

j. Single-family hillside homes.

2. Redevelopment Projects

a. Land disturbing activity that results in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site on Planning Priority Project categories.

b. Where Redevelopment results in an alteration to more than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, the entire project must be mitigated.

c. Where Redevelopment results in an alteration of less than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, only the alteration must be mitigated, and not the entire development.

d. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area and maintains the original grade and alignment, is considered a routine maintenance activity. Redevelopment does not include the repaving of existing roads to maintain original line and grade.

e. Existing single-family dwelling and accessory structures are exempt from the Redevelopment requirements unless such projects create, add, or replace 10,000 square feet of impervious surface area.

E. Stormwater Pollution Control Requirements. The site for every Planning Priority Project shall be designed to control pollutants, pollutant loads, and runoff volume to the maximum extent feasible by minimizing impervious surface area and controlling runoff from impervious surfaces through infiltration, evapotranspiration, bioretention and/or rainfall harvest and use. In addition, the following specific requirements apply:

1. New Single-Family Hillside Homes. A new single-family hillside home development project shall include mitigation measures to:

a. Conserve natural areas;

b. Protect slopes and channels;

c. Provide storm drain system stenciling and signage;

d. Divert roof runoff to vegetated areas before discharge unless the diversion would result in slope instability; and

e. Direct surface flow to vegetated areas before discharge, unless the diversion would result in slope instability.

2. Street and Road Construction of 10,000 square feet or more. Street and road construction of 10,000 square feet or more of impervious surface shall follow the City's Green Street Manual developed by the Engineer and approved by City Council resolution. The City's Green Street Manual shall be based on the USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets (December 2008 EPA-833-F-08-009).

3. Remainder of Planning Priority Projects Require a SUSMP. Except for the projects listed in paragraphs (1) and (2) of subsection D of this section, all other Planning Priority Projects shall prepare and submit to the Engineer for review and approval a SUSMP which shall also contain LID requirements consistent with Parts VI.D.7.c and VI.D.7.d(iii) of the Municipal NPDES Permit. In addition, Planning Priority Projects subject to this paragraph (3) shall do the following:

a. Incorporate the SUSMP into Project Plans. An applicant for a Planning Priority Project identified in paragraph (3) of subsection D of this section shall incorporate into the applicant's project plans a Storm Water Mitigation Plan (SWMP), which includes those BMPs necessary to control storm water pollution from construction activities and facility operations, as set forth in the SUSMP applicable to the applicant's project. Structural or Treatment Control BMPs (including, as applicable, post-construction treatment control BMPs) set forth in project plans shall meet the design standards set forth in the SUSMP and the current Municipal NPDES Permit.

b. Verify Maintenance of BMPs. If a project applicant has included or is required to include structural or treatment control BMPs in project plans, the applicant shall provide verification of maintenance provisions. The verification shall include the applicant's signed statement, as part of its project application, accepting responsibility for all structural and treatment control BMP maintenance until such time, if any, the property is transferred.

E. Issuance of Discretionary Permits. No discretionary permit may be issued for any Planning Priority Project identified in this section until the Engineer confirms the project plans comply with the applicable requirements of this section.

F. Issuance of Certificates of Occupancy. As a condition for issuing a certificate of occupancy for a Planning Priority Project identified in this section, the Engineer shall require facility operators and/or owners to build all the stormwater pollution control BMPs and structural or treatment control BMPs that are shown on the approved project plans and to submit a signed certification statement stating that the site and all structural or treatment control BMPs will be maintained in compliance with the SUSMP and other applicable regulatory requirements.

G. Transfer of Properties Subject to Requirement for Maintenance of Structural and Treatment Control BMPs.

1. The transfer or lease of a property subject to a requirement for maintenance of structural and treatment control BMPs shall include conditions requiring the transferee and its successors and assigns to either (a) assume responsibility for maintenance of any existing structural or treatment control BMP or (b) to replace an existing structural or treatment control BMP with new control measures or BMPs meeting the then current standards of the City and the SUSMP. Such requirement shall be included in any sale or lease agreement or deed for such property. The condition of transfer shall include a provision that the successor property owner or lessee conduct maintenance inspections of all structural or treatment control BMPs at least once a year and retain proof of inspection.

2. For residential properties where the structural or treatment control BMPs are located within a common area which will be maintained by a homeowners association, language regarding the responsibility for maintenance shall be included in the projects conditions, covenants and restrictions (CC&Rs). Printed educational materials will be required to accompany the first deed transfer to highlight the existence of the requirement and to provide information on what stormwater management facilities are present, signs that maintenance is needed, and how the necessary maintenance can be performed. The transfer of this information shall also be required with any subsequent sale of the property.

3. If structural or treatment control BMPs are located within an area proposed for dedication to a public agency, said BMPs shall be the responsibility of the developer until the dedication is accepted by the public agency.

H. CEQA. Provisions of this section shall be complementary to, and shall not replace, any applicable requirements for stormwater mitigation required under the California Environmental Quality Act.

5-7.114 Enforcement.

A. Violations Deemed a Public Nuisance.

1. The following violations shall be deemed a public nuisance:

a. Any condition caused or permitted to exist in violation of any of the provisions of this chapter; or

b. Any failure to comply with any applicable requirement of either the SUSMP or an approved stormwater mitigation plan with respect to a property; or

c. Any false certification or verification, or any failure to comply with a certification or verification provided by a project applicant or the applicant's successor in interest; or

d. Any failure to properly operate and maintain any structural or treatment control BMP on a property in accordance with an approved stormwater mitigation plan or the SUSMP, is determined to be a threat to the public health, safety and welfare, is declared and deemed a public nuisance, and may be abated or restored by any Engineer, and a civil or criminal action to abate, enjoin or otherwise compel the cessation of such nuisance may be brought by the City Attorney.

2. The cost of such abatement and restoration shall be borne by the owner of the property and the cost shall be billed to the owner of the property, as provided by law or ordinance for the recovery of nuisance abatement costs,

3. If any violation of this chapter constitutes a seasonal and recurrent nuisance, the Engineer shall so declare. The failure of any person to take appropriate annual precautions to prevent stormwater pollution after written notice of a determination under this section shall constitute a public nuisance and a violation of this chapter.

B. Concealment. Causing, permitting, aiding, abetting or concealing a violation of any provision of this chapter shall constitute a violation of such provision.

C. Civil Actions. In addition to any other remedies provided in this chapter, any violation of this chapter may be enforced by civil action brought by the City. In any such action, the City may seek any or all of the following remedies:

1. A temporary and/or permanent injunction;

2. Assessment of the violator for the costs of any investigation, inspection or monitoring survey which led to the establishment of the violation, and for the reasonable costs of preparing and bringing legal action under this section;

3. Costs incurred in removing, correcting or terminating the adverse effects resulting from violation;

4. Compensatory damages for loss or destruction to water quality, wildlife, fish and aquatic life.

D. Administrative Enforcement Powers. In addition to the other enforcement powers and remedies established by this chapter, the Engineer has the authority to utilize the following administrative remedies:

1. Cease and Desist Orders. When a discharge has taken place or is likely to take place in violation of this chapter, the Engineer may issue an order to cease and desist such discharge, or practice or operation likely to cause such discharge and direct that those persons not complying shall: (a) comply with the requirement; (b) comply with a time schedule for compliance; and (c) take appropriate remedial or preventive action to prevent the violation from recurring.

2. Notice to Clean. Whenever the Engineer finds any oil, earth, debris, grass, weeds, dead trees, tin cans, rubbish, refuse, waste or any other material of any kind, in or upon the sidewalk abutting or adjoining any parcel of land, or upon any parcel of land or grounds, which may result in pollutants entering the MS4 or a non-stormwater discharge to the MS4, he or she may give notice to the owner or occupant of the adjacent property to remove such oil earth, debris, grass, weeds, dead trees, tin cans, rubbish, refuse, waste or other material, in any manner that he or she may reasonably provide. The recipient of such notice shall undertake the activities as described in the notice.

E. Penalties. Violation of this chapter shall be punishable as provided in Chapter 1-2.01 of this Code. Each day that a violation continues shall constitute a separate offense.

F. Permit Revocation. To the extent the City makes a provision of this chapter or any identified BMP a condition of approval to the issuance of a permit or license, any person in violation of such condition is subject to the permit revocation procedures set forth in this code.

G. Burden of Proof. In an enforcement action, the burden of proof shall be on the person who is the subject of such action to establish that the reduction or elimination of the discharge to the maximum extent practicable has been accomplished through compliance with the best management practices available, including applicable monitoring, notifications and reporting requirements.

H. Remedies. Remedies under this chapter are in addition to and do not supersede or limit any and all other available remedies, civil or criminal. The remedies provided for in this chapter shall be cumulative and not exclusive.

5-7.115 No taking.

The provisions of this chapter shall not operate to deprive any property owner of substantially all of the market value of such owner's property or otherwise constitute an unconstitutional taking without compensation."

Section 2. Severability. If any section, subsection, sentence, clause, phrase or portion of this ordinance for any reason is held to be invalid or unconstitutional by any court of competent jurisdiction, such decision shall not affect the validity or the remaining portions of this ordinance. The City Council of the City of Redondo Beach hereby declares that it would have adopted this ordinance and each section, subsection, sentence, clause, phrase or portion thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, phrases or portions were to be declared invalid or unconstitutional.

Section 3. CEQA. The City Council hereby finds, in the exercise of its independent judgment and analysis, that this ordinance is exempt from the California Environmental Quality Act ("CEQA") because the Low Impact Development requirements for new development and redevelopment projects of this Ordinance will not have a significant effect on the environment, and the adoption of this Ordinance and the timing thereof is mandated by the action of the Los Angeles Regional Water Quality Control Board ("LARWQCB"). In this case, the City is acting at the direction of the LARWQCB and federal law to protect, maintain, restore and enhance natural resources and the environment. To comply with the requirements of the LARWQCB, the City Council finds that the adoption of this Ordinance is categorically exempt from the requirements of the California Environmental Quality Act ("CEQA") pursuant to CEQA Guidelines Sections 15307 and 15308. Staff is hereby directed to prepare and post a notice of exemption pursuant to Guidelines Section 15062.

SECTION 4. INCONSISTENT PROVISIONS. Any provisions of the Redondo Beach Municipal Code, or appendices thereto, or any other ordinances of the City inconsistent herewith, to the extent of such inconsistencies and no further, are hereby repealed.

SECTION 5. SEVERANCE. If any section, subsection, sentence, clause, or phrase of this ordinance is for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of the ordinance. The City Council hereby declares that it would have passed this ordinance and each section, subsection, sentence, clause and phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases be declared invalid or unconstitutional.

SECTION 6. PUBLICATION AND EFFECTIVE DATE. This ordinance shall be published by one insertion in the official newspaper of the City, and the same shall go into effect and be in full force and operation from and after thirty (30) days after its final passage and adoption.

PASSED, APPROVED AND ADOPTED this ____ day of April, 2015.

____

Steve Aspel, Mayor

ATTEST:

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS
CITY OF REONDO BEACH)

I, Eleanor Manzano, City Clerk of the City of Redondo Beach, California, do hereby certify that the foregoing Ordinance No. ______ was duly introduced at a regular meeting of the City Council held on the ___ day of _______, 2015, and was duly approved and adopted by the City Council at a regular meeting of said City Council held on the _____ day of , 2015, by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

____

Eleanor Manzano, City Clerk

APPROVED AS TO FORM:

____

Michael W. Webb, City Attorney

ORDINANCE NO. ___

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF TORRANCE, CALIFORNIA AMENDING IN ITS ENTIRETY CHAPTER 7 OF TITLE 5 OF THE TORRANCE MUNICIPAL CODE REGARDING STORMWATER AND URBAN RUNOFF POLLUTION CONTROL REGULATIONS AND MAKING A DETERMINATION OF EXEMPTION UNDER CEQA

WHEREAS, the federal Clean Water Act provides for the regulation and reduction of pollutants discharged into the waters of the United States by extending National Pollutant Discharge Elimination System ("NPDES") requirements to stormwater and urban runoff discharged into municipal storm drain systems.

WHEREAS, the City of Torrance (the "City") is a co-permittee under the "Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except those Discharges Originating from the City of Long Beach MS4, Order No. R4-2012-0175, NPDES Permit No. CAS00401" ("MS4 Permit") issued by the California Regional Water Quality Control Board—Los Angeles Region, and, as a co-permittee under the MS4 Permit, the City is required to adopt ordinances and implement procedures with respect to discharges into the municipal separate storm sewer system ("MS4").

WHEREAS, the City has previously adopted ordinances to ensure that it possesses the legal authority necessary to control discharges to and from those portions of the MS4 over which it has jurisdiction, in order to comply with the MS4 Permit, and to specifically prohibit certain discharges identified in the MS4 Permit.

WHEREAS, Chapter 7 of Title 5 of the Torrance Municipal Code is being revised in order to comply with the current MS4 Permit.

NOW, THEREFORE, the City Council of the City of Torrance, California does hereby ordain as follows:

Section 1. Chapter 7 of Title 5 of the Torrance Municipal Code is hereby amended in its entirety to read as follows:

"5-7.101 Title.

This chapter shall be known as the City of Torrance Stormwater Management and Discharge Control Ordinance.

5-7.102 Findings.

A. The federal Clean Water Act (33 U.S.C. Section 1251, *et seq*.,) provides for the regulation and reduction of pollutants discharged into the waters of the United States by extending National Pollutant Discharge Elimination System ("NPDES") requirements to stormwater and urban runoff discharge into municipal storm drain systems;

B. Stormwater and urban runoff flows from individual properties onto streets, then through storm drains passing through the City and finally into the waters of the United States;

C. The City is a co-permittee under the "Waste Discharge Requirements for Municipal Separate Storm Sewer System ("MS4") discharges within the Coastal Watersheds of Los Angeles County, except those discharges originating from the City of Long Beach MS4, which also serves as a NPDES Permit under the federal Clean Water Act (NPDES No. CAS614001), as well as waste discharge requirements under California law (the Municipal NPDES Permit") and, as a co-permittee under the Municipal NPDES Permit, the City is required to adopt ordinances and implement procedures with respect to the entry of non-stormwater discharges into the municipal stormwater system;

D. Part III, Section A of the Municipal NPDES Permit requires the City to effectively prohibit non-stormwater discharges from within its boundaries, into that portion of the MS4 which it owns or operates and into watercourses, except where such discharges are: (1) in compliance with a separate individual or general NPDES permit, or (2) identified and in compliance with Part III.A (non-stormwater discharges) of the Municipal NPDES Permit, or (3) originate from federal, state or other facilities which the City is preempted from regulating, and further provides that compliance with the terms of the Municipal NPDES Permit through the development and implementation of the programs described in the Municipal NPDES Permit will constitute compliance with the discharge prohibition in the Municipal NPDES Permit;

E. Part VI, Section A.2 of the Municipal NPDES Permit requires the City to establish and maintain the legal authority necessary to control discharges to and from those portions of the MS4 over which it has jurisdiction, so as to comply with the Municipal NPDES Permit and to specifically prohibit certain discharges identified in the Municipal NPDES Permit;

F. The Municipal NPDES Permit contemplates the development of an Enhanced Watershed Management Program in which the City will participate, which will in turn require the development and the implementation of programs for, among other things, the elimination of illicit connections and illicit discharges, development planning, development construction, and public information and education requirements, and which may require the later adoption of additional legal authority to implement such programs as they are developed by the permittees and approved by the Regional Board;

G. In order to control, in a cost-effective manner, the quantity and quality of stormwater and urban runoff to the maximum extent practicable, the adoption of the ordinance codified in this chapter is essential.

5-7.103 Purpose and intent.

A. The purpose of this chapter is to ensure the future health, safety and general welfare of the citizens of the City and the water quality of the receiving waters of the County of Los Angeles and surrounding coastal areas by:

1. Reducing pollutants in stormwater discharges to the maximum extent practicable;

2. Regulating illicit connections and illicit discharges and reducing the level of contamination of stormwater and urban runoff in the municipal stormwater system; and

3. Regulating non-stormwater discharges to the municipal stormwater system.

B. The intent of this chapter is to protect and enhance the quality of watercourses, water bodies, and wetlands within the City in a manner consistent with the federal Clean Water Act, the California Porter-Cologne Water Quality Control Act and the Municipal NPDES Permit.

C. This chapter is also intended to provide the City with the legal authority necessary to control discharges to and from those portions of the municipal stormwater system over which it has jurisdiction as required by the Municipal NPDES Permit, and fully and timely comply with the terms of the Municipal NPDES Permit while the Enhanced Watershed Management Program is being developed by the City as part of the Beach Cities Watershed Management Group, and in contemplation of the subsequent amendment of this chapter or adoption by the City of additional provisions of this chapter to implement the subsequently adopted Enhanced Watershed Management Program, or other programs developed under the Municipal NPDES Permit.

D. This chapter also sets forth requirements for the construction and operation of certain commercial development, new development and redevelopment and other projects (as further defined herein) which are intended to ensure compliance with the stormwater mitigation measures prescribed in the current MS4 Permit. This chapter authorizes the Engineer to define and adopt applicable best management practices and other stormwater pollution control measures, as provided herein, to carry out all inspections including entering entities discharging to the MS4, conduct surveillance, conduct monitoring, cite infractions and to impose fines pursuant to this chapter. Except as otherwise provided herein, the Engineer shall administer, implement and enforce the provisions of this section.

E. The City Council shall approve and enter into interagency agreements as deemed necessary by the City Council to control the contribution of pollutants of the shared MS4.

5-7.104 Definitions.

Except as specifically provided herein, any term used in this chapter shall be defined as that term is defined in the current Municipal NPDES Permit, or if it is not specifically defined in the Municipal NPDES Permit, then as such term is defined in the Federal Clean Water Act, as amended, or the regulations promulgated thereunder. If the definition of any term contained in this section conflicts with the definition of the same term in the current Municipal NPDES Permit, then the definition contained in the Municipal NPDES Permit shall govern. The following words and phrases shall have the following meanings when used in this chapter:

"Area susceptible to runoff" means any surface directly exposed to precipitation or in the path of runoff caused by precipitation which path leads off the parcel on which the surface is located.

"Automotive service facilities" means a facility that is categorized in any one of the following Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes. For inspection purposes, Permittees need not inspect facilities with SIC codes 5013, 5014, 5511, 5541, 7532-7534, and 7536-7539 provided that these facilities have no outside activities or materials that may be exposed to stormwater.

"Basin Plan" means the Water Quality Control Plan, Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, adopted by the Regional Water Board on June 13, 1994 and subsequent amendments.

"Best Management Practices (BMPs)" means practices or physical devices or systems designed to prevent or reduce pollutant loading from stormwater or non-stormwater discharges to receiving waters, or designed to reduce the volume of stormwater or non-stormwater discharged to the receiving water. Examples of BMPs may include public education and outreach, proper planning of development projects, proper cleaning of catch basin inlets, and proper sludge- or waste-handling and disposal, among others.

"Biofiltration" means a LID BMP that reduces stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration. Incidental infiltration is an important factor in achieving the required pollutant load reduction. Therefore, the term "biofiltration" as used in this chapter is defined to include only systems designed to facilitate incidental infiltration or achieve the equivalent pollutant reduction as biofiltration BMPs with an underdrain (subject to approval by the Regional Board's Executive Officer). Biofiltration BMPs include bioretention systems with an underdrain and bioswales.

"Bioretention" means a LID BMP that reduces stormwater runoff by intercepting rainfall on vegetative canopy, and through evapotranspiration and infiltration. The bioretention system typically includes a minimum 2-foot top layer of a specified soil and compost mixture underlain by a gravel-filled temporary storage pit dug into the in-situ soil. As defined in this Ordinance, a bioretention BMP may be designed with an overflow drain, but may not include an underdrain. When a bioretention BMP is designed or constructed with an underdrain it is regulated by the Municipal NPDES Permit as biofiltration.

"Bioswale" means a LID BMP consisting of a shallow channel lined with grass or other dense, low-growing vegetation. Bioswales are designed to collect stormwater runoff and to achieve a uniform sheet flow through the dense vegetation for a period of several minutes.

“City” means the City of Torrance, California.

“Clean Water Act (CWA)” means the Federal Water Pollution Control Act enacted in 1972, by Public Law 92-500, and amended by the Water Quality Act of 1987. The Clean Water Act prohibits the discharge of pollutants to Waters of the United States unless the discharge is in accordance with an NPDES permit.

“Commercial development” means any development on private land that is not heavy industrial or residential. The category includes, but is not limited to: hospitals, laboratories and other medical facilities, educational institutions, recreational facilities, plant nurseries, car wash facilities, mini-malls and other business complexes, shopping malls, hotels, office buildings, public warehouses and other light industrial complexes.

“Commercial Malls” means any development on private land comprised of one or more buildings forming a complex of stores which sells various merchandise, with interconnecting walkways enabling visitors to easily walk from store to store, along with parking area(s). A commercial mall includes, but is not limited to: mini-malls, strip malls, other retail complexes, and enclosed shopping malls or shopping centers

“Construction” means any construction or demolition activity, clearing, grading, grubbing, or excavation or any other activity that result in land disturbance. Construction does not include emergency construction activities required to immediately protect public health and safety or routine maintenance activities required to maintain the integrity of structures by performing minor repair and restoration work, maintain the original line and grade, hydraulic capacity, or original purposes of the facility. See “Routine Maintenance” definition for further explanation. Where clearing, grading or excavating of underlying soil takes place during a repaving operation, State General Construction Permit coverage by the State of California General Permit for Storm Water Discharges Associated with Industrial Activities or for Stormwater Discharges Associated with Construction Activities is required if more than one acre is disturbed or the activities are part of a larger plan

“Control” means to minimize, reduce, eliminate, or prohibit by technological, legal, contractual or other means, the discharge of pollutants from an activity or activities.

“Development” means any construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single family, multi-unit or planned unit development); industrial, commercial, retail and other nonresidential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

“Directly adjacent” means situated within two hundred (200) feet of the contiguous zone required for the continued maintenance, function, and structural stability of the environmentally sensitive area.

"Discharge" means when used without qualification the discharge of a pollutant.

"Discharge of a pollutant" means any addition of any pollutant or combination of pollutants to waters of the United States from any point source or, any addition of any pollutant or combination of pollutants to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. The term discharge includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by a state, municipality, or other person which do not lead to treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

"Discharging" directly means outflow from a drainage conveyance system that is composed entirely or predominantly of flows from the subject, property, development, subdivision, or industrial facility, and not commingled with the flows from adjacent lands.

"Discretionary project" is defined in the same manner as Section 15357 of the Guidelines for Implementation of the California Environmental Quality Act contained in Title 14 of the California Code of Regulations, as amended, and means a project which requires the exercise of judgment or deliberation when the City decides to approve or disapprove a particular activity, as distinguished from situations where the City merely has to determine whether there has been conformity with applicable statutes, ordinances or regulations.

"Disturbed area" means an area that is altered as a result of clearing, grading, and/or excavation.

"Engineer" means the City Engineer and persons directed by him or her and under the instruction and supervision of the City Engineer who are assigned to enforce this chapter.

"Environmentally sensitive area (ESA)" means an area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments (California Public Resources Code § 30107.5). Areas subject to storm water mitigation requirements are areas designated as Significant Ecological Areas by the County of Los Angeles (Los Angeles County Significant Areas Study, Los Angeles County Department of Regional Planning (1976) and amendments); an area designated as a Significant Natural Area by the California Department of Fish and Games Significant Natural Areas Program, provided that area has been field verified by the Department of Fish and Game; an area listed in the Basin Plan as supporting the Rare, Threatened, or Endangered Species (RARE) beneficial use; and an area identified by the City as environmentally sensitive.

"Flow-through treatment BMPs" means a modular, vault type "high flow biotreatment" devices contained within an impervious vault with an underdrain or designed with an impervious liner and an underdrain.

"Full Capture System" means any single device or series of devices, certified by the Executive Officer, that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate Q resulting from a one-year, one-hour storm in the sub-drainage area.

"Good housekeeping practices" means common practices related to the storage, use or cleanup of materials, performed in a manner that minimizes the discharge of pollutants. Examples include, but are not limited to, purchasing only the quantity of materials to be used at a given time, use of alternative and less environmentally harmful products, cleaning up spills and leaks, and storing materials in a manner that will contain any leaks or spills.

"General Construction Activities Storm Water Permit (GCASP)" means the general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from construction activities under certain conditions.

"General Industrial Activities Storm Water Permit (GIASP**)"** means the general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from certain industrial activities under certain conditions.

"Green Roof" means a LID BMP using planter boxes and vegetation to intercept rainfall on the roof surface. Rainfall is intercepted by vegetation leaves and through evapotranspiration. Green roofs may be designed as either a bioretention BMP or as a biofiltration BMP. To receive credit as a bioretention BMP, the green roof system planting medium shall be of sufficient depth to provide capacity within the pore space volume to contain the design storm depth and may not be designed or constructed with an underdrain.

"Hillside" means property located in an area with known erosive soil conditions, where the development contemplates grading on any natural slope that is twenty-five percent (25%) or greater and where grading contemplates cut or fill slopes.

"Illicit connection" means any human-made conveyance that is connected to the storm drain system without a permit, excluding gutters, roof-drains and other similar connections. Examples include channels, pipelines, conduits, inlets or outlets that are connected directly to the storm drain system.

"Illicit discharge" means any discharge to the storm drain system that is prohibited under local, state or federal statutes, ordinances, codes or regulations. This includes all non-stormwater discharges except discharges pursuant to a separate NPDES permit and discharges that are exempted or conditionally exempted in accordance with Part III the Municipal NPDES permit.

"Industrial/Commercial Facility" means any facility involved and/or used in the production, manufacture, storage, transportation, distribution, exchange or sale of goods and/or commodities, and any facility involved and/or used in providing professional and non-professional services. This category of facilities includes, but is not limited to, any facility defined by either the Standard Industrial Classifications (SIC) or the North American Industry Classification System (NAICS). Facility ownership (federal, state, municipal, private) and profit motive of the facility are not factors in this definition.

"Industrial Park" means land development that is set aside for industrial development. Industrial parks are usually located close to transport facilities, especially where more than one transport modalities coincide: highways, railroads, airports, and navigable rivers. It includes office parks, which have offices and light industry.

"Infiltration BMP" means a LID BMP that reduces stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Examples of infiltration BMPs include infiltration basins, dry wells, and pervious pavement.

"Infiltration" means the downward entry of water into the surface of the soil.

"Low Impact Development" or "LID" consists of building and landscape features designed to retain or filter stormwater runoff.

"Material" means any substance including, but not limited to: garbage and debris; lawn clippings, leaves, and other vegetation; biological and fecal waste; sediment and sludge; oil and grease; gasoline; paints, solvents, cleaners, and any fluid or solid containing chemicals.

"Municipal NPDES Permit" means the Waste Discharge Requirements for Municipal Storm Water and Urban Runoff Discharges within the County of Los Angeles, and the Incorporated Cities Therein, Except the City of Long Beach (Order No. R4-2012-0175), NPDES Permit No. CAS00401), issued by the California Regional Water Quality Control Board—Los Angeles Region, and any successor permit to that permit.

"Municipal Separate Storm Sewer System (MS4)" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

1. Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

2. Designed or used for collecting or conveying stormwater;

3. Which is not a combined sewer; and

4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR Section 122.2.

"New development" means land-disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision.

"Non-stormwater discharge" means any discharge to a municipal stormwater system that is not composed entirely of stormwater.

"NPDES permit" means any waste discharge requirements issued by the Regional Board or the State Water Resources Control Board in the form of an NPDES permit pursuant to Water Code Section 13370 (other than the Municipal NPDES Permit).

"Outfall" means a point source as defined by 40 CFR 122.2 at the point where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances with connect segments of the same stream or other waters of the United Sates and are used to convey waters of the United States. (40 CFR Section 122.26(b)(9))

"Parking lot" means land area or a facility for the parking or storage of motor vehicles used for businesses, commerce, industry or personal use with a lot size of five thousand (5,000) square feet or more of surface area, or with twenty-five (25) or more parking spaces.

"Planning priority projects" means those projects specified in Section 18.04.105.C of this chapter that are required to incorporate appropriate storm water mitigation measures into the design plan for their respective projects.

"Pollutant" means those pollutants defined in Section 502(6) of the federal Clean Water Act (33 U.S.C. Section 1362(6)), or incorporated into California Water Code Section 13373. The term "pollutant" shall not include uncontaminated stormwater, potable water or reclaimed water generated by a lawfully permitted water treatment facility.

"Project" means all development, redevelopment, and land disturbing activities. The term is not limited to "Project" as defined under CEQA (California Public Resources Code Section 21065).

"Rainfall Harvest and Use" means a LID BMP system designed to capture runoff, typically from a roof but can also include runoff capture from elsewhere within the site, and to provide for temporary storage until the harvested water can be used for irrigation or non-potable uses. The harvested water may also be used for potable water uses if the system includes disinfection treatment and is approved for such use by the local building department (Order No. R4-2012-0175).

"Receiving Water" means "water of the United States" into which waste and/or pollutants are or may be discharged.

"Redevelopment" means land-disturbing activity that result in the creation, addition, or replacement of 5,000 square feet or more of impervious surface area on an already developed site. Redevelopment includes, but is not limited to: the expansion of a building footprint; addition or replacement of a structure; replacement of impervious surface area that is not part of routine maintenance activity; and land disturbing activity related to structural or impervious surfaces. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Regional Board" means the California Regional Water Quality Control Board—Los Angeles Region.

"Restaurant" means a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption. (SIC Code 5812).

"Retail gasoline outlet" means any facility engaged in selling gasoline and lubricating oils.

"Routine Maintenance" includes, but is not limited to projects conducted to:

1. Maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

2. Perform as needed restoration work to preserve the original design grade, integrity and hydraulic capacity of flood control facilities.

3. Includes road shoulder work, regrading dirt or gravel roadways and shoulders and performing ditch cleanouts.

4. Update existing lines and facilities, which include replacing existing lines with new materials or pipes, to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.

5. Repair leaks.

Routine maintenance does not include construction of new lines or facilities resulting from compliance with applicable codes, standards and regulations. New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

"Runoff" means any runoff including storm water and dry weather flows from a drainage area that reaches a receiving water body or subsurface. During dry weather it is typically comprised of base flow either contaminated with pollutants or uncontaminated, and nuisance flows.

"Significant Ecological Area" means an area that is determined to possess an example of biotic resources that cumulatively represent biological diversity, for the purposes of protecting biotic diversity, as part of the Los Angeles County General Plan. Areas are designated as SEAs, if they possess one or more of the following criteria:

1. The habitat of rare, endangered, and threatened plant and animal species.

2. Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind, or are restricted in distribution on a regional basis or within Los Angeles County.

3. Habitat that at some point in the life cycle of a species or group of species, serves as a concentrated breeding, feeding, resting, migrating grounds and is limited in availability either regionally or within Los Angeles County.

4. Biotic resources that are of scientific interest because they are either an extreme in physical/geographical limitations, or represent an unusual variation in a population or community.

5. Areas important as game species habitat or as fisheries.

6. Areas that would provide for the preservation of relatively undisturbed examples of natural biotic communities in Los Angeles County.

7. Special areas.

"Site" means the land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

"Source control BMP" means any schedule of activities, prohibition of practices, maintenance procedures, managerial practices or operational practices that aim to prevent stormwater pollution by reducing the potential for contamination at the source of pollution.

"Standard urban stormwater mitigation plan" or "SUSMP" means a report submitted by an applicant for approval by the Engineer prior to issuance of a building, grading, planning or similar permit outlining the necessary LID requirements and BMPs which must be incorporated into design plans for development or redevelopment projects.

"Storm Drain System" means any facility or any parts of the facility, including streets, gutters, conduits, natural or artificial drains, channels and watercourse that are used for the purpose of collecting, storing, transporting or disposing of stormwater and are located within the City.

"Stormwater runoff" means that part of precipitation (rainfall) which travels via flow across a surface to the MS4 or receiving waters from impervious, semi-pervious or pervious surfaces. When all other factors are equal, runoff increases as the perviousness of a surface decreases.

"Structural BMP" means any structural facility designed and constructed to mitigate the adverse impacts of stormwater and urban runoff pollution (e.g. canopy, structural enclosure). Structural BMPs may include both treatment control BMPs and source control BMPs.

"Treatment" means the application of engineered systems that use physical, chemical or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media adsorption, biodegradation, biological uptake, chemical oxidation and UV radiation.

"Treatment control BMP" means any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media adsorption or any other physical, biological or chemical process.

"Urban runoff" means surface water flow produced by non-stormwater resulting from residential, commercial and industrial activities involving the use of potable and nonpotable water.

5-7.105 Construction and application.

This chapter shall be construed to assure consistency with the requirements of the federal Clean Water Act and acts amendatory or supplementary to the Federal Clean Water Act, applicable implementing regulations, and the Municipal NPDES Permit, and any amendment, revision or reissuance of the Municipal NPDES Permit.

5-7.106 Inspection.

The Engineer, or his representative, shall be authorized at any reasonable time to enter the premises of any property discharging to the MS4 to determine compliance with the provisions of this chapter; such inspection may include but not be limited to: sampling, monitoring, reviewing, photographing, videotaping and inspecting treatment facilities and discharge location.

5-7.107 Storm drain impact fees.

A. Every applicant for a permit pursuant to Section 9-1.02 of this Code for development construction shall pay a storm drain impact fee.

B. The proceeds of the storm drain impact fee shall be applied to offset the City's costs of enforcing the order as a result of development construction, and the amount of the storm drain impact fee shall not exceed the City's reasonable costs therefor.

C. The amount of the storm drain impact fee shall be established by resolution of the City Council, as amended from time to time, in accordance with the provisions of this section, as amended from time to time.

D. The City Engineer shall administer and collect the storm drain impact fee.

E. Permits issued pursuant to Section 9-1.02 for development construction shall not be issued until payment of the storm drain impact fee.

5-7.108 Critical source of pollution inspection fee.

A. Every person required to obtain a license pursuant to Torrance Municipal Code Section 6-1.06 and also engaged in a business designated in the Municipal NPDES permit as a critical source of pollution shall pay an annual critical source of pollution inspection fee.

B. The proceeds of the critical source of pollution inspection fee shall be applied to offset the City's costs of performing the inspections required by the Municipal NPDES permit and the amount of the critical source of pollution inspection fee shall not exceed the City's reasonable costs therefor.

C. The amount of the critical source of pollution inspection fee shall be established by resolution of the City Council as amended from time to time in accordance with provisions of this section.

D. The License Clerk and Collector shall administer and collect the critical source of pollution inspection fee.

E. No license issued pursuant to Torrance Municipal Code Section 6-1.06 shall be issued or renewed until payment of the critical source of pollution inspection fee is received by the License Clerk and Collector.

5-7.109 Prohibited activities.

A. Illicit Discharges and Connections. It is prohibited to commence, establish, use, maintain or continue any illicit connections to the MS4 or any illicit discharges to the MS4. This prohibition against illicit connections applies to the use, maintenance or continuation of any illicit connection, whether that connection was established prior to or after the effective date of this chapter.

B. Littering. No person shall throw, deposit, place, leave, maintain, keep or permit to be thrown, deposited, placed, left or maintained or kept, any refuse, rubbish, garbage, or any other discarded or abandoned objects, articles or accumulations, in or upon any street, alley, sidewalk, storm drain, inlet, catch basin conduit or drainage structure, business place, or upon any or private plot of land in the City, so that the same might be or become a pollutant. No person shall throw or deposit litter in any fountain, pond, lake, stream, or other body of water within the City. This section shall not apply to refuse, rubbish or garbage deposited in containers, bags or other appropriate receptacles which are placed in designated locations for regular solid waste pick-up and disposal.

C. Disposal of Landscape Debris. No person shall dispose of leaves, dirt, or other landscape debris into the municipal separate stormwater system.

D. Non-stormwater Discharges. The following non-stormwater discharges into the MS4 are prohibited unless in compliance with a separate NPDES permit or pursuant to a discharge exemption by the Regional Board, the Regional Board's Executive Officer, or the State Water Resources Control Board:

1. The discharge of untreated wash waters to the MS4 when gas stations, auto repair garages, or other type of automotive service facilities are cleaned;

2. The discharge of untreated wastewater to the MS4 from mobile auto washing, steam cleaning, mobile carpet cleaning, and other such mobile commercial and industrial operations;

3. To the maximum extent practicable, discharges to the MS4 from areas where repair of machinery and equipment, including motor vehicles, which are visibly leaking oil, fluid or antifreeze, is undertaken;

4. Discharges of untreated runoff to the MS4 from storage areas of materials containing grease, oil, or other hazardous substances, and uncovered receptacles containing hazardous materials;

5. Discharges of commercial/municipal swimming pool filter backwash to the MS4;

6. Discharges of untreated runoff from the washing of toxic materials from paved or unpaved areas to the MS4; provided, however, that nonindustrial and noncommercial activities which incidentally generate urban runoff, such as the hosing of sidewalks, shall be excluded from this prohibition;

7. To the maximum extent practicable, discharges to the MS4 from washing impervious surfaces in industrial/commercial areas which results in a discharge of untreated runoff to the MS4, unless specifically required by state law, or the City's Municipal code, or Los Angeles County's Health and Safety Codes, or permitted under a separate NPDES permit;

8. Discharges from the washing out of concrete trucks into the MS4;

9. Discharges to the MS4 of any pesticide, fungicide or herbicide, banned by the USEPA or the California Department of Pesticide Regulation; or

10. The disposal of hazardous wastes into trash containers used for municipal trash disposal where such disposal causes or threatens to cause a direct or indirect discharge to the MS4.

E. Car Washing. No motor vehicle, boat, trailer, or other type of mobile transportation may be washed, other than at a commercial carwash, unless such vehicle is being washed by:

1. A resident at their residence using a hand-held bucket or a water hose equipped with an automatic shutoff nozzle as long as water does not flow onto streets; or

2. A business that has an approved car wash facility for its fleet vehicles, provided that water does not flow onto streets.

5-7.110 Exempted discharges, conditionally exempted discharges or designated discharges.

A. Discharges from those activities specifically identified in, or pursuant to, Part III.A.1-3 of the Municipal NPDES Permit as being exempted discharges, conditionally exempted discharges or designated discharges shall not be considered a violation of this chapter; provided that, consistent with Part III.A.1-3 of the Municipal NPDES Permit:

1. Any applicable BMPs developed pursuant to the Municipal NPDES Permit are implemented to minimize any adverse impacts from such identified sources;

2. The discharger meets all notification, reporting and recordkeeping requirements; and

3. The discharger has conducted all applicable monitoring requirements.

B. Discharges in Violation of the Municipal NPDES Permit. Any discharge that would result in or contribute to a violation of the Municipal NPDES Permit, either separately or in combination with other discharges, is prohibited. Liability for any such discharge shall be the responsibility of the person(s) causing or responsible for the discharge, and such person(s) shall defend, indemnify and hold harmless the City from all losses, liabilities, claims or causes of actions in any administrative or judicial action relating to such discharge.

5-7.111 Good housekeeping provisions.

Owners and occupants of property within the City shall comply with the following requirements:

A. Septic Waste. No person shall leave, deposit, discharge, dump, or otherwise expose any chemical or septic waste to precipitation in an area where a discharge to City streets or MS4 may or does occur.

B. Use of Water. Runoff of water used for irrigation purposes shall be minimized to the maximum extent practicable. Runoff of water from the permitted washing down of paved areas shall be minimized to the maximum extent practicable.

C. Storage of Materials, Machinery and Equipment. Machinery or equipment that is to be repaired or maintained in areas susceptible to or exposed to stormwater, shall be placed in a manner so that leaks, spills and other maintenance-related pollutants are not discharged to the MS4.

D. Removal and Disposal of Debris from Industrial/Commercial Motor Vehicle Parking Lots. Industrial/commercial motor vehicle parking lots with more than twenty-five (25) parking spaces that are located in areas potentially exposed to stormwater shall be swept regularly or other equally effective measures shall be utilized to remove debris from such parking lots.

E. Food Wastes. Food wastes generated by nonresidential food service and food distribution sources shall be properly disposed of and in a manner so such wastes are not discharged to the MS4.

F. Best Management Practices. Best management practices shall be used in areas exposed to stormwater for the removal and lawful disposal of all fuels, chemicals, fuel and chemical wastes, animal wastes, garbage, batteries, or other materials which have potential adverse impacts on water quality.

G. Maintenance of Structural BMPs. Structural BMPs shall be properly operated and maintained, consistent with the approved SUSMP. Records and documentation of such maintenance shall be provided to the Engineer upon request.

5-7.112 Requirements for industrial/commercial and construction activities.

A. Industrial/Commercial and Construction Related Dischargers Generally. Each discharger associated with industrial/commercial activity or construction activity, or other discharger described in any general NPDES permit addressing such discharges, as may be issued by the U.S. Environmental Protection Agency, the State Water Resources Control Board, or the Regional Board shall comply with all requirements of such NPDES permit and the City's development construction program. Each discharger identified in an individual NPDES permit shall comply with and undertake all activities required by such permit. Proof of compliance with any such NPDES permit and the City's development construction program may be required in a form acceptable to the Engineer prior to the issuance of any grading, building or occupancy permits, or any other type of permit or license issued by the City.

B. Non-stormwater discharges to the MS4 from industrial, commercial or construction activities in violation of any applicable NPDES permit or the City's development construction program are prohibited.

C. Source Control BMPs for Industrial/Commercial Facilities. Industrial/commercial facilities shall implement the effective source control BMPs listed in Table 10 of Part VI.D.6.f. of the Municipal NPDES Permit, unless a particular pollutant generating activity does not occur on a facility's site.

5-7.113 Standard urban stormwater mitigation plan (SUSMP) and low impact development (LID) requirements for new development and redevelopment projects.

A. Objective. Pursuant to Part VI.D.7.b of the Municipal NPDES Permit, the provisions of this section establish requirements for construction activities and facility operations of development and redevelopment projects to comply with the current Municipal NPDES Permit to lessen the water quality impacts of development by using smart growth practices and integrate LID practices and standards for stormwater pollution mitigation through means of infiltration, evapotranspiration, biofiltration, and rainfall harvest and use. Except as otherwise provided herein, the City shall administer, implement and enforce the provisions of this section.

B. Scope. This section contains requirements for stormwater pollution control measures in development and redevelopment projects and authorizes the City to further define and adopt stormwater pollution control measures, and to develop LID principles and requirements, including but not limited to the objectives and specifications for integration of LID strategies. As specified in this section, certain Planning Priority Projects shall meet the requirements of this section through the preparation and submittal of a standard urban stormwater mitigation plan (SUSMP), which shall include the applicable LID requirements set forth in this section as an element of the SUSMP.

C. LID Standards Manual. The Engineer shall prepare, maintain, and update, as deemed necessary and appropriate, a manual ("LID Standards Manual"), which shall include urban and stormwater runoff quantity and quality control development principles and technologies for achieving compliance with the provisions of this section. The LID Standards Manual shall also include technical feasibility and implementation parameters, as well as other rules, requirements, and procedures as the Engineer deems necessary, for implementing the provisions of this Chapter.

D. Applicability – Planning Priority Projects. The following development and redevelopment projects shall be designated as Planning Priority Projects, which are subject to City conditioning and approval for the design and implementation of post-construction controls to mitigate storm water pollution prior to completion of the projects, and shall meet the requirements of this section:

1. New Development Projects.

a. All development projects equal to one (1) acre or greater of disturbed area that adds more than 10,000 square feet of impervious surface area.

b. Industrial parks 10,000 square feet or more of surface area.

c. Commercial malls 10,000 square feet or more of surface area.

d. Retail gasoline outlets with 5,000 square feet or more of surface area.

e. Restaurants (Standard Industrial Classification (SIC) of 5812) with 5,000 square feet or more of surface area.

f. Parking lots with 5,000 square feet or more of impervious surface area, or with 25 or more parking spaces.

g. Streets and roads construction of 10,000 square feet or more of impervious surface area. Street and road construction applies to standalone streets, roads, highways, and freeway projects, and also applies to streets within larger projects.

h. Automotive service facilities (Standard Industrial Classification (SIC) of 5013, 5014, 5511, 5541, 7532-7534 and 7536-7539) 5,000 square feet or more of surface area.

i. Projects located in or directly adjacent to, or discharging directly to an Significant Ecological Area (SEA), where the development will:

(i) Discharge stormwater runoff that is likely to impact a sensitive biological species or habitat; and

(ii) Create 2,500 square feet or more of impervious surface area.

j. Single-family hillside homes.

2. Redevelopment Projects

a. Land disturbing activity that results in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site on Planning Priority Project categories.

b. Where Redevelopment results in an alteration to more than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, the entire project must be mitigated.

c. Where Redevelopment results in an alteration of less than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, only the alteration must be mitigated, and not the entire development.

d. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area and maintains the original grade and alignment, is considered a routine maintenance activity. Redevelopment does not include the repaving of existing roads to maintain original line and grade.

e. Existing single-family dwelling and accessory structures are exempt from the Redevelopment requirements unless such projects create, add, or replace 10,000 square feet of impervious surface area.

E. Stormwater Pollution Control Requirements. The site for every Planning Priority Project shall be designed to control pollutants, pollutant loads, and runoff volume to the maximum extent feasible by minimizing impervious surface area and controlling runoff from impervious surfaces through infiltration, evapotranspiration, bioretention and/or rainfall harvest and use. In addition, the following specific requirements apply:

1. New Single-Family Hillside Homes. A new single-family hillside home development project shall include mitigation measures to:

a. Conserve natural areas;

b. Protect slopes and channels;

c. Provide storm drain system stenciling and signage;

d. Divert roof runoff to vegetated areas before discharge unless the diversion would result in slope instability; and

e. Direct surface flow to vegetated areas before discharge, unless the diversion would result in slope instability.

2. Street and Road Construction of 10,000 square feet or more. Street and road construction of 10,000 square feet or more of impervious surface shall follow the City's Green Street Manual developed by the Engineer and approved by City Council resolution. The City's Green Street Manual shall be based on the USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets (December 2008 EPA-833-F-08-009).

3. Remainder of Planning Priority Projects Require a SUSMP. Except for the projects listed in paragraphs (1) and (2) of subsection D of this section, all other Planning Priority Projects shall prepare and submit to the Engineer for review and approval a SUSMP which shall also contain LID requirements consistent with Parts VI.D.7.c and VI.D.7.d(iii) of the Municipal NPDES Permit. In addition, Planning Priority Projects subject to this paragraph (3) shall do the following:

a. Incorporate the SUSMP into Project Plans. An applicant for a Planning Priority Project identified in paragraph (3) of subsection D of this section shall incorporate into the applicant's project plans a Storm Water Mitigation Plan (SWMP), which includes those BMPs necessary to control storm water pollution from construction activities and facility operations, as set forth in the SUSMP applicable to the applicant's project. Structural or Treatment Control BMPs (including, as applicable, post-construction treatment control BMPs) set forth in project plans shall meet the design standards set forth in the SUSMP and the current Municipal NPDES Permit.

b. Verify Maintenance of BMPs. If a project applicant has included or is required to include structural or treatment control BMPs in project plans, the applicant shall provide verification of maintenance provisions. The verification shall include the applicant's signed statement, as part of its project application, accepting responsibility for all structural and treatment control BMP maintenance until such time, if any, the property is transferred.

E. Issuance of Discretionary Permits. No discretionary permit may be issued for any Planning Priority Project identified in this section until the Engineer confirms the project plans comply with the applicable requirements of this section.

F. Issuance of Certificates of Occupancy. As a condition for issuing a certificate of occupancy for a Planning Priority Project identified in this section, the Engineer shall require facility operators and/or owners to build all the stormwater pollution control BMPs and structural or treatment control BMPs that are shown on the approved project plans and to submit a signed certification statement stating that the site and all structural or treatment control BMPs will be maintained in compliance with the SUSMP and other applicable regulatory requirements.

G. Transfer of Properties Subject to Requirement for Maintenance of Structural and Treatment Control BMPs.

1. The transfer or lease of a property subject to a requirement for maintenance of structural and treatment control BMPs shall include conditions requiring the transferee and its successors and assigns to either (a) assume responsibility for maintenance of any existing structural or treatment control BMP or (b) to replace an existing structural or treatment control BMP with new control measures or BMPs meeting the then current standards of the City and the SUSMP. Such requirement shall be included in any sale or lease agreement or deed for such property. The condition of transfer shall include a provision that the successor property owner or lessee conduct maintenance inspections of all structural or treatment control BMPs at least once a year and retain proof of inspection.

2. For residential properties where the structural or treatment control BMPs are located within a common area which will be maintained by a homeowners association, language regarding the responsibility for maintenance shall be included in the projects conditions, covenants and restrictions (CC&Rs). Printed educational materials will be required to accompany the first deed transfer to highlight the existence of the requirement and to provide information on what stormwater management facilities are present, signs that maintenance is needed, and how the necessary maintenance can be performed. The transfer of this information shall also be required with any subsequent sale of the property.

3. If structural or treatment control BMPs are located within an area proposed for dedication to a public agency, said BMPs shall be the responsibility of the developer until the dedication is accepted by the public agency.

H. CEQA. Provisions of this section shall be complementary to, and shall not replace, any applicable requirements for stormwater mitigation required under the California Environmental Quality Act.

5-7.114 Enforcement.

A. Violations Deemed a Public Nuisance.

1. The following violations shall be deemed a public nuisance:

a. Any condition caused or permitted to exist in violation of any of the provisions of this chapter; or

b. Any failure to comply with any applicable requirement of either the SUSMP or an approved stormwater mitigation plan with respect to a property; or

c. Any false certification or verification, or any failure to comply with a certification or verification provided by a project applicant or the applicant’s successor in interest; or

d. Any failure to properly operate and maintain any structural or treatment control BMP on a property in accordance with an approved stormwater mitigation plan or the SUSMP, is determined to be a threat to the public health, safety and welfare, is declared and deemed a public nuisance, and may be abated or restored by any Engineer, and a civil or criminal action to abate, enjoin or otherwise compel the cessation of such nuisance may be brought by the City Attorney.

2. The cost of such abatement and restoration shall be borne by the owner of the property and the cost shall be billed to the owner of the property, as provided by law or ordinance for the recovery of nuisance abatement costs,

3. If any violation of this chapter constitutes a seasonal and recurrent nuisance, the Engineer shall so declare. The failure of any person to take appropriate annual precautions to prevent stormwater pollution after written notice of a determination under this section shall constitute a public nuisance and a violation of this chapter.

B. Concealment. Causing, permitting, aiding, abetting or concealing a violation of any provision of this chapter shall constitute a violation of such provision.

C. Civil Actions. In addition to any other remedies provided in this chapter, any violation of this chapter may be enforced by civil action brought by the City. In any such action, the City may seek any or all of the following remedies:

1. A temporary and/or permanent injunction;

2. Assessment of the violator for the costs of any investigation, inspection or monitoring survey which led to the establishment of the violation, and for the reasonable costs of preparing and bringing legal action under this section;

3. Costs incurred in removing, correcting or terminating the adverse effects resulting from violation;

4. Compensatory damages for loss or destruction to water quality, wildlife, fish and aquatic life.

D. Administrative Enforcement Powers. In addition to the other enforcement powers and remedies established by this chapter, the Engineer has the authority to utilize the following administrative remedies:

1. Cease and Desist Orders. When a discharge has taken place or is likely to take place in violation of this chapter, the Engineer may issue an order to cease and desist such discharge, or practice or operation likely to cause such discharge and direct that those persons not complying shall: (a) comply with the requirement; (b) comply with a time schedule for compliance; and (c) take appropriate remedial or preventive action to prevent the violation from recurring.

2. Notice to Clean. Whenever the Engineer finds any oil, earth, debris, grass, weeds, dead trees, tin cans, rubbish, refuse, waste or any other material of any kind, in or upon the sidewalk abutting or adjoining any parcel of land, or upon any parcel of land or grounds, which may result in pollutants entering the MS4 or a non-stormwater discharge to the MS4, he or she may give notice to the owner or occupant of the adjacent property to remove such oil earth, debris, grass, weeds, dead trees, tin cans, rubbish, refuse, waste or other material, in any manner that he or she may reasonably provide. The recipient of such notice shall undertake the activities as described in the notice.

E. Penalties. Violation of this chapter shall be punishable as provided in Chapter 1-2.01 of this Code. Each day that a violation continues shall constitute a separate offense.

F. Permit Revocation. To the extent the City makes a provision of this chapter or any identified BMP a condition of approval to the issuance of a permit or license, any person in violation of such condition is subject to the permit revocation procedures set forth in this code.

G. Burden of Proof. In an enforcement action, the burden of proof shall be on the person who is the subject of such action to establish that the reduction or elimination of the discharge to the maximum extent practicable has been accomplished through compliance with the best management practices available, including applicable monitoring, notifications and reporting requirements.

H. Remedies. Remedies under this chapter are in addition to and do not supersede or limit any and all other available remedies, civil or criminal. The remedies provided for in this chapter shall be cumulative and not exclusive.

5-7.115 No taking.

The provisions of this chapter shall not operate to deprive any property owner of substantially all of the market value of such owner's property or otherwise constitute an unconstitutional taking without compensation."

Section 2. **Severability**. If any section, subsection, sentence, clause, phrase or portion of this ordinance for any reason is held to be invalid or unconstitutional by any court of competent jurisdiction, such decision shall not affect the validity or the remaining portions of this ordinance. The City Council of the City of Torrance hereby declares that it would have adopted this ordinance and each section, subsection, sentence, clause, phrase or portion thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, phrases or portions were to be declared invalid or unconstitutional.

Section 3. **CEQA.** The City Council hereby finds, in the exercise of its independent judgment and analysis, that this ordinance is exempt from the California Environmental Quality Act ("CEQA") because the Low Impact Development requirements for new development and redevelopment projects of this Ordinance will not have a significant effect on the environment, and the adoption of this Ordinance and the timing thereof is mandated by the action of the Los

Angeles Regional Water Quality Control Board ("LARWQCB"). In this case, the City is acting at the direction of the LARWQCB and federal law to protect, maintain, restore and enhance natural resources and the environment. To comply with the requirements of the LARWQCB, the City Council finds that the adoption of this Ordinance is categorically exempt from the requirements of the California Environmental Quality Act ("CEQA") pursuant to CEQA Guidelines Sections 15307 and 15308. Staff is hereby directed to prepare and post a notice of exemption pursuant to Guidelines Section 15062.

Section 4. **<u>Publication</u>.** The City Clerk shall certify to the adoption of this Ordinance and shall cause the same to be published or posted in the manner prescribed by law.

APPROVED and ADOPTED this ____ day of _______, 2014.

Appendix N

Green Streets Policies

RESOLUTION NO. ____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF HERMOSA BEACH ADOPTING A GREEN STREET POLICY FOR STREET AND ROADWAY PROJECTS

The City Council of the City of Hermosa Beach does hereby resolve and order as follows:

Section 1. Purpose

It is the policy of the City of Hermosa Beach (City) to implement green street Best Management Practices (BMPs) as elements of street and roadway projects including public works capital improvement projects to the maximum extent practicable. This policy is implemented to demonstrate compliance with the Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Order No. R4-2012-0175, NPDES Permit No. CAS004001 effective December 28, 2012, and any amendment thereto (Municipal Stormwater Permit).

Green streets are amenities that provide multiple benefits including water quality improvement, groundwater replenishment, attractive streetscapes, traffic calming, pedestrian and bicycle accessibility, reduction in the heat island effect, and creation of linear or pocket parks. Green streets can incorporate a wide variety of design elements and techniques including the minimization of impervious area through reduction in street width and the application of permeable pavements, landscaped medians, bioretention, vegetated swales, infiltration, and/or storage of stormwater. Application of green techniques encourages stormwater contact with soil and vegetation to facilitate natural pollutant removal processes as well as retention and/or infiltration of stormwater to reduce runoff.

Section 2. Policy

A. Application. The City will require the application of green street strategies consistent with USEPA guidance regarding Managing Wet Weather with Green Infrastructure—Green Streets (December 2008 EPA-833-F-08-009) to the maximum extent practicable for the following types of projects:
   1. New public and private street and road construction or private development projects that include street and road construction of 10,000 square feet or more of impervious surface area;
   2. Redevelopment of streets and roads that results in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site.

   The term “street and road construction projects” applies to projects that are stand-alone street, road, highway, alley or walk-street projects and also applies to such projects within larger projects.

   Routine maintenance (as defined in the Municipal Stormwater Permit) and linear utility projects are excluded from these requirements. Routine maintenance includes slurry seals, repaving, and reconstruction of the road or street where the original line and grade are maintained. It also includes road shoulder work, regrading of dirt or gravel roadways and shoulders, and performing ditch cleanouts.

B. Benefits. The City will consider opportunities to improve stormwater quality, eliminate non-stormwater runoff, replenish groundwater, create attractive streetscapes, and provide pedestrian and bicycle accessibility and safety through new development and redevelopment of streets and roadway projects and related capital improvement projects.

C. Best Management Practice (BMP) Selection and Design. The City will require projects subject to this policy to incorporate green street BMPs to address stormwater runoff from the project area using the Green Street BMP Selection Guideline shown in Attachment A.

   The most recent version of the County of Los Angeles Low Impact Development (LID) Standards Manual will serve as the design reference for selected Green Street BMPs. The City of Hermosa Beach Director of Public Works has final authority in decisions regarding project/site-specific technical feasibility for selected BMPs.

D. Retrofit Scope. The City will use the Beach Cities Enhanced Watershed Management Program to identify opportunities for green street BMP retrofits. Final decisions regarding implementation will be determined by the Director of Public Works based on the availability of adequate funding.

E. Training. The City of Hermosa Beach will incorporate aspects of green streets into internal annual staff trainings.

Section 3. The City Clerk is directed to certify the adoption of this Resolution; record this Resolution in the book of the City's original resolutions; and make a minute of the adoption of the Resolution in the City Council's records and the minutes of this meeting.

Section 4. This Resolution will become effective immediately upon adoption and will remain effective unless repealed or superseded.

PASSED AND ADOPTED this ____ day of _________, 2015.

____

ATTACHMENT A
City of Hermosa Beach Green Street BMP Selection Guideline

BMP Type	Green Street Project Location					
	Primary Arterials, State Highway	Secondary Arterials	Other City Streets, Residential Streets	Streets without curb and gutter	Alleys	Sidewalks
Alternative Street Designs +	X	X	X	X	X	X
VEG-2 : Stormwater Planter	X	X	X			X
VEG-3 : Tree-Well Filter	X	X	X			X
VEG-4: Vegetated Swales	X	X				
VEG-5: Filter Strips				X		◆
RET-1: Bioretention	X	X	X	X		
RET-3: Infiltration Trench	X	X	X	X		
RET-5: Permeable Pavement without Underdrain		X	X		X	X
T-6: Proprietary Treatment Control Measures	X	X	X	X	X	
Curb Filtration System ++	◆	◆	◆	◆	◆	

+ Not included in County of Los Angeles Low Impact Development (LID) Standards Manual, subject to review by the City of Hermosa Beach Director of Public Works/City Engineer

++ As per City of Hermosa Beach standard design or subject to review by the City of Hermosa Beach Director of Public Works/City Engineer

◆ minimum BMPs to be implemented for green street project type

X BMPs to be considered depending on greens street project types and specific location

City of Manhattan Beach
Green Streets Policy

Purpose

It is the policy of the City of Manhattan Beach (City) to implement Green Street Best Management Practices (BMPs) as elements of street and roadway projects including public works capital improvement projects to the maximum extent practicable. This policy is implemented to demonstrate compliance with the Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Order No. R4-2012-0175, NPDES Permit No. CAS004001 effective December 28, 2012, and any amendment thereto (Municipal Stormwater Permit).

Green Streets are amenities that provide multiple benefits including water quality improvement, groundwater replenishment, attractive streetscapes, traffic calming, pedestrian and bicycle accessibility, reduction in the heat island effect, and creation of linear or pocket parks. Green streets can incorporate a wide variety of design elements and techniques including the minimization of impervious area through reduction in street width and the application of permeable pavements, street trees and landscaped medians, bioretention, vegetated swales, biofiltration, and/or storage of stormwater. Application of green techniques encourages stormwater contact with soil and vegetation to facilitate natural pollutant removal processes as well as retention and/or infiltration of stormwater to reduce runoff.

Policy

A. Application. The City will require the application of Green Street strategies consistent with USEPA guidance regarding Managing Wet Weather with Green Infrastructure—Green Streets (December 2008 EPA-833-F-08-009) to the maximum extent practicable for the following types of projects:
   1. New public and private street and road construction or private development projects that include street and road construction of 10,000 square feet or more of impervious surface area;
   2. Redevelopment of streets and roads that results in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site.

   The term "street and road construction projects" applies to projects that are standalone street, road, highway or freeway projects and also applies to such projects within larger projects.

   Routine maintenance (as defined in the Municipal Stormwater Permit) and linear utility projects are excluded from these requirements. Routine maintenance includes slurry seals, repaving, and reconstruction of the road or street where the original line and grade are maintained. It also includes road shoulder work, regrading of dirt or gravel roadways and shoulders, and performing ditch cleanouts.

B. Benefits. The City will consider opportunities to improve stormwater quality, eliminate non-stormwater runoff, replenish groundwater, create attractive streetscapes, and provide pedestrian and bicycle accessibility and safety through new development and redevelopment of streets and roadway projects and related capital improvement projects.

C. Best Management Practice (BMP) Selection and Design Standard. The most recent version of the County of Los Angeles Low Impact Development Standards Manual will serve as the design reference for selected Green Street BMPs. The Director of Public Works has final authority in decisions regarding project/site-specific technical feasibility for selected BMPs.

D. Runoff Capture Design Goal. This policy establishes a minimum runoff capture design goal of the runoff produced from a 0.25 inch, 24-hour storm event for green street projects. Designers should pursue greater volume mitigation at project sites where it is practical. Project area is defined as the boundary of proposed improvements (construction/reconstruction) within the City of Manhattan Beach right of way. For new median construction/reconstruction projects, the project boundary is limited to the area that is being reconstructed. New pervious areas within the project area such as open space, medians, and parkway can be used as credit toward the capture goal. Project areas are not expected to accommodate offsite tributary runoff. Although maintenance projects are exempt from the Green Street Policy, the engineer/planner is encouraged to consider LID features where the conditions are favorable.

E. Retrofit Scope. The City will use the Beach Cities Enhanced Watershed Management Program to identify opportunities for green street BMP retrofits. Final decisions regarding implementation will be determined by the Director of Public Works based on the availability of adequate funding.

F. Training. The City of Manhattan Beach will incorporate aspects of green streets into internal annual staff training of targeted staff.

Green Street Policy

Purpose

The City of Redondo Beach Department of Public Works shall implement green street BMPs for transportation corridors associated with new and redevelopment street and roadway projects, including Capital Improvement Projects (CIPs). This policy is enacted to demonstrate compliance with the NPDES MS4 Permit for the Los Angeles Region (Order No. R4-2012-0175).

Green streets are an amenity that provides many benefits including water quality improvement, groundwater replenishment, creation of attractive streetscapes, creation of parks and wildlife habitats, and pedestrian and bicycle accessibility. Green streets are defined as right-of-way areas that incorporate infiltration, biofiltration, and/or storage and use BMPs to collect, retain, or detain stormwater runoff as well as a design element that creates attractive streetscapes.

Policy

A. Application. The Department of Public Works shall require new development and/or redevelopment streets and roadway projects and CIP projects conducted within the right-of-way of transportation corridors to incorporate green street BMPs. Transportation corridors projects are major arterials as defined in the City's General Plan which add at least 10,000 square feet of impervious surface. Routine maintenance or repair and linear utility projects are excluded from these requirements. Routine maintenance includes slurry seals, repaving, and reconstruction of the road or street where the original line and grade are maintained.

B. Amenities. The Department of Public Works shall consider opportunities to replenish groundwater, create attractive streetscapes, create parks and wildlife habitats, and provide pedestrian and bicycle accessibility through new development and redevelopment of streets and roadway projects and CIPs.

C. Guidance. New development subject to this Policy shall comply with the requirements of the Los Angeles County LID Standards Manual. In addition, to the maximum extent practicable, the Department of Public Works shall use the City of Los Angeles Green Streets guidance, USEPA's *Managing Wet Weather with Green Infrastructure Municipal Handbook: Green Streets*, or equivalent guidance developed by the Department of Public Works for use in public and private developments. The Department of Public Works shall prepare, maintain, and update, as deemed necessary and appropriate or upon direction from the Los Angeles Regional Water Quality Control Board, a list of minimum requirements for green street BMPs. These minimum requirements shall be in addition to any other BMPs that the Department of Public works deems necessary to achieve the purpose and intent of this Policy.

D. Retrofit Scope. The Department of Public Works shall use the City's Watershed Management Program or Enhanced Watershed Management Program to identify opportunities for green street BMP retrofits. Final decisions regarding implementation will be determined by the City Engineer based on the availability of adequate funding.

E. Training. The Department of Public Works shall incorporate aspects of green streets into internal annual staff trainings.

City of Torrance - Green Street Policy

Purpose

The City of Torrance shall implement green street BMPs for transportation corridors associated with new and rehabilitation roadway Capital Improvement Projects (CIPs). This policy is enacted to demonstrate compliance with the NPDES MS4 Permit for the Los Angeles Region (Order No. R4-2012-0175).

Green streets are defined as right-of-way areas that incorporate infiltration, bio-filtration, and/or storage and use BMPs to collect, retain, or detain stormwater runoff as well as a design element that creates attractive streetscapes.

Policy

The Public Works Department shall require new and/or rehabilitation streets CIP projects conducted within the right-of-way to incorporate bio-filtration (Filterra or equal) BMPs adjacent to existing or proposed catch basins. Transportation corridors projects are major arterials as defined in the General Plan which add at least 10,000 square feet of impervious surface. Routine maintenance or repair and linear utility projects are excluded from these requirements. Routine maintenance includes slurry seals, repaving, and reconstruction of the road or street where the original line and grade are maintained. New storm drain CIP projects that install catch basins within irrigated parkways within watershed areas that DO NOT drain to detention or retention basins shall also include bio-filtration BMPs to be installed adjacent to catch basins to intercept irrigation run off.

The Public Works Department and Community Development Department shall require new or redeveloped alleys that have known drainage problems to include Interlocking Pavers with Infiltration Trenches in lieu of concrete gutter for alley upgrades. (Interlocking Pavers shall be per City of Los Angeles Standard Drawing S-485-0 until a new City of Torrance Standard Drawing is approved.)

Final decisions regarding implementation will be determined by the City Engineer based on the availability of adequate funding.

Appendix O

Structural BMP Unit Cost Tables

Table O-1. Manhattan Beach Infiltration Trench (Alternative 1) Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Demolish and remove existing asphalt or concrete	Assume 5% BMP footprint requires asphalt removal, 3" to 6" deep, bituminous roads	SY	Carollo, 2014	$6.75	548	$3,699	600	$4,051
Excavation, 250 to 2500 CY	Larger scale excavations to 3 to 8 ft depth; sub-regional detention facilities, etc.	CY	RS Means	$14.45	20,432	$295,239	24,781	$358,079
Hauling, 10 CY truck, 10 miles RT	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait	CY	Carollo, 2014	$9.00	15,324	$137,915	22,302	$200,722
Utility area drain, catch basins or manholes	Curb inlet frame, grate and curb box, large, 24"x36"	EA	RS Mean Line No 334413131582	$1,572	1	$1,572	1	$1,572
Shoring System	2 wall shoring system	SF	Carollo, 2014	$37	20,831	$770,758	25,592	$946,898
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252	500	$126,000	1,000	$252,000
Vent/Cleanout/Observation Wells	PVC, 6" diameter	EA	RS Means Line No 220576205210	$141	25	$3,486	54	$7,636
Diversion Structure	Infiltration Basin	EA	Carollo, 2014	$40,000	1	$40,000	1	$40,000
72" corrugated steel, perforated pipe, 16 gauge (reduced for 36'' pipe with 1.2 multiplier)	Infiltration gallery	LF	RS Means	$16.63	11,715	$194,846	11,715	$194,846
CDS	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Geosynthetic Fabric; non-woven geotextile	120 lb tensile strength	SY	RS Means Line No	$1.39	131,961	$183,425	146,114	$203,099

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
			313219161550					
Geo-grid	Soil stabilization grid (various sizes)	SY	Estimate from online manufacturers	$3.00	131,961	$395,882	146,114	$438,343
Washed Pea Gravel (1/4 to 1/2") - AASHTO #7 or #8 stone	Or similar gradation commonly available in the area	CY	RS Means	$70.00	–	–	8,002	$560,117
Drainage/Storage Rock (#2 stone)	Drainage fill	CY	RS Means, Line No 333650102600	$37.85	13,030	$493,174	13,030	$493,174
Subtotal						**$2,705,995**	**N/A**	**$3,820,537**

[1] Safety factor of 1.05 (low) and 1.15 (high) applied to BMP footprint

Table O-2. Manhattan Beach Infiltration Trench (Alternative 2) Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Demolish and remove existing asphalt or concrete	Assume 5% BMP footprint requires asphalt removal, 3" to 6" deep, bituminous roads	SY	Carollo, 2014	$6.75	438	$2,959	480	$3,241
Excavation, 250 to 2500 CY	Larger scale excavations to 3 to 8 ft depth; sub-regional detention facilities, etc.	CY	RS Means	$14.45	16,670	$240,874	20,148	$291,146
Hauling, 10 CY truck, 10 miles RT	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait	CY	Carollo, 2014	$9.00	12,502	$112,519	18,134	$163,203
Utility area drain, catch basins or manholes	Curb inlet frame, grate and curb box, large, 24"x36"	EA	RS Mean Line No 334413131582	$1,572	1	$1,572	1	$1,572
Shoring System	2 wall shoring system	SF	Carollo, 2014	$37	16,768	$620,417	20,589	$761,802
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252	500	$126,000	1,000	$252,000
Vent/Cleanout/Observation Wells	PVC, 6'' diameter	EA	RS Means Line No 220576205210	$141	20	$2,789	43	$6,108
Diversion Structure	Infiltration Basin	EA	Carollo, 2014	$40,000	1	$40,000	1	$40,000
72" corrugated steel, perforated pipe, 16 gauge (reduced for 36'' pipe with 1.2 multiplier)	Infiltration gallery	LF	RS Means	$16.63	9,372	$155,877	9,372	$155,877
CDS	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Geosynthetic Fabric; non-woven geotextile	120 lb tensile strength	SY	RS Means Line No	$1.39	108,171	$150,358	119,507	$166,115

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
			313219161550					
Geo-grid	Soil stabilization grid (various sizes)	SY	Estimate from online manufacturers	$3.00	108,171	$324,514	119,507	$358,522
Washed Pea Gravel (1/4 to 1/2") - AASHTO #7 or #8 stone	Or similar gradation commonly available in the area	CY	RS Means	$70.00	–	–	6,401	$448,094
Drainage/Storage Rock (#2 stone)	Drainage fill	CY	RS Means, Line No 333650102600	$37.85	10,424	$394,539	13,030	$493,174
Subtotal						**$2,232,418**	**N/A**	**$3,260,853**

[1] Safety factor of 1.05 (low) and 1.15 (high) applied to BMP footprint

Table O-3. Polliwog Park Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Demolition	Assume 5% BMP footprint requires asphalt removal, 6" deep	SY	RS Means Line No. 024113175050	$9.70	237	$2,295	257	$2,494
Excavation	Assume no chemical contamination	CY	OC Public Works Abstract Report Bid No EF07398	$15.00	7,885	$118,278	10,285	$154,275
Hauling	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait. Includes cost of dust monitoring, dust control, and BMP requirements. (Conversion from CY to Ton = 1/1.8)	Tons	Carollo, 2014	$9.00	5,914	$53,225	9,257	$83,309
Finish Grading	Fine grading, loam or topsoil fine grade	SY	RS Means Line No. 312216101020	$1.16	4,731	$5,488	5,143	$5,965
Shoring System	2 wall shoring system	SF	Carollo, 2014	$37	2,918	$107,974	3,651	$135,085
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252	500	$126,000	1,000	$252,000
Diversion Structure	Cast-in-place concrete structure	EA	NMC Builders, 2008	$150,000	1	$150,000	1	$150,000
Manholes	5' ID manhole, 8' deep with cover	EA	Internal Geosyntec estimate	$4,000	1	$4,000	2	$8,000
Solids Removal (Pretreatment)	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Cistern, concrete	Range of precast, cast in place, and cast in place floor with precast vault	CF	Jensen Stormwater and Contech	$8.95	148,104	$1,325,039	148,104	$1,325,039

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Traditional Asphalt Subgrade and Base Course	Plant mixed asphaltic base courses for roadways and large paved areas (2'' low and 4'' high)	CY	RS Means, Line No 321126131600	$78.35	13	$1,030	29	$2,238
Traditional Asphalt Top Course	Wearing course, plant mix asphalt, less than 300 tons	SY	RS Means Line No 321216131585	$17.31	237	$4,095	257	$4,451
Soil preparation	Topsoil placement and grading, top dress by hand, 6 inch depth	SF	OC Public Works Bid Abstract Report No ER20369 (2012)	$0.52	42,580	$22,142	46,283	$24,067
Mixed BMP Vegetation	Shrubs - broadleaf evergreen, plant 6' on center	SF	RS Means	$2.00	42,580	$85,160	46,283	$92,565
Bentonite Liner	1" - 4" thick layer	CY	www.bentoniteliner.com	$0.68	9,462	$6,434	10,285	$6,994
Geosynthetic Fabric	120 lb tensile strength	SY	OC Public Works Bid Abstract Report No EF07405 (2013)	$2.76	4,731	$13,058	5,143	$14,193
Gravel Delivery	Includes delivery (Conversion = 2Tons/CY)	Tons	Internal Geosyntec estimate	$28.00	1,577	$44,157	2,571	$71,995
Gravel Spreading and Grading	Includes spreading and grading only	CY	Internal Geosyntec Estimate	$10.00	1,577	$15,770	2,571	$25,713
Subtotal						**$2,144,143**	**N/A**	**$2,478,383**

[1] Safety factor of 1.15 (low) and 1.25 (high) applied to BMP footprint

Table O-4. Hermosa Beach Infiltration Trench Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Demolish and remove existing asphalt or concrete	Assume 5% BMP footprint requires asphalt removal, 3" to 6" deep, bituminous roads	SY	Carollo, 2014	$6.75	45	$303	49	$332
Excavation, 250 to 2500 CY	Larger scale excavations to 3 to 8 ft depth; sub-regional detention facilities, etc.	CY	RS Means	$14.45	1,321	$19,087	1,678	$24,243
Hauling, 10 CY truck, 10 miles RT	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait	CY	Carollo, 2014	$9.00	991	$8,916	1,510	$13,590
Utility area drain, catch basins or manholes	Curb inlet frame, grate and curb box, large, 24"x36"	EA	RS Mean Line No 334413131582	$1,572	1	$1,572	1	$1,572
Shoring System	2 wall shoring system	SF	Carollo, 2014	$37	2,136	$79,025	2,674	$98,931
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252	500	$126,000	1,000	$252,000
Vent/Cleanout/Observation Wells	PVC, 6" diameter	EA	RS Means Line No 220576205210	$141	2	$286	4	$626
Diversion Structure	Infiltration Basin	EA	Carollo, 2014	$40,000	1	$40,000	1	$40,000
72" corrugated steel, perforated pipe, 16 gauge (reduced for 30" pipe with 1.2 multiplier)	Infiltration gallery	LF	RS Means	$13.86	757	$10,485	757	$10,485
Pump		EA	www.rainharvestingsupplies.com	$2,135	2	$4,270	4	$8,540
CDS	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	–	–	1	$60,000
Geosynthetic Fabric; non-woven geotextile	120 lb tensile strength	SY	RS Means Line No	$1.39	10,228	$14,217	11,537	$16,036

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
			313219161550					
Geo-grid	Soil stabilization grid (various sizes)	SY	Estimate from online manufacturers	$3.00	10,228	$30,684	11,537	$34,610
Washed Pea Gravel (1/4 to 1/2") - AASHTO #7 or #8 stone	Or similar gradation commonly available in the area	CY	RS Means	$70.00	–	–	657	$45,956
Drainage/Storage Rock (#2 stone)	Drainage fill	CY	RS Means, Line No 333650102600	$37.85	884	$33,449	884	$33,449
Subtotal						**$368,296**	**N/A**	**$640,372**

[1] Safety factor of 1.05 (low) and 1.15 (high) applied to BMP footprint

Table O-5. Hermosa Beach Greenbelt Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Excavation	Assume no chemical contamination	CY	OC Public Works Abstract Report Bid No EF07398	$15.00	16,299	$244,482	20,669	$310,031
Hauling	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait. Includes cost of dust monitoring, dust control, and BMP requirements. (Conversion from CY to Ton = 1/1.8)	Tons	Carollo, 2014	$9.00	12,224	$110,017	18,602	$167,417
Finish Grading	Fine grading, loam or topsoil fine grade	SY	RS Means Line No. 312216101020	$1.16	8,149	$9,453	8,858	$10,275
Shoring System	2 wall shoring system	SF	Carollo, 2014	$37	4,596	$170,052	5,590	$206,840
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252.00	500	$126,000	1,000	$252,000
Diversion Structure	Cast-in-place concrete structure	EA	NMC Builders, 2008	$150,000	1	$150,000	1	$150,000
Manholes	5' ID manhole, 8' deep with cover	EA	Internal Geosyntec estimate	$4,000	2	$8,000	3	$12,000
Solids Removal (Pretreatment)	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Cistern, concrete	Range of precast, cast in place, and cast in place floor with precast vault	CF	Various	$8.95	318,889	$2,852,998	318,889	$2,852,998
Soil preparation	Topsoil placement and grading, top dress by hand, 6 inch depth	SF	OC Public Works Bid Abstract Report No ER20369 (2012)	$0.52	73,344	$38,139	79,722	$41,456
Mixed BMP Vegetation	Shrubs - broadleaf evergreen, plant 6' on center	SF	RS Means	$2.00	73,344	$146,689	79,722	$159,445

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Bentonite Liner	1" - 4" thick layer	CY	www.bentonitelin er.com	$0.68	16,299	$11,083	17,716	$12,047
Geosynthetic Fabric	120 lb tensile strength	SY	OC Public Works Bid Abstract Report No EF07405 (2013)	$2.76	8,149	$22,492	8,858	$24,448
Gravel Delivery	Includes delivery (Conversion = 2Tons/CY)	Tons	Internal Geosyntec estimate	$28.00	2,716	$76,061	4,429	$124,012
Gravel Spreading and Grading	Includes spreading and grading only	CY	Internal Geosyntec Estimate	$10.00	2,716	$27,165	4,429	$44,290
Subtotal						**$4,052,630**	**N/A**	**$4,487,259**

[1] Safety factor of 1.15 (low) and 1.25 (high) applied to BMP footprint

Table O-6. Park #3 Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Excavation	Assume no chemical contamination	CY	OC Public Works Abstract Report Bid No EF07398	$15.00	4,453	$66,792	5,647	$84,700
Hauling	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait. Includes cost of dust monitoring, dust control, and BMP requirements. (Conversion from CY to Ton = 1/1.8)	Tons	Carollo, 2014	$9.00	3,340	$30,056	5,082	$45,738
Finish Grading	Fine grading, loam or topsoil fine grade	SY	RS Means Line No. 312216101020	$1.16	2,226	$2,583	2,420	$2,807
Shoring System	2 wall shoring system	SF	Carollo, 2014	$37	2,402	$88,883	2,922	$108,112
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252	500	$126,000	1,000	$252,000
Diversion Structure	Cast-in-place concrete structure	EA	NMC Builders, 2008	$150,000	1	$150,000	1	$150,000
Manholes	5' ID manhole, 8' deep with cover	EA	Internal Geosyntec estimate	$4,000	1	$4,000	1	$4,000
Solids Removal (Pretreatment)	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Cistern, concrete	Range of precast, cast in place, and cast in place floor with precast vault	CF	Jensen Stormwater and Contech	$8.95	87,120	$779,435	87,120	$779,435
Soil preparation	Topsoil placement and grading, top dress by hand, 6 inch depth	SF	OC Public Works Bid Abstract Report No ER20369 (2012)	$0.52	20,038	$10,420	21,780	$11,326

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Mixed BMP Vegetation	Shrubs - broadleaf evergreen, plant 6' on center	SF	RS Means	$2.00	20,038	$40,075	21,780	$43,560
Bentonite Liner	1" - 4" thick layer	CY	www.bentoniteliner.com	$0.68	4,453	$3,028	4,840	$3,291
Geosynthetic Fabric	120 lb tensile strength	SY	OC Public Works Bid Abstract Report No EF07405 (2013)	$2.76	2,226	$6,145	2,420	$6,679
Gravel Delivery	Includes delivery (Conversion = 2Tons/CY)	Tons	Internal Geosyntec estimate	$28.00	742	$20,780	1,210	$33,880
Gravel Spreading and Grading	Includes spreading and grading only	CY	Internal Geosyntec Estimate	$10.00	742	$7,421	1,210	$12,100
Subtotal						**$1,395,618**	**N/A**	**$1,657,628**

[1] Safety factor of 1.15 (low) and 1.25 (high) applied to BMP footprint

Table O-7. Powerline Easement Infiltration Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Demolition	Assume 5% BMP footprint requires asphalt removal, 6" deep	SY	RS Means Line No. 024113175050	$9.70	–	–	1,916	$18,584
Excavation	Assume no chemical contamination	CY	OC Public Works Abstract Report Bid No EF07398	$15.00	58,056	$870,833	63,861	$957,917
Hauling	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait. Includes cost of dust monitoring, dust control, and BMP requirements. (Conversion from CY to Ton = 1/1.8)	Tons	Carollo, 2014	$9.00	24,190	$217,708	31,931	$287,375
Finish Grading	Fine grading, loam or topsoil fine grade	SY	RS Means Line No. 312216101020	$1.16	34,833	$40,407	38,317	$44,447
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252.00	300	$75,600	500	$126,000
Distribution Laterals	24" diameter RCP, includes excavation, backfill, bedding	LF	OC Public Works Bid Abstract Report No EF07398 (2012)	$156.00	500	$78,000	500	$78,000
Diversion Structure	Cast-in-place concrete structure	EA	NMC Builders, 2008	$150,000	1	$150,000	1	$150,000
Manholes	5' ID manhole, 8' deep with cover	EA	Internal Geosyntec estimate	$4,000	2	$8,000	3	$12,000
Solids Removal (Pretreatment)	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Soil preparation	Topsoil placement and grading, top dress by hand, 6 inch depth	SF	OC Public Works Bid Abstract Report No ER20369 (2012)	$0.52	313,500	$163,020	344,850	$179,322
Mixed BMP Vegetation	Shrubs - broadleaf evergreen, plant 6' on center	SF	RS Means	$2.00	313,500	$627,000	344,850	$689,700

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Bentonite Liner	1" - 4" thick layer	CY	www.bentoniteliner.com	$0.68	968	$658	4,257	$2,895
Geosynthetic Fabric	120 lb tensile strength	SY	OC Public Works Bid Abstract Report No EF07405 (2013)	$2.76	34,833	$96,140	38,317	$105,754
Engineered Biofiltration Media	If possible, obtain costs for media that meets recently revised City specifications	CY	RS Means	$100.00	58,056	$5,805,556	63,861	$6,386,111
Subtotal						**$8,192,922**	**N/A**	**$9,158,105**

[1] Safety factor of 1.1 (high cost) applied to BMP footprint

Table O-8. Artesia Blvd Infiltration Unit Costs[1]

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Demolition	Assume 5% BMP footprint requires asphalt removal, 6" deep	SY	RS Means Line No. 024113175050	$9.70	–	–	267	$2,593
Excavation	Assume no chemical contamination	CY	OC Public Works Abstract Report Bid No EF07398	$15.00	9,719	$145,790	12,473	$187,097
Hauling	8 CY truck, 15 MPH average, 6 mile cycle, 20 minute wait. Includes cost of dust monitoring, dust control, and BMP requirements. (Conversion from CY to Ton = 1/1.8)	Tons	Carollo, 2014	$9.00	4,050	$36,448	6,237	$56,129
Finish Grading	Fine grading, loam or topsoil fine grade	SY	RS Means Line No. 312216101020	$1.16	4,860	$5,637	5,346	$6,201
BMP Inflow and Outflow Conveyance	48" diameter class 3 reinforced culvert	LF	NMC Builders, 2008	$252.00	300	$75,600	500	$126,000
Distribution Laterals	24" diameter RCP, includes excavation, backfill, bedding	LF	OC Public Works Bid Abstract Report No EF07398 (2012)	$156.00	500	$78,000	500	$78,000
Diversion Structure	Cast-in-place concrete structure	EA	NMC Builders, 2008	$150,000	1	$150,000	1	$150,000
Manholes	5' ID manhole, 8' deep with cover	EA	Internal Geosyntec estimate	$4,000	2	$8,000	3	$12,000
Solids Removal (Pretreatment)	More than 4 acres tributary area	EA	Carollo, 2014	$60,000	1	$60,000	2	$120,000
Soil preparation	Topsoil placement and grading, top dress by hand, 6 inch depth	SF	OC Public Works Bid Abstract Report No ER20369 (2012)	$0.52	43,737	$22,743	48,111	$25,018

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Mixed BMP Vegetation	Shrubs - broadleaf evergreen, plant 6' on center	SF	RS Means	$2.00	43,737	$87,474	48,111	$96,221
Bentonite Liner	1" - 4" thick layer	CY	www.bentoniteliner.com	$0.68	135	$92	594	$404
Geosynthetic Fabric	120 lb tensile strength	SY	OC Public Works Bid Abstract Report No EF07405 (2013)	$2.76	4,860	$13,413	5,346	$14,754
Engineered Biofiltration Media	If possible, obtain costs for media that meets recently revised City specifications	CY	RS Means	$100.00	8,099	$809,944	8,909	$890,939
Subtotal						**$1,493,141**	**N/A**	**$1,765,356**

[1] Safety factor of 1.1 (high cost) applied to BMP footprint

Table O-9. Torrance Catch Basin Inlet Filter Unit Costs

Cost Item	Units	Cost Source	Low Cost Scenario			High Cost Scenario		
			Units per catch basin	Unit Price	Line Item	Units per catch basin	Unit Price	Line Item
Heavy Metal Filter Sock	EA	Carollo	2	$175	$350	3	$175	$525
Curb Inlet Filter Box	EA	Carollo	2	$360	$720	3	$360	$1,080
Installation Curb Inlet	EA	Carollo	1	$125	$125	1	$145	$145
Curb Markers	EA	Carollo	1	$25	$25	1	$25	$25
Subtotal (per catch basin)					**$1,220**	**N/A**	**N/A**	**$1,775**

Table O-10. Torrance Catch Basin Inlet Filter Annual O&M Unit Costs

Cost Item	Units	Cost Source	Low Cost Scenario			High Cost Scenario		
			Units per catch basin	Unit Price	Line Item	Units per catch basin	Unit Price	Line Item
Maintenance twice per year	EA	Carollo	2	$150	$300	2	$155	$310
Replace 100% of filters each year	EA	Carollo	2	$175	$350	3	$175	$525
Subtotal (per catch basin)					**$650**	**N/A**	**N/A**	**$835**

Table O-11. Catch Basin Insert Unit Costs (Cities of Redondo Beach, Hermosa Beach and Manhattan Beach)

Cost Item	Description	Units	Cost Source	Low Cost Scenario Unit Cost	High Cost Scenario Unit Cost
ARS	Furnish and install with Automatic Retractable Screen (ARS). 3.5-5' size used for low cost and 28' size used for high cost	EA	Machado Lake Trash TMDL Project	$341	$2,046
CPS	Install connector pipe screen full capture trash system (CPS)	EA	Machado Lake Trash TMDL Project	$390	$390
Subtotal (per catch basin)				**$731**	**$2,436**

Table O-12. Catch Basin Insert Annual O&M Unit Costs (Cities of Redondo Beach, Hermosa Beach, and Manhattan Beach)

Cost Item	Description	Units	Cost Source	Unit Price	Low Cost Scenario		High Cost Scenario	
					Units	Line Item	Units	Line Item
Storm-season inspections (monthly)	7 monthly inspections from October to April	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$14.79	7	$103.53	7	$103.53
Storm-season inspections (post-storm)	Inspections after major storm event (storms with a rainfall intensity greater than 1 inch in 12 hours)	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$12.90	3	$38.70	5	$64.50
Storm-season cleanout	Cleanout of debris/sediment after major storm event	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$33.69	3	$101.07	5	$168.45
Dry-weather season O&M	Inspection/cleaning during the dry season (May 1 - September 30)	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$39.69	1	$39.69	1	$39.69
Admin/ Insurance	Contract Admin/Liability Insurance	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$40.58	1	$40.58	1	$40.58
Disposal	Disposal of debris/sediment	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$20.00	1	$20.00	1	$20.00
Subtract current cleaning cost[1]	Subtracting the current cost of cleaning a catch basin without an insert	EA	City of Rancho Palos Verdes Approval of Catch Basin Maintenance Agreement	$15.25	1	$15.25	1	$15.25
Subtotal (per catch basin per year)						**$328.32**	**N/A**	**$421.50**

[1] Subtracted from unit cost. Calculated from average total costs for cleaning non-retrofitted catch basins from 2006-2011, including contract administration costs.

Capital cost estimates were developed for varying capacities of green streets and translated into unit costs per square foot of BMP footprint. Unit costs from several example projects were averaged to determine a low and high unit cost per square foot of green streets that would be applied for distributed green street BMPs. The resulting unit cost ranged from $15.42 (low) to $31.60 (high) per square foot of BMP area. Cost items and unit prices for line items included in this analysis are shown in Table F-13. Details of the units and line items for the various capacities can be made available upon request.

Table O-13. Green Streets Unit Costs

Cost Item	Description	Units	Cost Source	Unit Price
Demolish and remove existing asphalt or concrete	Pavement removal, 3" to 6" deep, bituminous roads	SY	Carollo, 2014	$6.75
Excavation, 5 to 50 CY	Small scale excavations to 3 to 6 ft depth; curb bulb-outs, planter strips, etc.	CY	RS Means with multiplier applied	$32.51
Excavation, 50 to 250 CY	Small scale excavations to 3 to 6 ft depth; larger curb bulb-outs, planter strips, etc.	CY	RS Means with multiplier applied	$20.66
Excavation, 250 to 2500 CY	Larger scale excavations to 3 to 8 ft depth; sub-regional detention facilities, etc.	CY	RS Means	$14.45
Hauling, 10 CY truck, 10 miles RT	8 CY truck, 15 MPH ave, 6 mile cycle, 20 minute wait	CY	Carollo, 2014	$9.00
Cast In Place, Reinforced Concrete Retaining Wall[1]	4' high, $418.65/cu yd, assume 6" thick,	LF	RS Mean Line No 033053406200	$93.03
Cast in Place concrete curb and gutter, machine formed	Radius, 6" x 18", includes concrete	LF	RS Means Line No. 3211613130416	$8.65
Utility area drain, catch basins or manholes	Curb inlet frame, grate and curb box, large, 24"x36"	EA	RS Mean Line No 334413131582	$1,572
Shoring System[1]		SF	Carollo, 2014	$37
12" Storm Drain (Public ROW) - fully installed; all costs; avg 4 to 6 ft depth[2]	Please provide all inclusive unit cost including asphalt cutting, trenching, bedding, pipe placement, backfill, and re-paving. Whatever pipe material is most common in City.	LF	510-ASD12"Dia, Pipe, 12" Dia. PVC (all depths) including Excavation and Backfill	$76.00

Cost Item	Description	Units	Cost Source	Unit Price
18" Storm Drain (Public ROW) - fully installed; all costs; avg 4 to 6 ft depth[1]	Please provide all inclusive unit cost including asphalt cutting, trenching, bedding, pipe placement, backfill, and re-paving. Whatever pipe material is most common in City.	LF	510-ASD18"Dia, Pipe, 18" Dia. RCP (all depths) including Excavation and Backfill	$130.00
Mulch	Aged bark, hand spread 3" deep	SY	RS Means 329113160100	$8.56
Soil preparation	Topsoil placement and grading, top dress by hand, 6 inch depth	SF	OC Public Works Bid Abstract Report No ER20369 (2012)	$0.52
Mixed BMP Vegetation	Shrubs - broadleaf evergreen, plant 6' on center	SF	RS Means pg 641	$2.00
Drainage/Storage Rock (#2 stone)[1]	Drainage fill	CY	RS Means, Line No 333650102600	$37.85
Washed Choke Stone (1/2 to 1-1/2") - AASHTO #57 or #67 stone[2]	Crushed 1-1/2" stone, compacted, (converted from SY using 1' depth)	CY	RS Means, Line No 321123230320	$14.02
Rounded Decorative Drain Rock	Whatever is typically used in french drains and decorative features	CY	RS Means	$110.00
Engineered Biofiltration Media	If possible, obtain costs for media that meets recently revised City specifications	CY	RS Means	$100.00

[1] Line item included for high cost scenario only

[2] Line item included for low cost scenario only

Appendix P

Documentation of Legal Authority

COUNTY OF LOS ANGELES
OFFICE OF THE COUNTY COUNSEL

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JOHN F. KRATTLI
County Counsel

December 16, 2013

Mr. Samuel Unger, P.E., Executive Officer
California Regional Water Quality Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013-2343

Attention: Mr. Ivar Ridgeway

Re: Certification By Legal Counsel For Los Angeles County Flood Control District's Annual Report

Dear Mr. Unger:

Pursuant to the requirements of Part VI(A)(2)(b) of Order No. R4-2012-0175 (the "Order"), the Office of the County Counsel of the County of Los Angeles makes the following certification in support of the Annual Report of the Los Angeles County Flood Control District ("LACFCD"):

Certification Pursuant To Order Part VI(A)(2)(b)

"*Each Permittee must submit a statement certified by its chief legal counsel that the Permittee has the legal authority within its jurisdiction to implement and enforce the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and this Order.*"

LACFCD has the legal authority within its jurisdiction to implement and enforce each of the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and the Order.

Order Part VI(A)(2)(b)(i)

"*Citation of applicable municipal ordinances or other appropriate legal authorities and their relationship to the requirements of 40 CFR §122.26(d)(2)(i)(A-F) and this Order*"

Citations Of Applicable Ordinances Or Other Legal Authorities

Although many portions of State law, the Charter of the County of Los Angeles, the Los Angeles County Code and LACFCD's Flood Control District Code ("Code") are potentially applicable to the implementation and enforcement of these requirements, the primary applicable laws and ordinances are as follows:

Los Angeles County Code, Title 12, Chapter 12.80 STORMWATER AND RUNOFF POLLUTION CONTROL, including:

§12.80.010 - §12.80.360 Definitions

§12.80.370 Short title.

§12.80.380 Purpose and intent.

§12.80.390 Applicability of this chapter.

§12.80.400 Standards, guidelines and criteria.

§12.80.410 Illicit discharges prohibited.

§12.80.420 Installation or use of illicit connections prohibited.

§12.80.430 Removal of illicit connection from the storm drain system.

§12.80.440 Littering and other discharge of polluting or damaging substances prohibited.

§12.80.450 Stormwater and runoff pollution mitigation for construction activity.

§12.80.460 Prohibited discharges from industrial or commercial activity.

§12.80.470 Industrial/commercial facility sources required to obtain a NPDES permit.

§12.80.480 Public facility sources required to obtain a NPDES permit.

§12.80.490 Notification of uncontrolled discharges required.

§12.80.500 Good housekeeping provisions.

§12.80.510 Best management practices for construction activity.

§12.80.520 Best management practices for industrial and commercial facilities.

§12.80.530 Installation of structural BMPs.

§12.80.540 BMPs to be consistent with environmental goals.

§12.80.550 Enforcement—Director's powers and duties.

§12.80.560 Identification for inspectors and maintenance personnel.

§12.80.570 Obstructing access to facilities prohibited.

§12.80.580 Inspection to ascertain compliance—Access required.

§12.80.590 Interference with inspector prohibited.

§12.80.600 Notice to correct violations—Director may take action.

§12.80.610 Violation a public nuisance.

§12.80.620 Nuisance abatement—Director to perform work when—Costs.

§12.80.630 Violation—Penalty.

§12.80.635 Administrative fines.

§12.80.640 Penalties not exclusive.

§12.80.650 Conflicts with other code sections.

§12.80.660 Severability.

§12.80.700 Purpose.

§12.80.710 Applicability.

§12.80.720 Registration required.

§12.80.730 Exempt facilities.

§12.80.740 Certificate of inspection—Issuance by the director.

§12.80.750 Certificate of inspection—Suspension or revocation.

§12.80.760 Certificate of inspection—Termination.

§12.80.770 Service fees.

§12.80.780 Fee schedule.

§12.80.790 Credit for overlapping inspection programs.

§12.80.800 Annual review of fees.

Los Angeles County Code, Title 12, Chapter 12.84 LOW IMPACT DEVELOPMENT STANDARDS, including:

§12.84.410 Purpose.

§12.84.420 Definitions.

§12.84.430 Applicability.

§12.84.440 Low Impact Development Standards.

§12.84.445 Hydromodification Control.

§12.84.450 LID Plan Review.

§12.84.460 Additional Requirements.

Los Angeles County Code, Title 22 PLANNING AND ZONING, Part 6 ENFORCEMENT PROCEDURES, including:

§22.60.330 General prohibitions.

§22.60.340 Violations.

§22.60.350 Public nuisance.

§22.60.360 Infractions.

§22.60.370 Injunction.

§22.60.380 Enforcement.

§22.60.390 Zoning enforcement order and noncompliance fee.

Los Angeles County Code, Title 26 BUILDING CODE, including:

§26.103 Violations And Penalties

§26.104 Organization And Enforcement

§26.105 Appeals Boards

§26.106 Permits

§26.107 Fees

§26.108 Inspections

LACFCD Code Chapter 21 - STORMWATER AND RUNOFF POLLUTION CONTROL including:

§21.01 Purpose and Intent

§21.03 Definitions

§21.05 Standards, Guidelines, and Criteria

§21.07 Prohibited Discharges

§21.09 Installation or Use of Illicit Connections Prohibited

§21.11 Littering Prohibited

§21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity

§21.15 Notification of Uncontrolled Discharges Required

§21.17 Requirement to Monitor and Analyze

§21.19 Conflicts With Other Code Sections

§21.21 Severability

§21.23 Violation a Public Nuisance

California Government Code §6502

California Government Code §23004

California Water Code §8100 *et. seq.*

Relationship Of Applicable Ordinances Or Other Legal Authorities To The Requirements of 40 CFR §122.26(d)(2)(i)(A-F) And The Order

Although, depending upon the particular issue, there may be multiple ways in which particular sections of the County of Los Angeles' ordinances, LACFCD's ordinances, and statutes relate to the requirements contained in 40 CFR §122.26(d)(2)(i)(A-F) and the Order, the table below indicates the basic relationship with Part VI(A)(2)(a) of the Order:

Order Part VI(A)(2)(a) Items	**Primary Applicable Ordinance/Statute**
i. Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited]; §12.80.450 [construction] §12.80.460 [industrial and commercial] §12.80.470 and .480 [industrial and commercial NPDES requirements] §12.84.440 [LID standards] §12.84.445 [hydromodification control] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.340 [violations] §22.60.350 [public nuisance] §22.60.360 [infractions] §22.60.370 [injunction] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.103 [violations and penalties]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§26.104 [enforcement] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
ii. Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited] LACFCD Code: §21.07 Prohibited Discharges
iii. Prohibit and eliminate illicit discharges and illicit connections to the MS4.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited]; §12.80.420 [illicit connections prohibited] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.23 Violation a Public Nuisance

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
iv. Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.	Los Angeles County Code: §12.80.410 [illicit discharge prohibited]; §12.80.440 [littering and other polluting prohibited] LACFCD Code: §19.07 Interference With or Placing Obstructions, Refuse, Contaminating Substances, or Invasive Species in Facilities Prohibited §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
v. Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows).	Los Angeles County Code: §12.80.490 [notification of uncontrolled discharge] §12.80.570 [obstructing access to facilities] §12.80.580 [compliance inspection] §12.80.610 [violation a nuisance] §12.620 [nuisance abatement] §12.80.635 [violation penalty]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§12.80.640 [penalties not exclusive] §12.84.440 [LID standards] §12.84.445 [hydromodification control] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.340 [violations] §22.60.350 [public nuisance] §22.60.360 [infractions] §22.60.370 [injunction] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.103 [violations and penalties] §26.104 [enforcement] §26.106 [permits] §26.108 [inspections] LACFCD Code: §19.11 Violation a Public Nuisance §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§21.19 Conflicts With Other Code Sections §21.23 Violation a Public Nuisance
vi. Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.	Same as item v., above
vii. Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Copermittees.	California Government Code §6502 California Government Code §23004
viii. Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation.	California Government Code §6502 California Government Code §23004
ix. Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4.	Los Angeles County Code: §12.80.490 [notification of uncontrolled discharge] §12.80.570 [obstructing access to facilities] §12.80.580 [compliance inspection] §12.80.610 [violation a nuisance] §12.80.620 [nuisance abatement] §12.80.635 [violation penalty] §12.80.640 [penalties not exclusive] §22.60.380 [enforcement.] §26.106 [permits] §26.108 [inspections]

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
x. Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations.	Los Angeles County Code: §12.80.450 [construction mitigation] §12.80.500 [good housekeeping practices] §12.80.510 [construction BMPs] §12.80.520 [industrial/commercial BMPs] §12.84.440 [LID standards] §12.84.450 [LID Plan Review] §22.60.330 [general prohibitions] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance
xi. Require that structural BMPs are properly operated and maintained.	Los Angeles County Code: §12.80.530 [installation of structural BMPs] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze

Order Part VI(A)(2)(a) Items	Primary Applicable Ordinance/Statute
	§21.23 Violation a Public Nuisance
xii. Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.	Los Angeles County Code: §12.80.530 [installation of structural BMPs] §22.60.380 [enforcement.] §22.60.390 [zoning enforcement order] §26.106 [permits] §26.108 [inspections] LACFCD Code: §21.05 Standards, Guidelines, and Criteria §21.07 Prohibited Discharges §21.09 Installation or Use of Illicit Connections Prohibited §21.11 Littering Prohibited §21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity §21.15 Notification of Uncontrolled Discharges Required §21.17 Requirement to Monitor and Analyze §21.23 Violation a Public Nuisance

<u>Order Part VI(A)(2)(b)(ii)</u>

"*Identification of the local administrative and legal procedures available to mandate compliance with applicable municipal ordinances identified in subsection (i) above and therefore with the conditions of this Order, and a statement as to whether enforcement actions can be completed administratively or whether they must be commenced and completed in the judicial system.*"

The local administrative and legal procedures available to mandate compliance with the above ordinances are specified in those ordinances, particularly in:

Los Angeles County Code:

§12.80.550 Enforcement—Director's powers and duties.

§12.80.600 Notice to correct violations—Director may take action.

§12.80.610 Violation a public nuisance.

§12.80.620 Nuisance abatement—Director to perform work when—Costs.

§12.80.630 Violation—Penalty.

§12.80.635 Administrative fines.

§12.80.640 Penalties not exclusive.

§12.84.450 LID Plan Review.

§12.84.460 Additional Requirements.

Title 26, §103 Violations And Penalties

Title 26, §104 Organization And Enforcement

Title 26, §105 Appeals Boards

Title 26, §106 Permits

§22.60.330 General prohibitions.

§22.60.340 Violations.

§22.60.350 Public nuisance.

§22.60.360 Infractions.

§22.60.370 Injunction.

§22.60.380 Enforcement.

§22.60.390 Zoning enforcement order and noncompliance fee.

LACFCD Code:

§21.05 Standards, Guidelines, and Criteria

§21.07 Prohibited Discharges

§21.09 Installation or Use of Illicit Connections Prohibited

§21.11 Littering Prohibited

§21.13 Evidence of Compliance With Permit Requirements for Industrial or Commercial Activity

§21.15 Notification of Uncontrolled Discharges Required

§21.17 Requirement to Monitor and Analyze

§21.23 Violation a Public Nuisance

LACFCD attempts to first resolve each enforcement action administratively. However, the above cited ordinances also provide LACFCD with the authority to pursue such actions in the judicial system as necessary.

Very truly yours,

JOHN F. KRATTLI
County Counsel

By Judith Fries
JUDITH A. FRIES
Principal Deputy County Counsel
Public Works Division

JAF:jyj

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December 8, 2014

Mr. Sam Unger, Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 W. 4th Street, Suite 200
Los Angeles, CA 90013-1105

RE: Legal Authority Certification for the City of Hermosa Beach to Implement and Enforce the Requirements of LARWQCB Order R4-2012-0175

Dear Mr. Unger:

The City of Hermosa Beach submits this statement in its capacity as a co-permittee under LARWQCB Order R4-2012-0175 (NPDES No. CAS004001) (the "MS4 Permit"), in accordance with Part VI.A.2 of the Order.

I am the City Attorney of the City of Hermosa Beach, California. In that capacity, I state that it is my opinion that the City has adequate legal authority to implement and enforce the requirements in the MS4 Permit, consistent with the requirements set forth in the regulations implementing the Clean Water Act, 40 CFR § 122.26(d)(2)(i)(A-F), and to the extent permitted by state and federal law and subject to the limitations on municipal action under the California and United States Constitutions.

The primary source of the City's authority is Article 11, § 7 of the California Constitution. The City also has authority under § 13002 of the California Water Code to adopt and enforce ordinances conditioning, restricting and limiting activities which might degrade the quality of waters of the State. Pursuant to Article 11, § 7 of the California Constitution and § 13002 of the California Water Code, the City adopted Chapter 8.44 of the Hermosa Beach Municipal Code ("HBMC"), which contains the City's regulations enabling it to impose the legal requirements of the MS4 Permit (see attached analysis of legal authority). Thus, the City has the legal authority as required under Part VI.A.2 of the MS4 Permit.

Article 11, § 7 also provides the City the authority to require the use of control measures to prevent or reduce the discharge of pollutants and ensure that such control measures are properly operated and maintained. The City's environmental requirements are also implemented in part through the application of the California Environmental Quality Act ("CEQA") process to proposed projects, as enforceable mitigation measures. The City, as a municipal corporation, has authority to enter into contracts that enable it to carry out its necessary functions, including the power to enter into interagency agreements to control the contribution of pollutants from one portion of the shared MS4 to another.

Pursuant to HBMC Chapters 1.04 Violations and Penalties, 1.08 Administrative Citations and Penalties and 8.44 Storm Water Management and Urban Runoff Pollution Control, the City's regulations may be enforced administratively, civilly and criminally. The HBMC also provides various procedures to modify and/or revoke city-issued permits for unlawful and/or environmentally disruptive activity.

Consequently, it is my opinion that the City has adequate legal authority to implement and enforce the requirements in the MS4 Permit. Please do not hesitate to contact me should you have any questions or need any additional information

Very truly yours,

Michael Jenkins
City Attorney

Enclosure

Hermosa Beach Statement of Legal Authority

A. The following list shows the relationship of the Hermosa Beach Municipal Code and other legal authorities to the MS4 permit requirements under Part VI.A.2 of the Permit:

i. Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit.

HBMC 8.44.060 Prohibited Activities; HBMC 8.44.090 Requirements for Industrial/Commercial and Construction Activities

ii. Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A.

HBMC 8.44.060 Prohibited Activities

iii. Prohibit and eliminate illicit discharges and illicit connections to the MS4.

HBMC 8.44.060 Prohibited Activities

iv. Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4.

HBMC 8.44.060 Prohibited Activities; HBMC8.44.080 Good Housekeeping Provisions; HBMC 8.44.090 Requirements for Industrial/Commercial and Construction Activities; HBMC 8.44.095 Standard Urban Storm Water Mitigation Plan (SUSMP) Requirements for New Development and Redevelopment Projects

v. Require compliance with conditions in Permittee ordinances, permits, contracts or orders (i.e., hold dischargers to its MS4 accountable for their contributions of pollutants and flows).

HBMC 8.44.090 Requirements for Industrial/Commercial and Construction Activities; HBMC 8.44.100 Standard Urban Stormwater Mitigation Plan (SUSMP) Requirements for New Development and Redevelopment Projects; HBMC 8.44.110 Violations of Stormwater and Urban Runoff

Pollution Control Measures; HBMC Chapter 1.04 Violations and Penalties and Chapter 1.10 Administrative Citations and Penalties

vi. Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders.

HBMC 8.44.110 Violations of Stormwater and Urban Runoff Pollution Control Measures; HBMC Chapter 1.04 Violations and Penalties and Chapter 1.10 Administrative Citations and Penalties

vii. Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Co-permittees.

In addition to the provisions of HBMC Chapter 8.44, which control the contribution of pollutants, the City, as a municipal corporation, has authority to enter into contracts that enable it to carry out its necessary functions, including the power to enter into interagency agreements to control the contribution of pollutants from one portion of the shared MS4 to another.

viii. Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation.

In addition to the provisions of HBMC Chapter 8.44, which control the contribution of pollutants, the City, as a municipal corporation, has authority to enter into contracts that enable it to carry out its necessary functions, including the power to enter into interagency agreements to control the contribution of pollutants from one portion of the shared MS4 to another.

ix. Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4.

HBMC 8.44.100 Inspection Authority

x. Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations.

Article 11, § 7 of the California Constitution; California Public Resources Code § 21000 et seq. (CEQA); HBMC 8.44.080 Good Housekeeping Provisions, HBMC 8.44.090 Requirements for Industrial/Commercial and Construction Activities; HBMC 8.44.095 Standard Urban Stormwater Mitigation Plan (SUSMP) Requirements for New Development and Redevelopment Projects; HBMC Title 17 Zoning

xi. Require that structural BMPs are properly operated and maintained.

Article 11, § 7 of the California Constitution; California Public Resources Code § 21000 et seq. (CEQA); HBMC 8.44.080 Good Housekeeping Provisions, HBMC8.44.090 Requirements for Industrial/Commercial and Construction Activities; 8.44.095 Standard Urban Stormwater Mitigation Plan (SUSMP) Requirements for New Development and Redevelopment Projects; HBMC Title 17 Zoning

xii. Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4.

California Public Resources Code § 21000 et seq. (CEQA); HBMC 8.44.100 Inspection Authority; HBMC 8.44.110 Violations of Stormwater and Urban Runoff Pollution Control Measures

B. Procedures available to mandate compliance with applicable municipal ordinances under HBMC Chapters 1.04 Violations and Penalties, 1.08 Administrative Citations and Penalties and 8.44 Storm Water Management and Urban Runoff Pollution Control:

1. Criminal Citation (judicial)
2. Administrative Citation (administrative)
3. Administrative Cease and Desist Order (administrative)
4. Civil Nuisance Abatement (judicial)
5. Civil Injunction (judicial)
6. Permit Revocation/Modification (administrative)
7. All other criminal and civil remedies available by law

RICHARDS | WATSON | GERSHON
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355 South Grand Avenue, 40th Floor, Los Angeles, California 90071-3101
Telephone 213.626.8484 Facsimile 213.626.0078

December 1, 2014

VIA ELECTRONIC TRANSMISSION

Mr. Samuel Unger
Executive Officer
Los Angeles Regional Quality Control Board
320 W. 4th Street, Suite 200
Los Angeles, CA 90013
sunger@waterboards.ca.gov

Re: Legal Authority of the City of Manhattan Beach to Implement and Enforce the Requirements of 40 CFR 122.26(d)(2)(i)(A-F) and RWQCB Order R4-2012-0175, NPDES Permit CAS004001

Dear Mr. Unger:

The City of Manhattan Beach (the "City"), by and through its City Attorney, hereby submits the following certification ("Statement"), pursuant to Section VI.A.2.b of Order R4-2012-0175 (NPDES Permit CAS004001), issued by the California Regional Water Quality Control Board, Los Angeles Region ("RWQCB") on November 8, 2012 and entitled "Waste Discharge Requirements for Municipal Separate Storm Sewer System ("MS4") Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4" (the "Permit").

The City is one of the co-permittees under the Permit. Section VI.A.2.b of the Permit requires the City to provide the RWQCB with a statement by its chief legal counsel, certifying that the City has the legal authority to implement and enforce each of the current requirements set forth in 40 C.F.R. § 122.26(d)(2)(i)(A-F) and the Permit. The purpose of this Statement is to describe the City's compliance with Section VI.A.2.b of the Permit. As discussed in further detail herein, it is our opinion that the City has the necessary legal authority to implement the Permit and to control and prohibit discharges of pollutants into the Municipal Separate Storm Sewer System ("MS4"). However, this Statement is not, nor should it be construed as, a waiver of any rights that the City may have relating to the Permit.

1. Legal Authority Statement

In our opinion, the City has the necessary legal authority to comply with the legal requirements imposed upon it under the Permit, consistent with the requirements set forth in the U.S. Environmental Protection Agency's regulations promulgated under the Clean Water Act, and, specifically, 40 C.F.R. § 122.26(d)(2)(i)(A-F), and to the extent permitted by state and federal law and subject to the limitations on municipal action under the California and United States Constitutions, except as noted herein.

The City, as a general law city, has broad general police powers under the California Constitution to enact legislation for health and public welfare of the community to the extent not preempted by federal or state law. In addition, the City adopted ordinances for the purpose of ensuring that it has adequate legal authority to implement and enforce its storm water control program. The City has the authority under the California Constitution and state law to enact and enforce these ordinances, and these ordinances were duly enacted.

2. Ordinances

The City has adopted ordinances related to the regulation of urban runoff to control and prohibit discharges of pollutants into the MS4 and to comply with the requirements of the Permit applicable to it, as well as, to the extent applicable, 40 C.F.R. § 122.26 (d)(2)(i)(A)-(F). The City's Storm Water Ordinance (Chapter 18.04 of the Manhattan Beach Municipal Code ("MBMC")) is the principal City ordinance addressing the control of urban runoff. Under this ordinance, the City has the necessary legal authority to do the following:

i. 40 C.F.R. § 122.26(d)(2)(i)(A); Permit Section VI.A.2.a.i: Control the contribution of pollutants to its MS4 from storm water discharges associated with industrial and construction activity and control the quality of storm water discharged from industrial and construction sites. This requirement applies both to industrial and construction sites with coverage under an NPDES permit, as well as to those sites that do not have coverage under an NPDES permit (MBMC § 5.84.070--Requirements for industrial/commercial and construction activities);

ii. 40 C.F.R. § 122.26(d)(2)(i)(C); Permit Section VI.A.2.a.ii: Prohibit all non-storm water discharges through the MS4 to receiving waters not otherwise authorized or conditionally exempt pursuant to Part III.A (MBMC § 5.84.040--Prohibited activities; MBMC § 5.84.060--Good housekeeping provisions);

iii. 40 C.F.R. § 122.26(d)(2)(i)(B); Permit Section VI.A.2.a.iii: Prohibit and eliminate illicit discharges and illicit connections to the MS4 (MBMC § 5.84.040--Prohibited activities);

iv. 40 C.F.R. § 122.26(d)(2)(i)(C); Permit Section VI.A.2.a.iv: Control the discharge of spills, dumping, or disposal of materials other than storm water to its MS4 (MBMC § 5.84.040--Prohibited activities; MBMC § 5.84.060--Good housekeeping provisions; MBMC § 5.84.090--Enforcement);

v. 40 C.F.R. § 122.26(d)(2)(i)(E); Permit Section VI.A.2.a.v: Require compliance with conditions in Permittee ordinances, permits, contracts or orders (*i.e.*, hold dischargers to its MS4 accountable for their contributions of pollutants and flows) (MBMC § 5.84.090--Enforcement);

vi. 40 C.F.R. § 122.26(d)(2)(i)(E)-(F); Permit Section VI.A.2.a.vi: Utilize enforcement mechanisms to require compliance with applicable ordinances, permits, contracts, or orders (MBMC § 5.84.090--Enforcement);

vii. 40 C.F.R. § 122.26(d)(2)(i)(D); Permit Section VI.A.2.a.vii: Control the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements among Copermittees (MBMC § 5.84.040--Prohibited activities; MBMC § 5.84.090--Enforcement);

viii. 40 C.F.R. § 122.26 (d)(2)(i)(D); Permit Section VI.A.2.a.viii: Control of the contribution of pollutants from one portion of the shared MS4 to another portion of the MS4 through interagency agreements with other owners of the MS4 such as the State of California Department of Transportation (MBMC § 5.84.040--Prohibited activities; MBMC § 5.84.090--Enforcement);

ix. 40 C.F.R. § 122.26(d)(2)(i)(F); Permit Section VI.A.2.a.ix: Carry out all inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with applicable municipal ordinances, permits, contracts and orders, and with the provisions of this Order, including the prohibition of non-storm water discharges into the MS4 and receiving waters. This means the Permittee must have authority to enter, monitor, inspect, take measurements, review and copy records, and require regular reports from entities discharging into its MS4 (MBMC § 5.84.100--Adoption urban stormwater mitigation plan (SUSMP));

x. 40 C.F.R. § 122.26(d)(2)(i)(E); Permit Section VI.A.2.a.x: Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality standards/receiving water limitations (MBMC § 5.84.100--Adoption urban stormwater mitigation plan (SUSMP); MBMC § 5.84.060--Good housekeeping provisions);

xi. 40 C.F.R. § 122.26(d)(2)(i)(E); Permit Section VI.A.2.a.xi: Require that structural BMPs are properly operated and maintained (MBMC § 5.84.100--Adoption urban stormwater mitigation plan (SUSMP)); and

xii. 40 C.F.R. § 122.26(d)(2)(i)(E); Permit Section VI.A.2.a.xii: Require documentation on the operation and maintenance of structural BMPs and their effectiveness in reducing the discharge of pollutants to the MS4 (MBMC §

5.84.100--Adoption urban stormwater mitigation plan (SUSMP); MBMC § 5.84.060--Good housekeeping provisions; MBMC § 5.84.090--Enforcement).

3. Implementation

Some of the City's ordinances are implemented through permit programs and others are implemented as regulatory programs. Under each ordinance, one or more City bodies, departments, or department directors are authorized and directed in each ordinance to take the actions contemplated by the ordinance (*e.g.*, to consider evidence and make findings, to issue or deny permits, to impose conditions on projects, to inspect, to take enforcement action, etc.).

The City's Storm Water Ordinance (MBMC Chapter 5.84) is the principal City ordinance addressing the control of urban runoff. This ordinance is regulatory, and applies to specified new and existing residential and business communities and associated facilities and activities, as well as new development and redevelopment, and all other specified new and existing facilities and activities that threaten to discharge pollutants within the boundaries of the City and within its regulatory jurisdiction, whether or not a City permit or approval is required. The City's Storm Water Ordinance also contains discharge prohibitions and requirements for the implementation of BMPs and other requirements necessary to implement the Permit.

Other City departments require compliance with the City's Storm Water Ordinance as a condition for issuance of relevant City permits. City departments may also impose specific conditions of approval consistent with the City's Storm Water Ordinance. All City environmental ordinances are also implemented, in part, through the application of the CEQA process to proposed projects.

4. Administrative and Judicial/Legal Procedures

In addition to the above authority, the City has in place various legal and administrative procedures to assist in enforcing the various urban runoff related Ordinances, including the following:

A. Administrative Remedies

- General Penalties (MBMC Chapter 1.04—Penalty Provisions).
- Administrative Penalties and Citations (MBMC Chapter 1.04—Penalty Provisions).

B. Nuisance Remedies

- Public nuisance under State law.
- City nuisance abatement procedures (MBMC Chapter 1.04—Penalty Provisions).

C. Criminal Remedies

- Misdemeanor citations/prosecution (MBMC Chapter 1.04—Penalty Provisions).

D. Equitable Remedies

- Injunctive relief under State law and the Municipal Code (MBMC Chapter 1.04—Penalty Provisions).
- Declaratory relief under State law.

E. Other Civil Remedies

- Federal law claims (*e.g.*, Clean Water Act and Resource Conservation and Recovery Act Citizen Suits).
- Remedies under the California Government Code.

Violations of the City's Storm Water Ordinance are deemed a "public nuisance," in which case enforcement actions can be completed administratively, or judicially when necessary.

Please contact me if you have any questions or if you need any additional information regarding the City's legal authority to enforce the Permit.

Very truly yours,

Quinn M. Barrow

Quinn M. Barrow
City Attorney

cc: Mayor and Members of the City Council
Mark Danaj, City Manager
Raul Saenz, Utilities Manager
Candice K. Lee, Esq.
Norman A. Dupont, Esq.

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Redondo Beach Municipal Code

Title 5 SANITATION AND HEALTH

Chapter 7 STORMWATER AND URBAN RUNOFF POLLUTION CONTROL REGULATIONS

Article 1. General

5-7.101 Authorization.

The City is authorized by Article XI, Section 5 and Section 7 of the State Constitution to exercise the police power of the State by adopting regulations promoting the public health, safety and general prosperity. This chapter is enacted pursuant to authority conferred by law including but not limited to the California Health and Safety Code, Sections 5400 through 5474, the California Government Code, Sections 54725 through 54740, and 66000 through 66003, the California Code of Regulations, Title 22, the Clean Water Act, 33 U.S.C. 1251, et seq., and the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901, et seq. (§ 2, Ord. 2851 c.s., eff. October 5, 2000, as amended by § 1, Ord. 2890 c.s., eff. August 15, 2002, as amended by § 1, Ord. 2905 c.s., eff. August 5, 2003)

5-7.102 Purpose and intent.

(a) The purpose of this chapter is to ensure the future health, safety and general welfare of the citizens of the City and to improve and protect the water quality and beneficial uses of the receiving waters of the County of Los Angeles and surrounding coastal areas by:

(1) Reducing pollutants in stormwater discharges to the maximum extent practicable;

(2) Regulating illicit connections and illicit discharges and thereby reducing the level of contamination of stormwater and urban runoff into the municipal stormwater system;

(3) Regulating nonstormwater discharges to the municipal stormwater system;

(4) Incorporating into the design of new development and redevelopment projects BMPs that will reduce to the maximum extent practicable the amount of pollutants that are generated and/or discharged into the City's storm drain system and surrounding coastal waters; and

(5) Incorporating BMPs into construction activities in a manner that will reduce the level of pollutant discharged into the storm drain system to the maximum extent practicable.

(b) The intent of this chapter is to protect and enhance the quality of watercourses, water bodies and wetlands within the City in a manner consistent with the Federal Clean Water Act, the California Porter-Cologne Water Quality Control Act and the municipal NPDES permit.

(c) This chapter is also intended to provide the City with the legal authority necessary to control discharges to and from those portions of the storm drain system over which it has jurisdiction as required by the municipal NPDES permit. The municipal NPDES permit requires the City to institute a stormwater management program. The City's program parallels the Countywide Stormwater Management Plan (CSWMP) as approved by the California Regional Water Quality Control Board (CRWQCB) and as modified by the Municipal NPDES Permit. The CSWMP is also known as the Storm Water Quality Management Plan (SQMP). The SQMP includes five major elements titled: Illicit Discharge/Illicit Connection Elimination, Development Planning, Development Construction, Public Agency Activities, and Public Information and Participation. This chapter includes implementation strategies and requirements for each of these elements.

(d) This chapter also shall regulate development within the Coastal Zone in accordance with the policies of the City's Local Coastal Plan and Sections 30230, 30231, 30232, and 30240 of the California Coastal Act. (§ 2, Ord. 2851 c.s., eff. October 5, 2000, as amended by § 2, Ord. 2890 c.s. eff. August 15, 2002, as amended by § 1, Ord. 2905 c.s., eff. August 5, 2003)

5-7.103 Definitions.

Whenever in this chapter, the following terms are used, they shall have the meaning respectively ascribed to them in this chapter unless another meaning for the word is apparent from the context. The definitions in this chapter are included for reference purposes and are not intended to narrow the scope of the definitions set forth in Federal or State law or regulations and any term used in this chapter shall have the same meaning as that term is defined in the municipal NPDES permit, or if it is not specifically defined in the municipal NPDES permit, than as such term is defined in the Federal Clean Water Act, as amended, and/or the regulations promulgated thereunder. Words used in this chapter in the singular may include the plural and the plural may include the singular. Use of masculine shall also mean feminine and neuter.

"Act" refers to the Federal Water Pollution Control Act also known as the Clean Water Act as amended, 33 U.S.C. 1251, et seq.

"Area susceptible to runoff" means any surface directly exposed to precipitation or in the path of runoff caused by precipitation which path leads off the parcel on which the surface is located.

"Authorized enforcement officer" means the City Engineer or his/her designee.

"Automotive repair shop" means a facility that is categorized in any one of the following standard industrial classifications (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.

"Best management practices (BMPs)" means any programs, activities, technology, process, siting criteria, operational methods, practices, facilities, and/or procedures that when implemented to their maximum efficiency will prevent or reduce pollutants in discharges. Examples of BMPs may include install discharge treatment systems, education and outreach, proper planning of development projects, proper cleaning of catch basin inlets, and proper sludge- or waste-handling and disposal, among others.

"Bypass" means the diversion of stormwater or urban runoff streams from any portion of a stormwater treatment facility.

"CFR" means the Code of Federal Regulations.

"City" means the City of Redondo Beach, Los Angeles County, California.

"Commercial development" means any development on private land that is not heavy industrial or single-family residential. The category includes, but is not limited to: hospitals, laboratories and other medical facilities, educa-

tional institutions, recreational facilities, plant nurseries, multi-family residential buildings, apartments, car wash facilities, mini-malls and other business complexes, shopping malls, hotels, office buildings, public warehouses and other light industrial complexes.

"Directly connected impervious area (DCIA)" means the area covered by a building, impermeable pavement, and/or other impervious surfaces, which drains into the storm drain system without first flowing across permeable land area (e.g. lawns).

"Discharge" means when used without qualification the "Discharge of a pollutant."

"Discharge exception" means discharges authorized by the NPDES permit, which are exceptions to this chapter and excluded from the definitions of "illicit connections" and "illicit/prohibited discharges," as defined herein, including only:

Discharges composed entirely of stormwater, discharges covered under current EPA or Regional Water Quality Control Board issued NPDES permits, or other waivers, permits or approvals granted by an appropriate government agency (provided that the discharger is in full compliance with all requirements of the permit and other applicable laws or regulations), discharges to the stormwater drainage system from potable water drinking supply and distribution system releases (consistent with American Water Works Association guidelines for dechlorination and suspended solids reduction practices), emergency firefighting activities, reclaimed and potable landscape irrigation systems, diverted stream flows permitted by the State Water Resources Board, natural springs, rising ground-water (excluding active dewatering), uncontaminated groundwater infiltration systems (as defined by 40 CFR 35.2005(20)), discharges from potable water sources such as passive foundation drains, and air conditioning condensation, water from crawl space pumps, passive footing drains, vehicle washing at residences or by non-profit organizations, flows from riparian habitats and wetlands, dechlorinated or debrominated swimming pool discharges, dewatering of lakes and decorative fountains and sidewalk rinsing.

Notwithstanding the above, where the City Engineer or his/her authorized representative determines that a discharge in accordance with the preceding paragraph may cause a pollutant or pollutants to be discharged to the stormwater drainage system, or may otherwise contribute to a violation of water quality standards protected by the NPDES permit, then upon the giving of thirty (30) days written notice by the City Engineer to the owner or operator of the property or facility, the discharge exception shall not apply to the subject discharge.

"Discharge of a pollutant" means: any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source" or, any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. The term discharge includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

"Discretionary project" means a project which requires the exercise of judgment or deliberation when the public agency or public body decides to approve or disapprove a particular activity, as distinguished from situations where the public agency or body merely has to determine whether there has been conformity with applicable statutes, ordinances or regulations.

"Enforcing attorney" means the City Attorney or District Attorney acting as counsel to the City or his/her appointee. For purposes of criminal prosecution, only the District Attorney and/or City Attorney shall act as the enforcing attorney.

"Engineer" means the City Engineer and persons directed by them and under their instruction and supervision who are assigned to investigate compliance and detect violations of this chapter.

"Environmentally sensitive area" means an area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments (California Public Resources Code § 30107.5). Areas subject to storm water mitigation requirements are: areas designated as significant ecological areas by the County of Los Angeles (Los Angeles County Significant Areas Study, Los Angeles County Department of Regional Planning (1976) and amendments); an area designated as a significant natural area by the California Department of Fish and Game's Significant Natural Areas Program, provided that area has been filed verified by the Department of Fish and Game; an area listed in the Basin Plan as supporting the "Rare, Threatened, or Endangered Species (RARE)" beneficial use; and an area identified by a permittee as environmentally sensitive.

"EPA" means the Environmental Protection Agency of the United States.

"Good housekeeping practices" means common practices related to the storage, use or cleanup of materials, performed in a manner that minimizes the discharge of pollutants. Examples include, but are not limited to, purchasing only the quantity of materials to be used at a given time, use of alternative and less environmentally harmful products, cleaning up spills and leaks, and storing materials in a manner that will contain any leaks or spills.

"Grease" means and includes waxes, fats, oils and other nonvolatile materials as determined by appropriate procedures set forth in 40 CFR Part 136.

"Greater than nine (9) unit home subdivision" means any subdivision being developed for ten (10) or more single- or multiple-family dwelling units.

"Hearing officer" means the City Engineer or his/her designee, who shall preside at the administrative hearings authorized by this chapter and issue final decisions on the matters raised therein.

"Hillside" means property located in an area with known erosive soil conditions, where the development contemplates grading on any natural slope that is twenty-five percent or greater and where grading contemplates cut or fill slopes.

"Illicit connection" means any man-made conveyance that is connected to the storm drain system without a permit, excluding roof drains and other similar type connections. Examples include channels, pipelines, conduits, inlets, or outlets that are connected directly to the storm drain system.

"Illicit discharge" means any discharge to the storm drain system that is prohibited under local, state or federal statutes, ordinances, codes or regulations. The term illicit discharge includes all non storm-water discharges except discharges pursuant to an NPDES permit, discharges that are identified in Part 1, "Discharge Prohibitions" of the Municipal NPDES permit, and discharges authorized by the Regional Board Executive Officer.

"Industrial user," means any source of industrial wastewater as defined in this section, or wastewater, which is subject to regulations under Section 307(b) and (c) of the Act. The term includes but is not limited to users who are identified under the Divisions A, B, C, D, E and I, in the Standard Industrial Classification Manual, 1987, Office of Management and Budget, as amended and/or by the County Sanitation Districts of Los Angeles.

"Infiltration" means the downward entry of water into the surface of the soil.

"Material" means any substance including, but not limited to: garbage and debris; lawn clippings, leaves, and other vegetation; biological and fecal waste; sediment and sludge; oil and grease; gasoline; paints, solvents, cleaners, and other fluid or solid containing chemicals.

"Municipal NPDES permit" means the "waste discharge requirements for municipal stormwater and urban runoff discharges within the County of Los Angeles" (Order No. 01-182), dated December 13, 2001, issued by the California Regional Water Quality Control Board-Los Angeles Region, and any successor permit to that permit.

"Municipal separate stormwater system (MS4)" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, alleys, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) owned by a State, city, county, town or other public body, that is designed or used for collecting or conveying storm water, which is not a combined sewer, and which is not part of a publicly owned treatment works, and which discharges to waters of the United States.

"National Pollutant Discharge Elimination System (NPDES)" means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing pretreatment requirements, under CWA §§ 307, 402, 318, and 405. The term includes an "approved program."

"New development" means all public and private residential (whether single-family, multi-unit or PUD), industrial, commercial, retail or other nonresidential construction projects, where the project requires any one or more of the following activities: grading, filling, trenching or disturbance of earth; paving or resurfacing with any medium; landscaping; construction of foundations; erection of steel, wood or other framing; installation of siding or masonry of any type; stripping, sanding, stuccoing or exterior preparation, repair and painting; interior drywall installation, plastering, installation of plumbing, electrical, finished carpentry, complete flooring or interior wall covering, whether paint or otherwise.

"Nonstormwater discharge" means any discharge to a stormwater system that is not composed entirely of stormwater.

"NPDES permit" means any waste discharge requirements issued by the Regional Board or the State Water Resources Control Board as an NPDES permit pursuant to Water Code Section 13370 (other than the municipal NPDES permit).

"100,000 square foot commercial development" means any commercial development that creates at least 100,000 square feet of impermeable area, including parking areas.

"Parking lot" means land area or facility for the temporary parking or storage of motor vehicles used personally, for business or for commerce with an improved lot size of

5,000 square feet or more, or with twenty-five (25) or more parking spaces potentially exposed to rainwater.

"Planning priority projects" means any: (1) 43,560 or more square feet or greater of impervious area commercial/industrial developments, (2) automotive repair facilities (SIC 5013, 5014, 5541, 7532 -- 7534, and 7536 -- 7539), (3) retail gasoline outlets, (4) restaurants (SIC 5812), (5) Ten (10) or more unit homes (including single family homes, multifamily homes, condominiums, and apartments, (6) locations within or adjacent to or directly discharging to an environmentally sensitive area where the development will: (a) discharge stormwater and urban runoff that is likely to impact a sensitive biological species or habitat; and (b) create 2,500 square feet or more of impervious surface area, (7) parking lots, (8) redevelopment projects in subject categories that meet redevelopment thresholds, (9) single-family hillside home.

"Planning priority project characteristics" means any project that has the following as any part of the project: (1) vehicle or equipment fueling areas; (2) vehicle or equipment maintenance areas, including washing and repairs; (3) commercial or industrial waste handling or storage, excluding typical office or household wastes; (4) outdoor handling or storage of hazardous materials or waste; (5) outdoor work areas for activities such as, but not limited to, welding, cutting, metal fabrication, assembly, application of paints, coating or finishing; pre-cast concrete fabrication, etc.; (6) outdoor animal care confinement (kennels, stables, etc.) or slaughter; (7) outdoor food handling or processing; (8) outdoor horticulture activities (9) located in the Coastal Zone and not exempt from the requirement to obtain a Coastal Development Permit pursuant to Section 10-5.2208(a) of the Redondo Beach Municipal Code.

"Pollutants" means those "pollutants" defined in CWA § 502(6) (33 U.S.C. § 1362(6)), and incorporated by reference into California Water Code § 13373.

"Potable Water Distribution Systems Releases" means sources of flows from drinking water storage, supply and distribution systems including flows from system failures, pressure releases, system maintenance, distribution line testing, fire hydrant flow testing; and flushing and de-watering of pipes, reservoirs, vaults, and minor non-invasive well maintenance activities not involving chemical addition(s). It does not include wastewater discharges from activities that occur at wellheads, such as well construction or well maintenance.

"Pretreatment facility" means any works or devices that are used for the treatment of wastewater, prior to discharge into a public sewer.

"Private property" means any real property location, irrespective of ownership, which is not open to the general public.

"Prohibited discharge" means any discharge from public or private property to the stormwater drainage system that is not composed entirely of stormwater, or which otherwise contains any pollutant, with the exception of discharges permitted from point or nonpoint sources by (i) the NPDES permit, (ii) a State general permit or other Regional Water Quality Control Board or State Water Resources Control Board issued NPDES permit, (iii) a permit issued pursuant to the provisions of this chapter, and/or (iv) the discharge exception. Prohibited discharge shall also include any discharge, whether direct or indirect, to groundwater or any river, stream, creek, wash, harbor, bay or the Pacific Ocean.

"Project" means anything that constitutes "development," as defined in Article 10 of Chapter 5 of Title 10 of the Redondo Beach Municipal Code.

"Rainy Season" means the calendar period beginning October 15 through April 15.

"Redevelopment" means, on an already existing developed site, the creation or addition of at least 5,000 square feet of impervious surfaces. Redevelopment includes, but is not limited to: the expansion of a building footprint or addition or replacement of a structure; structural development including an increase in gross floor area and/or exterior construction or remodeling; replacement of impervious surface that is not part of a routine maintenance activity; and disturbing activities related with structural or impervious surfaces. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Regional Board" means the California Regional Water Quality Control Board--Los Angeles Region.

"Restaurant" means a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption. (SIC code 5812).

"Retail gasoline outlet" means any facility engaged in selling gasoline and lubricating oil.

"Sidewalk Rinsing" means pressure washing of paved pedestrian walkways with average water usage of 0.006 gallons per square foot, with no cleaning agents, and properly disposing of all debris collected, as authorized under Regional Board Resolution No. 98-08.

"Site Design BMP" means any project design feature that reduces the creation or severity of potential pollutant sources or reduces the alteration of the project site's natural flow regime.

"Source control BMP" means any schedules of activities, prohibitions of practices, maintenance procedures, managerial practices or operational practices that aim to prevent stormwater pollution by reducing the potential for contamination at the source of pollution.

"Standard industrial classification (SIC)" means a system of classifying a business based on the type of its activity as identified in the Standard Industrial Classification Manual, 1987, Office of Management and Budget, as amended.

"Storm event" means a rainfall event that produces more than 0.1 inch of precipitation, which is separated from the previous storm event by at least seventy-two (72) hours of dry weather.

"Stormwater drainage system" means any local or regional street gutter, channel, conduits, storm drain, constructed drain, natural or artificial drains and watercourses, lined diversion structure, wash area, inlet, outlet or other facility together with appurtenances, pumping stations and equipment, which is part of or tributary to the City's stormwater runoff system in the County-wide stormwater runoff system owned or operated by the County of Los Angeles.

"Stormwater runoff" means that part of precipitation (rainfall) which travels via flow across a surface to the storm drain system or receiving waters from impervious, semipervious or pervious surfaces. When all other factors are equal, runoff increases as the perviousness of a surface decreases.

"Structural BMP" means any structural facility designed and constructed to mitigate the adverse impacts of stormwater and urban runoff pollution (e.g. canopy, structural enclosure). The category may include both treatment control BMPs and source control BMPs.

"Treatment" means the application of engineered systems that use physical, chemical or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media adsorption, biodegradation, biological uptake, chemical oxidation and UV radiation.

"Treatment control BMP" means any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media adsorption or any other physical, biological or chemical process.

"Unpolluted water" means water to which no pollutant has been added either intentionally or accidentally.

"Urban runoff" means surface water flow produced by non-stormwater resulting from residential, commercial, and industrial activities involving the use of potable and nonpotable water.

"Urban Stormwater Mitigation Plan (USMP)" means a plan which shall identify BMPs that shall be incorporated into the project design to mitigate/reduce pollution impacts to receiving water caused by stormwater/urban runoff. This plan shall detail appropriate/necessary Site Design, Source Control, and Treatment BMPs for the project. (§ 2, Ord. 2851 c.s., eff. October 5, 2000, as amended by § 3, Ord. 2890 c.s. eff. August 15, 2002, as amended by § 1, Ord. 2905 c.s., eff. August 5, 2003)

5-7.104 Inspection.

The Engineer, or his representative, shall be authorized at any reasonable time to enter the premises of any property discharging to the MS4 to determine compliance with the provisions of this chapter; such inspection may include but not be limited to: sampling, monitoring, reviewing, photographing, videotaping and inspecting treatment facilities and discharge location. (§ 2, Ord. 2851 c.s., eff. October 5, 2000, as amended by § 4, Ord. 2890 c.s., eff. August 15, 2002, as amended by § 1, Ord. 2905 c.s., eff. August 5, 2003)

5-7.105 Storm drain impact fees.

(a) Every applicant for a permit pursuant to Section 9-1.02 of this Code for development construction shall pay a storm drain impact fee.

(b) The proceeds of the storm drain impact fee shall be applied to offset the City's costs of enforcing the order as a result of development construction, and the amount of the storm drain impact fee shall not exceed the City's reasonable costs therefor.

(c) The amount of the storm drain impact fee shall be established by resolution of the City Council, as amended from time to time, in accordance with the provisions of this section, as amended from time to time.

(d) The City Engineer shall administer and collect the storm drain impact fee.

(e) Permits issued pursuant to Section 9-1.02 for development construction shall not be issued until payment of the storm drain impact fee. (§ 1, Ord. 2873 c.s., eff. August 10, 2001, as amended by § 5, Ord. 2890 c.s., eff. August 15, 2002, as amended by § 1, Ord. 2905 c.s., eff. August 5, 2003)

5-7.106 Critical source of pollution inspection fee.

(a) Every person required to obtain a license pursuant to Redondo Beach Municipal Code Section 6-1.06 and also engaged in a business designated in the Municipal NPDES permit as a critical source of pollution shall pay an annual critical source of pollution inspection fee.

(b) The proceeds of the critical source of pollution inspection fee shall be applied to offset the City's costs of performing the inspections required by the Municipal NPDES permit and the amount of the critical source of pollution inspection fee shall not exceed the City's reasonable costs therefor.

(c) The amount of the critical source of pollution inspection fee shall be established by resolution of the City Council as amended from time to time in accordance with provisions of this section.

(d) The License Clerk and Collector shall administer and collect the critical source of pollution inspection fee.

(e) No license issued pursuant to Redondo Beach Municipal Code Section 6-1.06 shall be issued or renewed until payment of the critical source of pollution inspection fee is received by the License Clerk and Collector. (§ 1, Ord. 3000 c.s., eff. May 17, 2007)

CHAPTER 1
GENERAL PROVISIONS

ARTICLE 1 - ADOPTION OF CODE

(O-282; O-455; O-538; O-1758)

11.1.1 HOW CODE DESIGNATED AND CITED.

The ordinances embraced in the following Divisions and Sections shall constitute and be designated as The Torrance Municipal Code and may be so cited.

(O-1758)

11.1.2 NATURE OF CODE.

This record shall consist of all of the regulatory and penal and of certain of the administrative ordinances of the City of Torrance.

11.1.3 PROVISIONS CONSIDERED CONTINUATIONS OF EXISTING ORDINANCES.

The provisions appearing in this Code, so far as they are the same as those of ordinances existing at the time of the effective date of this Code, shall be considered as continuances thereof and not as new enactments.

11.1.4 EFFECT OF REPEAL OF ORDINANCES.

The repeal of an ordinance shall not revive any ordinance in force before or at the time the ordinance repealed took effect.

The repeal of an ordinance shall not affect any punishment or penalty incurred before the repeal took effect, nor any suit, prosecution or proceeding pending at the time of the repeal, for any offense committed under the ordinance repealed.

11.1.5 VALIDITY OF CODE.

It is hereby declared to be the intention of the City Council that the sections, paragraphs, sentences, clauses and phrases of this Code are severable, and if any phrase, clause, sentence, paragraph or section of this Code be declared unconstitutional by the valid judgment or decree of a court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs and sections of this code.

ARTICLE 2 - PENAL PROVISIONS

11.2.1 GENERAL PENALTY; CONTINUING VIOLATIONS.

Whenever in this Code or in any other ordinance of the City, any act is prohibited or is made or declared to be unlawful or an offense, or the doing of any act is required or the failure to do any act is declared to be unlawful or a misdemeanor, where no specific penalty is provided for, the violation of any such provision of this Code or any other ordinance of the City shall be punishable by a fine not exceeding $500.00 or imprisonment of a term not exceeding 6 months, or by both such fine and imprisonment.

All remedies provided for herein shall be cumulative and not exclusive.

11.2.2 ISSUANCE OF CITATIONS FOR VIOLATION OF THIS CODE AND OTHER CITY ORDINANCES.

(Added by O-925)

When any person is arrested for a violation of this Code or of any uncodified ordinances of the City and such person is not immediately taken before a magistrate as prescribed in the Penal Code of the State of California, the arresting officer shall prepare in duplicate a written notice to appear in court, containing the name and address of such person, the offense charged, and the time and place where and when such person shall appear in court.

11.2.3 FAILURE TO APPEAR IN COURT IS A MISDEMEANOR.

(Added by O-925)

Any person wilfully violating his written promise to appear in court is guilty of a misdemeanor regardless of the disposition of the charge upon which he was originally arrested.

11.2.4 ISSUANCE OF WARRANT FOR FAILURE TO APPEAR IN COURT.

(Added by O-925)

When a person signs a written promise to appear at the time and place specified in the written promise to appear and has not posted bail as provided in Section 853.1 of the Penal Code of the State of California, or in any amendment thereto, or modification thereof, the magistrate shall issue and have delivered for execution, a warrant for his arrest within twenty (20) days after his failure to appear as promised, or if such person promises to appear before an officer authorized to accept bail other than a magistrate and fails to do so on or before the date which he promises to appear, then, within 20 days after the delivery of such written promise to appear by the officer to a magistrate having jurisdiction over the offense.

11.2.5 ENFORCEMENT PERSONNEL.

(Added by O-3302; Amended by O-3543; O-3746)

a) Pursuant to the provisions of Section 836.5 of the California Penal Code, or any amendment thereof, those classifications of officers and employees of the City of Torrance set forth herein shall be authorized to exercise the powers of arrest.

b) Those officers and employees listed herein may arrest a person without a warrant whenever the officer or employee has reasonable cause to believe that the person to be arrested has committed a misdemeanor in the presence of the officer or employee that is in violation of a statute or ordinance that the officer or employee has the duty to enforce.

c) The following classification of officers and employees of the City are hereby authorized to exercise powers of arrest:

1) Assistant Finance Director;

2) Revenue Inspector Collector;

3) Director of Building and Safety;

4) Building Regulations Administrator;

5) Building Inspection Supervisor;

6) Building Inspector;

7) Environmental Services Administrator;

8) Environmental Quality Officer;

9) Public Works Inspector;

10) Senior Public Works Inspector;

11) Senior Building Inspector;

12) Senior Electrical Inspector;

13) Senior Environmental Quality Officer;

14) Senior Mechanical Inspector;

15) Senior Plumbing Inspector;

16) Senior Grading Inspector;

17) Public Works Director;

18) Deputy Public Works Director; (Operations);

19) Deputy Public Works Director; (Engineering);

20) Sanitation Services Manager;

21) Streetscape Manager;

22) Street Services Supervisor (Sanitation);

23) Street Services Supervisor (Waste Water);

24) Street Services Supervisor (Streetscape);

25) Animal Control Supervisor;

26) Animal Control Officer;

27) Fire Fighter;

28) Fire Engineer;

29) Fire Captain;

30) Fire Battalion Chief;

31) Fire Assistant Chief;

32) Senior Fire Inspector;

33) Fire Prevention Specialist;

34) Senior Fire Prevention Specialist;

35) Senior Fire Prevention Officer;

36) Hazardous Materials Analyst;

37) Hazardous Materials Specialist.

11.2.6 ISSUANCE OF CITATIONS.

(Added by O-3302; Amended by O-3386; O-3430; O-3543; O-3694; O-3713; O-3762)

Those persons holding the job titles enumerated in the Section 11.2.5 may issue citations, if at all, for those violations of the Torrance Municipal Code which are both listed in this section and for which they have the responsibility to enforce.

The following Torrance Municipal Code sections may be enforced by means of the issuance of a citation, pursuant to law, for their violation. Each such section will be for the purposes of the citation, and any subsequent prosecution, an infraction, as provided in Government Code Section 36900.

DIVISION 3

31.3.4	35.3.2	36.1.4	37.2.3
33.3.3	35.4.3	36.1.7	38.1.3
33.3.4	35.9.2	36.1.13	38.4.1
34.2.1	35.11.2	36.1.15	310.1.1
34.2.9	35.11.11	36.1.20	
35.1.2	35.12.2	37.2.1	
35.2.2	36.1.3	37.2.2	

DIVISION 4

41.1.2	41.9.1	45.2.3	46.3.1

41.1.4	41.10.1	45.4.6	46.3.2
41.1.5	43.1.2	45.4.8	46.5.2
41.1.7	43.1.3	45.4.9	46.7.2
41.1.8	43.1.4	45.6.2	48.1.2
41.5.1	43.1.5	45.6.3	48.1.3
41.6.1	43.1.7	45.6.5	48.1.5
41.6.2	43.1.8	45.6.14	48.1.7
41.6.3	43.1.9	45.6.15	48.1.8
41.6.4	43.1.11	45.6.23	49.2.1
41.7.1	43.2.9	46.2.1	49.2.6 (b)
41.8.1	43.4.2	46.2.5	49.2.9 (a)
41.8.6	44.3.15 (b)	46.2.6	42.9.10

DIVISION 6

61.1.11	61.5.5	61.6.23	62.1.3
61.1.15	61.6.2	61.6.24	62.1.4 (a)
61.1.16	61.6.4	61.6.25	62.1.4 (b)
61.1.17	61.6.5	61.6.26	62.1.5
61.2.7	61.6.6	61.6.27	62.1.6
61.3.8	61.6.8	61.6.28	62.1.7
61.3.9	61.6.9	61.6.30	62.1.8 (a)
61.3.10	61.6.10	61.6.32	62.1.8 (b)
61.3.11	61.6.11	61.6.33	62.2.1
61.4.3	61.6.13	61.7.1	62.2.8
61.4.10	61.6.14	61.9.1	62.4.2
61.5.2	61.6.17	61.12.140 (a)	63.4.3
61.5.3	61.6.18	61.12.140 (f)	63.4.4

61.5.4	61.6.19	61.12.140 (g)	

DIVISION 7

72.1.1	72.2.17	74.5.18	75.1.10
72.2.3	72.2.18	74.6.2	75.1.14
72.2.10	72.2.21	74.6.8	75.2.1
72.2.12	72.2.22	74.8.2	77.1.30
72.2.14	74.2.3	75.1.6	
72.2.15	74.2.4	75.1.8	
72.2.16	74.5.4	75.1.9	

DIVISION 8

88.5.1	88.5.4	88.6.1	88.6.14
88.5.2	88.5.7	88.6.13	88.11.2

DIVISION 9

91.4.1	91.21.1	92.2.8	97.2.3
91.4.5	91.23.1	92.2.9	97.5.1
91.4.6	91.24.1	92.5.13	97.5.4
91.4.11	91.25.1	92.5.14	97.5.6
91.7.1	91.25.3	92.10.2	97.5.12
91.8.1	91.25.6	92.13.1	97.8.2
91.9.1	91.25.7	92.18.1	97.8.3
91.10.1	91.30.1	92.21.1	97.8.4
91.11.1	91.31.1	92.22.3	97.8.5
91.11.2	91.36.3	92.30.4	97.8.6
91.13.1	91.36.6	93.1.1	97.8.7

91.15.1	91.38.1	93.1.7	
91.20.1	91.47.5	97.2.2	

11.2.7 FEES FOR THE COLLECTION OF DELINQUENT PARKING CITATIONS.

(Added by O-3716)

Any person liable for a civil penalty will be required to pay the penalty provided on the bail schedule of parking penalties for parking violations, including process service fees, and any late payment penalty. In addition, if the City incurs collection costs in conjunction with the assignment of a parking citation, those costs will be added to the penalty and the violator will be liable to the city for both the civil penalties and the collection costs.

ARTICLE 3 - RULES OF CONSTRUCTION

11.3.1 CONSTRUCTION; PROVISIONS GOVERNING.

Unless the provisions of the context otherwise require, these general provisions, rules of construction and definitions shall govern the construction of this Code. The provisions of this Code and all proceedings under it are to be construed with a view to effect its objects and to promote justice.

11.3.2 HEADINGS, EFFECT OF.

The headings of the sections of this Code are intended as catchwords to indicate the contents of the section and shall not be deemed to govern, limit, modify or in any manner affect the scope, meaning or intent of the provisions of any section.

11.3.3 REFERENCE APPLIES TO AMENDMENTS.

Whenever a reference is made to any portion of this Code, or to any ordinances of this City, the reference applies to all amendments and additions now or hereafter made.

ARTICLE 4 - DEFINITIONS

In the construction of this Code and of all ordinances of the City, the following definitions of a general nature shall apply, unless the provisions of the context or the intent of the City Council clearly requires otherwise.

11.4.1 CHARTER.

Shall mean and refer to the Charter of the City of Torrance, as amended.

11.4.2 CITY.

Shall be construed as if followed by the words of Torrance.

11.4.3 CODE.

Shall mean Torrance Municipal Code.

11.4.4 COMPUTATION OF TIME.

Shall be the time in which any act provided by law is to be done is computed by excluding the first day and including the last, unless the last day is a holiday and then it is also excluded.

11.4.5 COUNCIL.

Shall be construed to mean the City Council of the City of Torrance.

11.4.6 COUNTY.

Shall mean the County of Los Angeles.

11.4.7 DAY.

A day is the period of time between any midnight and the midnight following.

11.4.8 DAYTIME, NIGHTTIME.

Daytime is the period of time between sunrise and sunset. Nighttime is the period of time between sunset and sunrise.

11.4.9 GENDER.

The masculine gender includes the feminine and neuter.

11.4.10 IN THE CITY.

Shall mean and include all territory over which the City now has, or shall hereafter acquire, jurisdiction for the exercise of its police powers or other regulatory powers.

11.4.11 JOINT AUTHORITY.

All words giving a joint authority to 3 or more persons or officers shall be construed as giving such authority to a majority of such persons or officers.

11.4.12 MONTH.

Shall mean a calendar month.

11.4.13 NUMBER.

The singular number includes the plural, and the plural, the singular.

11.4.14 OATH.

Shall include affirmation.

11.4.15 OFFICIAL TIME.

Whenever certain hours are named herein, they shall mean Pacific Standard Time or Daylight Saving Time as may be in current use in the City.

11.4.16 OR, AND.

Or may be read and, and and may be read or, if the sense requires it.

11.4.17 OWNER.

As applied to a building or land, shall include any part owner, joint owner, tenant in common, tenant in partnership, joint tenant or tenant by the entirety of the whole or of a part of such building or land.

11.4.18 PERSON.

Includes any person, firm, association, organization, partnership, business, trust, corporation or company.

11.4.19 PERSONAL PROPERTY.

Includes every species of property, except real property, as herein defined.

11.4.20 PRECEDING, FOLLOWING.

The words preceding and following mean next before and next after, respectively.

11.4.21 PROCESS.

Includes a writ or summons issued in the course of judicial proceedings of either a civil or criminal nature.

11.4.22 PROPERTY.

Shall include real and personal property.

11.4.23 REAL PROPERTY.

Shall include lands, tenements and hereditaments.

11.4.24 ROADWAY.

Is that portion of a highway improved, designed or ordinarily used for vehicular travel.

11.4.25 SHALL, MAY.

Shall is mandatory and may is permissive.

11.4.26 SIDEWALK.

Shall be that portion of a highway, other than the roadway, set apart for pedestrian travel.

11.4.27 SIGNATURE OR SUBSCRIPTION BY MARK.

Includes mark when the signer or subscriber cannot write, such signer's or subscriber's name being written near the mark by a witness who writes his own name near the signer's or subscriber's name; but a signature or subscription by mark can be acknowledged or can serve as a signature or subscription to a sworn statement only when two (2) witnesses so sign their own names thereto.

11.4.28 STATE.

The words the state and this state shall be construed to mean the State of California.

11.4.29 STREET, HIGHWAY.

Shall be a way or place of whatever nature, publicly maintained and open to the use of the public for purposes of vehicular travel.

11.4.30 TENANT OR OCCUPANT.

The words tenant or occupant applied to a building or land, shall include any person holding a written or an oral lease of or who occupies, the whole or a part of such building or land, either alone or with others.

11.4.31 TENSES.

The present tense includes the past and future tenses, and the future includes the present.

11.4.32 WEEK.

A week consists of seven consecutive days.

11.4.33 WRITING.

Includes any form of a recorded message capable of comprehension by ordinary visual means. Whenever any notice, report, statement or record is required or authorized by this Code, it shall be made in writing in the English language unless it is expressly provided otherwise.

11.4.34 YEAR.

Shall mean a calendar year, except where otherwise provided.

ARTICLE 5 - APPEALS; PROCEDURES

(Added by O-957; Amended by O-2822)

11.5.1 FILING OF NOTICE OF APPEAL.

(Amended by O-1661; O-3528)

Except as otherwise provided in this Code, if any application for any permit or consent of any City body or official having such authority is denied or approved by any City body or official and no other body is designated in the Code to hear an appeal, the applicant, or any interested person adversely affected, upon payment of an appeal fee, the City Manager, or any member of the City Council may personally serve the City Clerk with a written notice of appeal to the City Council from such decision within fifteen (15) days after such decision.

11.5.2 CONTENTS OF NOTICE OF APPEAL, FEES.

(Amended by O-3416)

a) The notice of appeal shall contain the following information in addition to the information given by the applicant thereon or reasonably required by the City Clerk therefor:

1) The name, address, and telephone number of the applicant.

2) The type of permit desired or action requested.

3) The date on which said permit was issued or refused or the decision was made and the name of the City officer, body, or department taking such action.

4) The grounds on which the appeal is taken.

b) A fee for filing an appeal shall be charged as provided by resolution of the City Council.

11.5.3 PROCEDURE AFTER FILING.

a) Upon receipt of the notice of appeal, and the appeal fee, the City Clerk shall notify the concerned City officials, bodies or departments that an appeal has been filed and shall transmit a copy of the appeal documents to such officials, bodies or departments.

b) The concerned City officials, bodies or departments shall prepare the necessary reports for the City Council, provide public notices, posting, mailing or advertising in the same manner as provided for the original hearing or decision making process, request the appeal be placed on the agenda for hearing before the City Council within thirty (30) days of receipt of the said notice of appeal, and notify the applicant in writing of the time, date and place of the hearing not less than five (5) days before the Council hearing.

11.5.4 HEARING BEFORE COUNCIL.

The Council shall hold a hearing at the time set therefor as provided in Section 11.5.3. The Council may summon witnesses and hear evidence relating to such application, but the rules of evidence shall not apply. The Council may continue the hearing from time to time. At the conclusion thereof, the Council shall grant or deny such application or make such modifications of the decision or action appealed from with reference thereto as it may deem fit. The order of the Council shall be immediately final and conclusive, and no applicant, and no application for the same purpose may be made for one (1) year after the date of such order.

ARTICLE 6 - IN GENERAL

11.6.1 NOTICES, SERVICE OF.

Whenever a notice is required to be given under this Code, unless different provisions herein are otherwise specifically made, such notice may be given either by personal delivery thereof to the person to be notified or by deposit in the United States mail in a sealed envelope postage prepaid, addressed to such person to be notified, at his last known business or residence address as the same appears in the public records of the City or other records pertaining to the matter to which such notice is directed. Service by mail shall be deemed to have been completed at the time of deposit in the post office.

11.6.2 PROOF OF NOTICE.

Proof of giving any notice may be made by the certificate of any officer or employee of the City, or by affidavit of any person over the age of eighteen (18) years, which shows service in conformity with this Code, or other provisions of law applicable to the subject matter concerned.

11.6.3 EFFECT OF ISSUANCE OF PERMIT OR LICENSE.

(Added by O-1901)

Any permit or license issued in violation of any provisions of this Code or of any City ordinance or which purports to authorize the doing of any act prohibited by this Code or other ordinance shall be void and shall not constitute approval of any violation of any provisions of this Code or any other law or ordinance.

11.6.4 SERVICE OF NOTICE ON CITY CLERK.

(Added by O-2403; Amended by O-2732)

Unless otherwise provided by the laws of the United States of America or the State of California, or by other provisions of this Code, or by a contract to which the City is a party, service upon the City of all notices, whether or not required by law, or any other documents, including any subpoenas duces tecum for the production of any City records, shall be effected by filing such notices, subpoenas, or other documents with the City Clerk of the City.

Appendix Q

Selection of Critical Condition

BACTERIA – 90TH PERCENTILE TMDL YEAR – MANHATTAN BEACH GAGE

Manhattan Beach Gauge D1070					
Precipitation Total			Number of Wet Days		
Year	Precip. (in)	Percentile	Year	Days	Percentile
1998	29.26	100%	1998	99	100%
1995	**22**	**95%**	2010	76	95%
2005	21.94	91%	**1995**	**73**	**86%**
1993	21.7	86%	2005	73	86%
2011	17.23	82%	1993	71	82%
1992	15.74	77%	1992	67	73%
2003	14.57	73%	2011	67	73%
2010	14.35	68%	1989	66	68%
2008	14.27	64%	1999	65	64%
2001	13.78	59%	1994	60	59%
1997	12.28	55%	2000	59	55%
2004	10.9	50%	1996	58	50%
2000	10.86	45%	2004	55	45%
1996	10.23	41%	2003	53	36%
2009	8.88	36%	2006	53	36%
1991	8.28	32%	2001	52	32%
2006	7.94	27%	2009	49	27%
1994	7.69	23%	1997	45	23%
1999	7.55	18%	2008	42	18%
1989	7.44	14%	1991	41	9%
1990	4.5	9%	2002	41	9%
2002	4	5%	2007	40	5%
2007	3.47	0%	1990	39	0%

COPPER – 90TH PERCENTILE DAILY LOAD - DOMINGUEZ CHANNEL ANALYSIS REGION

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
12/27/2004	31,312,007	60.7	31.0	100%
3/20/2011	29,060,258	46.7	25.8	100%
2/12/2003	26,298,172	45.5	27.7	99%
12/28/2004	22,781,614	44.2	31.0	99%
3/15/2003	23,632,270	41.4	28.1	98%
1/7/2005	23,704,308	39.5	26.7	98%
12/19/2010	22,415,152	38.4	27.4	98%
1/1/2005	22,887,234	36.4	25.5	97%
1/27/2008	17,368,762	30.9	28.5	97%
1/25/2008	18,665,740	30.7	26.3	96%
2/20/2004	16,833,095	28.0	26.6	96%
12/15/2008	15,951,698	27.8	27.9	96%
1/20/2010	15,798,848	27.7	28.1	95%
2/6/2010	15,729,036	26.2	26.7	95%
12/20/2010	14,546,645	24.9	27.4	95%
2/24/2008	14,917,722	24.7	26.5	94%
2/24/2004	13,785,525	24.7	28.7	94%
12/18/2010	14,369,712	24.6	27.4	93%
5/1/2003	13,244,040	24.0	29.1	93%
2/26/2006	12,677,625	23.8	30.1	93%
12/7/2009	14,264,586	23.8	26.7	92%
10/19/2004	14,063,955	23.5	26.7	92%
12/31/2005	13,537,145	22.9	27.1	91%
1/6/2008	13,704,266	22.7	26.5	91%
2/17/2009	13,278,389	22.1	26.7	91%
2/20/2005	12,442,688	21.5	27.7	90%
11/30/2007	**13,129,863**	**21.1**	**25.8**	**90%**
2/11/2003	12,156,135	21.0	27.7	89%
12/22/2010	12,190,852	20.9	27.4	89%
2/11/2005	11,861,441	20.6	27.8	89%
3/28/2006	12,817,317	20.5	25.7	88%
10/25/2004	12,937,482	20.4	25.2	88%
2/5/2010	11,979,000	20.0	26.7	88%
1/23/2008	10,620,633	18.5	28.0	87%
2/3/2008	10,016,045	18.3	29.3	87%
2/18/2005	9,756,024	17.9	29.5	86%
3/25/2012	10,919,891	17.8	26.1	86%
12/15/2002	9,230,222	17.0	29.4	86%

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
2/16/2009	9,744,219	16.9	27.9	85%
12/12/2009	8,404,272	16.5	31.4	85%
2/19/2005	10,206,811	16.3	25.6	84%
2/9/2005	9,110,565	16.2	28.5	84%
10/14/2009	9,486,034	15.8	26.7	84%
1/19/2010	8,943,577	15.4	27.5	83%
1/28/2008	8,364,151	15.2	29.2	83%
11/6/2002	9,155,190	15.2	26.5	82%
1/18/2010	9,036,992	14.8	26.2	82%
4/4/2006	6,967,943	14.4	33.1	82%
12/21/2010	8,348,384	14.3	27.4	81%
2/27/2010	7,098,103	14.1	31.9	81%
1/4/2008	8,313,372	14.1	27.1	81%
11/26/2008	7,467,163	13.9	29.8	80%
1/21/2012	7,512,682	13.8	29.4	80%
10/6/2010	7,242,584	13.8	30.5	79%
2/23/2003	7,980,165	13.6	27.3	79%
2/17/2005	7,218,537	13.3	29.5	79%
12/12/2011	7,726,019	13.3	27.5	78%
1/2/2004	6,720,802	12.8	30.5	78%
12/29/2010	7,517,626	12.7	27.1	77%
1/8/2005	7,479,474	12.5	26.8	77%
10/15/2004	7,252,323	12.1	26.8	77%
10/31/2003	6,043,495	11.3	29.8	76%
3/17/2012	6,313,983	11.1	28.1	76%
2/21/2005	6,282,137	11.0	28.0	75%
4/12/2010	6,482,727	11.0	27.1	75%
11/4/2008	5,574,369	10.9	31.3	75%
11/8/2002	6,698,336	10.6	25.3	74%
2/29/2004	6,634,305	10.5	25.5	74%
3/21/2005	6,138,728	10.5	27.3	74%
2/22/2005	5,938,403	10.4	28.0	73%
4/13/2012	6,585,692	10.4	25.2	73%
2/9/2003	5,690,745	10.0	28.1	72%
3/23/2011	5,715,041	9.9	27.8	72%
12/31/2004	5,506,833	9.8	28.6	72%
1/2/2011	5,753,882	9.5	26.5	71%
2/6/2009	4,867,387	9.4	30.8	71%

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
11/4/2011	5,106,680	9.2	29.0	70%
10/13/2007	5,927,135	9.2	24.8	70%
11/20/2011	5,155,535	9.0	27.9	70%
1/22/2008	5,130,327	8.8	27.5	69%
10/5/2011	5,321,098	8.8	26.4	69%
11/9/2005	5,533,232	8.7	25.3	68%
4/11/2012	4,446,967	8.7	31.2	68%
4/26/2005	5,030,015	8.6	27.2	68%
12/25/2003	5,245,611	8.4	25.7	67%
12/5/2004	4,949,169	8.3	26.8	67%
12/18/2007	5,653,928	8.3	23.4	67%
12/25/2010	5,010,113	8.2	26.3	66%
4/14/2003	4,548,122	8.0	28.1	66%
2/25/2011	4,769,946	7.9	26.6	65%
1/22/2010	4,414,439	7.8	28.4	65%
1/21/2010	4,344,942	7.7	28.4	65%
10/18/2004	4,587,728	7.7	26.7	64%
2/5/2009	3,865,855	7.4	30.8	64%
2/22/2008	4,216,191	7.4	28.1	63%
1/23/2012	4,308,546	7.3	27.2	63%
12/17/2010	4,248,719	7.3	27.4	63%
2/16/2005	3,923,685	7.2	29.5	62%
3/21/2011	4,486,104	7.2	25.8	62%
12/18/2002	4,210,652	7.1	26.8	61%
1/24/2008	4,227,769	7.0	26.3	61%
10/19/2010	3,474,342	6.9	32.0	61%
4/20/2007	3,776,909	6.8	28.6	60%
1/28/2005	3,733,545	6.7	28.6	60%
2/11/2007	3,515,013	6.6	30.1	60%
10/30/2010	3,807,601	6.6	27.6	59%
10/16/2005	3,685,195	6.5	28.2	59%
2/1/2004	4,141,935	6.5	25.0	58%
12/4/2004	3,884,430	6.3	25.9	58%
12/19/2007	4,220,534	6.2	23.4	58%
1/5/2008	3,533,926	6.0	27.1	57%
2/27/2006	3,135,758	5.9	30.1	57%
11/28/2002	3,341,100	5.8	28.0	56%
12/17/2008	3,607,544	5.7	25.5	56%

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
2/25/2004	3,135,821	5.6	28.7	56%
1/30/2007	3,318,231	5.6	27.0	55%
3/5/2006	2,962,988	5.4	29.5	55%
12/16/2002	2,948,589	5.4	29.4	54%
1/9/2005	3,150,007	5.4	27.3	54%
4/12/2003	2,841,017	5.3	29.7	54%
5/2/2003	2,832,986	5.1	29.1	53%
2/18/2011	2,862,405	5.1	28.6	53%
2/20/2008	2,828,230	5.1	28.8	53%
4/14/2006	2,869,020	5.1	28.3	52%
11/6/2011	3,030,571	5.1	26.8	52%
2/9/2009	2,870,133	5.0	27.7	51%
1/24/2009	2,374,682	4.8	32.5	51%
1/17/2010	2,930,670	4.8	26.2	51%
9/21/2007	2,945,352	4.8	26.0	50%
2/26/2011	2,837,279	4.7	26.6	50%
12/6/2007	2,755,304	4.6	26.5	49%
12/5/2010	2,400,536	4.6	30.4	49%
12/11/2009	2,795,477	4.5	25.9	49%
10/26/2004	2,854,466	4.5	25.2	48%
5/20/2006	2,839,899	4.5	25.1	48%
11/11/2003	2,572,500	4.4	27.2	47%
11/5/2004	2,572,500	4.3	26.6	47%
2/19/2011	2,294,198	4.2	29.4	47%
2/15/2012	2,082,349	4.2	32.2	46%
12/24/2003	2,251,256	4.1	29.3	46%
1/3/2005	2,497,319	4.1	26.2	46%
5/18/2011	2,306,463	3.9	26.9	45%
4/25/2012	2,308,536	3.9	26.8	45%
11/12/2011	2,174,554	3.8	27.7	44%
1/26/2008	2,182,482	3.7	27.1	44%
12/25/2006	2,020,322	3.6	28.6	44%
3/17/2005	2,023,658	3.6	28.4	43%
2/17/2004	2,074,455	3.6	27.6	43%
1/23/2009	2,053,799	3.6	27.8	42%
2/10/2005	1,967,186	3.5	28.5	42%
2/20/2010	2,015,114	3.5	27.5	42%
2/13/2009	1,876,970	3.5	29.5	41%

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
2/22/2007	2,076,926	3.4	26.3	41%
3/13/2003	2,023,658	3.3	26.4	40%
11/7/2002	1,992,933	3.3	26.5	40%
12/27/2006	1,776,634	3.2	29.0	40%
2/24/2003	1,885,761	3.2	27.3	39%
3/25/2011	1,760,492	3.2	29.2	39%
1/13/2010	2,066,943	3.2	24.8	39%
4/26/2012	1,897,335	3.2	26.8	38%
12/23/2003	1,951,005	3.1	25.8	38%
12/3/2004	1,835,372	3.1	27.4	37%
3/24/2011	1,696,950	3.1	29.2	37%
1/3/2011	1,769,701	2.9	26.7	37%
3/26/2006	1,911,518	2.9	24.5	36%
1/13/2006	1,500,212	2.9	30.8	36%
9/22/2007	1,823,679	2.9	25.2	35%
10/20/2010	1,625,021	2.7	27.1	35%
3/26/2012	1,661,845	2.7	26.1	35%
3/2/2011	1,629,468	2.7	26.4	34%
12/20/2002	1,428,401	2.7	30.1	34%
2/9/2010	1,570,402	2.7	27.1	33%
5/17/2011	1,556,834	2.6	26.9	33%
1/26/2010	1,637,395	2.6	25.5	33%
12/5/2007	1,555,742	2.6	26.5	32%
3/27/2006	1,600,858	2.5	25.4	32%
3/31/2012	1,483,027	2.5	27.4	32%
3/1/2004	1,589,905	2.5	25.5	31%
10/16/2004	1,502,745	2.5	26.8	31%
12/22/2008	1,419,467	2.5	28.2	30%
11/8/2010	1,333,938	2.5	29.6	30%
2/17/2006	1,505,022	2.4	26.0	30%
2/10/2003	1,309,194	2.3	28.1	29%
3/30/2006	1,214,504	2.2	29.3	29%
12/8/2006	1,284,662	2.2	27.5	28%
11/3/2003	1,454,949	2.2	23.9	28%
5/22/2006	1,241,330	2.2	27.9	28%
3/22/2005	1,255,348	2.1	27.3	27%
3/1/2006	1,433,024	2.1	23.1	27%
2/21/2008	1,149,453	2.0	28.6	26%

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
11/23/2010	1,119,060	2.0	28.3	26%
4/27/2005	1,149,309	2.0	27.2	26%
2/7/2009	1,006,627	1.9	30.8	25%
2/18/2009	1,143,216	1.9	26.7	25%
3/20/2006	1,046,843	1.8	27.9	25%
10/24/2010	820,995	1.8	34.6	24%
11/29/2002	1,004,502	1.8	28.0	24%
2/2/2004	1,090,598	1.7	25.0	23%
3/6/2010	937,382	1.7	29.0	23%
12/19/2002	1,003,535	1.7	26.8	23%
5/4/2005	1,047,657	1.7	25.5	22%
4/20/2010	1,001,782	1.7	26.4	22%
11/2/2008	925,436	1.6	27.4	21%
2/19/2007	923,357	1.6	27.1	21%
2/16/2011	876,853	1.6	28.4	21%
10/25/2010	710,814	1.5	34.6	20%
9/18/2005	999,623	1.5	24.1	20%
4/11/2010	878,904	1.5	27.1	19%
3/18/2012	807,317	1.4	28.1	19%
10/4/2010	765,371	1.4	28.7	19%
2/20/2011	732,343	1.3	29.5	18%
12/6/2010	695,012	1.3	30.4	18%
3/6/2006	580,888	1.1	29.5	18%
4/11/2003	717,854	1.0	23.3	17%
4/28/2010	620,033	1.0	26.8	17%
12/26/2010	619,485	1.0	26.3	16%
4/10/2012	519,300	1.0	31.2	16%
11/12/2003	583,254	1.0	27.2	16%
11/6/2004	583,254	1.0	26.6	15%
5/21/2006	608,704	1.0	25.2	15%
12/26/2006	490,783	0.9	28.6	14%
1/2/2005	514,226	0.8	26.2	14%
2/23/2008	504,525	0.8	26.5	14%
2/18/2004	446,451	0.8	27.6	13%
1/14/2006	395,045	0.8	30.8	13%
9/20/2007	405,281	0.7	28.0	12%
3/18/2005	361,558	0.6	28.4	12%
3/14/2003	361,558	0.6	26.4	12%

Date	Inflow (cubic feet)	Copper		
		Cu Load (lb)	Cu Conc (ug/L)	Cu Load Percentile
4/13/2003	312,847	0.6	29.8	11%
10/12/2007	359,673	0.6	24.8	11%
12/13/2009	258,991	0.5	31.4	11%
12/9/2006	291,949	0.5	27.5	10%
12/21/2002	262,934	0.5	30.1	10%
3/19/2006	267,300	0.5	27.9	9%
1/10/2005	269,313	0.5	27.3	9%
3/2/2006	284,878	0.4	23.1	9%
3/31/2006	204,339	0.4	29.3	8%
3/3/2011	188,136	0.3	26.4	8%
11/25/2008	147,231	0.3	29.8	7%
5/5/2005	151,029	0.2	25.5	7%
12/10/2009	140,400	0.2	25.9	7%
2/19/2010	110,684	0.2	27.5	6%
1/7/2008	86,988	0.1	26.5	6%
9/19/2005	94,694	0.1	24.1	5%
2/15/2011	74,925	0.1	28.4	5%
1/23/2010	70,452	0.1	28.4	5%
4/27/2010	66,744	0.1	26.8	4%
12/23/2010	61,612	0.1	27.4	4%
10/13/2009	56,889	0.1	26.7	4%
11/24/2010	50,735	0.1	28.3	3%
2/14/2009	16,365	0.0	29.5	3%
4/1/2012	16,953	0.0	27.4	2%
12/14/2008	14,987	0.0	27.9	2%
10/5/2010	3,669	0.0	30.5	2%
2/18/2006	1,934	0.0	26.0	1%
12/6/2004	779	0.0	27.6	1%
12/18/2008	429	0.0	25.5	0%
3/7/2010	248	0.0	29.0	0%

LEAD – 90TH PERCENTILE DAILY LOAD - DOMINGUEZ CHANNEL ANALYSIS REGION

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
3/20/2011	29,060,258	24.9	13.7	100%
12/27/2004	31,312,007	22.4	11.4	100%
1/1/2005	22,887,234	20.7	14.5	99%
12/19/2010	22,415,152	17.2	12.3	99%
1/7/2005	23,704,308	16.6	11.2	98%
2/12/2003	26,298,172	16.3	9.9	98%
12/28/2004	22,781,614	16.3	11.4	98%
3/15/2003	23,632,270	16.2	11.0	97%
10/25/2004	12,937,482	15.8	19.5	97%
1/20/2010	15,798,848	14.1	14.3	96%
2/24/2008	14,917,722	13.7	14.7	96%
1/27/2008	17,368,762	13.3	12.3	96%
2/20/2004	16,833,095	13.0	12.4	95%
12/15/2008	15,951,698	12.5	12.5	95%
1/25/2008	18,665,740	12.1	10.4	95%
2/6/2010	15,729,036	11.4	11.6	94%
1/6/2008	13,704,266	11.3	13.2	94%
12/20/2010	14,546,645	11.2	12.3	93%
12/18/2010	14,369,712	11.0	12.3	93%
10/19/2004	14,063,955	10.4	11.8	93%
1/23/2008	10,620,633	10.0	15.1	92%
12/7/2009	14,264,586	9.9	11.1	92%
2/17/2009	13,278,389	9.8	11.9	91%
2/24/2004	13,785,525	9.6	11.2	91%
11/30/2007	13,129,863	9.5	11.6	91%
12/22/2010	12,190,852	9.4	12.3	90%
2/5/2010	**11,979,000**	**8.7**	**11.6**	**90%**
12/31/2005	13,537,145	8.7	10.2	89%
2/26/2006	12,677,625	8.7	10.9	89%
5/1/2003	13,244,040	8.6	10.5	89%
2/16/2009	9,744,219	8.4	13.8	88%
3/25/2012	10,919,891	8.3	12.1	88%
2/11/2005	11,861,441	8.2	11.1	88%
3/28/2006	12,817,317	8.1	10.2	87%
1/18/2010	9,036,992	8.0	14.2	87%
11/6/2002	9,155,190	7.9	13.8	86%
2/20/2005	12,442,688	7.9	10.1	86%
1/19/2010	8,943,577	7.7	13.8	86%

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
2/3/2008	10,016,045	7.6	12.2	85%
2/19/2005	10,206,811	7.6	11.9	85%
2/11/2003	12,156,135	7.5	9.9	84%
1/4/2008	8,313,372	7.1	13.7	84%
12/12/2009	8,404,272	7.0	13.4	84%
12/15/2002	9,230,222	7.0	12.1	83%
2/18/2005	9,756,024	6.9	11.4	83%
1/21/2012	7,512,682	6.8	14.6	82%
2/9/2005	9,110,565	6.8	11.9	82%
1/28/2008	8,364,151	6.7	12.9	82%
12/29/2010	7,517,626	6.7	14.2	81%
10/14/2009	9,486,034	6.5	11.0	81%
2/29/2004	6,634,305	6.4	15.5	81%
12/21/2010	8,348,384	6.4	12.3	80%
2/27/2010	7,098,103	5.9	13.4	80%
12/12/2011	7,726,019	5.9	12.2	79%
10/6/2010	7,242,584	5.5	12.1	79%
4/4/2006	6,967,943	5.4	12.5	79%
1/2/2004	6,720,802	5.4	12.9	78%
1/8/2005	7,479,474	5.4	11.5	78%
11/8/2002	6,698,336	5.2	12.5	77%
10/15/2004	7,252,323	5.2	11.6	77%
2/23/2003	7,980,165	5.2	10.5	77%
12/18/2007	5,653,928	5.2	14.7	76%
2/17/2005	7,218,537	5.1	11.4	76%
2/21/2005	6,282,137	4.9	12.4	75%
3/17/2012	6,313,983	4.7	12.0	75%
3/23/2011	5,715,041	4.7	13.2	75%
11/26/2008	7,467,163	4.6	9.9	74%
2/22/2005	5,938,403	4.6	12.4	74%
10/31/2003	6,043,495	4.5	12.1	74%
11/20/2011	5,155,535	4.5	14.1	73%
4/12/2010	6,482,727	4.5	11.0	73%
11/4/2008	5,574,369	4.4	12.6	72%
3/21/2005	6,138,728	4.3	11.3	72%
4/13/2012	6,585,692	4.2	10.3	72%
1/22/2010	4,414,439	4.2	15.2	71%
1/21/2010	4,344,942	4.1	15.2	71%

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
11/9/2005	5,533,232	4.1	11.8	70%
12/25/2003	5,245,611	4.1	12.4	70%
2/9/2003	5,690,745	3.9	11.0	70%
10/13/2007	5,927,135	3.9	10.5	69%
10/16/2005	3,685,195	3.9	16.9	69%
12/19/2007	4,220,534	3.9	14.7	68%
3/21/2011	4,486,104	3.9	13.7	68%
2/22/2008	4,216,191	3.8	14.6	68%
4/26/2005	5,030,015	3.7	11.9	67%
12/18/2002	4,210,652	3.7	14.1	67%
12/5/2004	4,949,169	3.7	11.8	67%
10/5/2011	5,321,098	3.6	10.8	66%
10/26/2004	2,854,466	3.5	19.5	66%
11/4/2011	5,106,680	3.5	10.9	65%
1/2/2011	5,753,882	3.5	9.6	65%
12/4/2004	3,884,430	3.4	14.2	65%
11/28/2002	3,341,100	3.4	16.4	64%
4/14/2003	4,548,122	3.4	12.1	64%
10/18/2004	4,587,728	3.4	11.8	63%
4/11/2012	4,446,967	3.4	12.2	63%
2/25/2011	4,769,946	3.3	11.2	63%
2/6/2009	4,867,387	3.3	10.9	62%
12/31/2004	5,506,833	3.3	9.6	62%
11/6/2011	3,030,571	3.3	17.3	61%
12/17/2010	4,248,719	3.3	12.3	61%
1/22/2008	5,130,327	3.2	9.9	61%
2/1/2004	4,141,935	3.1	12.0	60%
4/20/2007	3,776,909	3.1	13.1	60%
12/25/2010	5,010,113	3.1	9.9	60%
1/5/2008	3,533,926	3.0	13.7	59%
1/23/2012	4,308,546	2.9	10.7	59%
1/30/2007	3,318,231	2.8	13.7	58%
10/30/2010	3,807,601	2.8	11.9	58%
2/11/2007	3,515,013	2.8	12.9	58%
2/16/2005	3,923,685	2.8	11.4	57%
1/24/2008	4,227,769	2.7	10.4	57%
12/17/2008	3,607,544	2.7	12.0	56%
2/5/2009	3,865,855	2.6	10.9	56%

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
4/14/2006	2,869,020	2.6	14.6	56%
1/17/2010	2,930,670	2.6	14.2	55%
1/28/2005	3,733,545	2.5	10.9	55%
10/19/2010	3,474,342	2.5	11.6	54%
1/9/2005	3,150,007	2.5	12.7	54%
12/11/2009	2,795,477	2.3	13.4	54%
11/11/2003	2,572,500	2.3	14.4	53%
1/13/2010	2,066,943	2.3	17.6	53%
3/5/2006	2,962,988	2.2	12.2	53%
12/16/2002	2,948,589	2.2	12.1	52%
2/18/2011	2,862,405	2.2	12.3	52%
2/25/2004	3,135,821	2.2	11.2	51%
2/27/2006	3,135,758	2.1	10.9	51%
9/21/2007	2,945,352	2.1	11.6	51%
1/3/2005	2,497,319	2.1	13.5	50%
2/9/2009	2,870,133	2.1	11.6	50%
2/20/2008	2,828,230	2.0	11.6	49%
11/5/2004	2,572,500	2.0	12.5	49%
2/26/2011	2,837,279	2.0	11.2	49%
11/12/2011	2,174,554	2.0	14.6	48%
12/24/2003	2,251,256	1.9	13.8	48%
2/15/2012	2,082,349	1.9	14.9	47%
1/24/2009	2,374,682	1.9	13.0	47%
4/25/2012	2,308,536	1.9	13.2	47%
12/6/2007	2,755,304	1.9	10.8	46%
5/2/2003	2,832,986	1.8	10.5	46%
5/20/2006	2,839,899	1.8	10.3	46%
4/12/2003	2,841,017	1.8	10.1	45%
12/5/2010	2,400,536	1.8	11.8	45%
2/13/2009	1,876,970	1.8	15.0	44%
11/7/2002	1,992,933	1.7	13.8	44%
2/19/2011	2,294,198	1.7	11.8	44%
4/26/2012	1,897,335	1.6	13.2	43%
3/1/2004	1,589,905	1.5	15.5	43%
1/3/2011	1,769,701	1.5	13.8	42%
1/23/2009	2,053,799	1.5	11.9	42%
1/26/2008	2,182,482	1.5	11.0	42%
2/10/2005	1,967,186	1.5	11.9	41%

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
12/25/2006	2,020,322	1.5	11.5	41%
5/18/2011	2,306,463	1.4	9.9	40%
3/26/2006	1,911,518	1.4	11.6	40%
3/13/2003	2,023,658	1.4	10.8	40%
12/3/2004	1,835,372	1.4	11.8	39%
3/25/2011	1,760,492	1.3	12.0	39%
2/9/2010	1,570,402	1.3	13.3	39%
9/22/2007	1,823,679	1.3	11.2	38%
3/24/2011	1,696,950	1.3	12.0	38%
1/26/2010	1,637,395	1.3	12.3	37%
3/26/2012	1,661,845	1.3	12.1	37%
2/22/2007	2,076,926	1.3	9.7	37%
2/24/2003	1,885,761	1.2	10.5	36%
12/20/2002	1,428,401	1.2	13.8	36%
12/23/2003	1,951,005	1.2	10.0	35%
2/20/2010	2,015,114	1.2	9.5	35%
5/22/2006	1,241,330	1.2	15.2	35%
12/27/2006	1,776,634	1.2	10.6	34%
2/17/2004	2,074,455	1.2	8.9	34%
3/17/2005	2,023,658	1.1	8.9	33%
3/1/2006	1,433,024	1.1	12.5	33%
3/30/2006	1,214,504	1.1	14.7	33%
1/13/2006	1,500,212	1.1	11.6	32%
10/16/2004	1,502,745	1.1	11.6	32%
2/17/2006	1,505,022	1.0	11.2	32%
3/27/2006	1,600,858	1.0	10.5	31%
12/5/2007	1,555,742	1.0	10.8	31%
12/22/2008	1,419,467	1.0	11.8	30%
11/29/2002	1,004,502	1.0	16.4	30%
3/31/2012	1,483,027	1.0	11.0	30%
11/8/2010	1,333,938	1.0	12.1	29%
11/3/2003	1,454,949	1.0	10.8	29%
5/17/2011	1,556,834	1.0	9.9	28%
10/20/2010	1,625,021	0.9	9.3	28%
3/2/2011	1,629,468	0.9	9.2	28%
2/10/2003	1,309,194	0.9	11.0	27%
11/23/2010	1,119,060	0.9	12.8	27%
2/21/2008	1,149,453	0.9	12.3	26%

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
12/19/2002	1,003,535	0.9	14.1	26%
3/22/2005	1,255,348	0.9	11.3	26%
12/8/2006	1,284,662	0.9	10.7	25%
4/27/2005	1,149,309	0.9	11.9	25%
2/18/2009	1,143,216	0.8	11.9	25%
3/20/2006	1,046,843	0.8	12.8	24%
2/2/2004	1,090,598	0.8	12.0	24%
4/20/2010	1,001,782	0.8	12.9	23%
3/6/2010	937,382	0.8	13.7	23%
2/19/2007	923,357	0.7	12.9	23%
2/16/2011	876,853	0.7	13.2	22%
2/7/2009	1,006,627	0.7	10.9	22%
11/2/2008	925,436	0.7	11.6	21%
10/24/2010	820,995	0.6	12.4	21%
9/18/2005	999,623	0.6	9.9	21%
4/28/2010	620,033	0.6	15.9	20%
3/18/2012	807,317	0.6	12.0	20%
4/11/2010	878,904	0.6	11.0	19%
5/4/2005	1,047,657	0.6	8.9	19%
10/25/2010	710,814	0.6	12.4	19%
2/20/2011	732,343	0.5	11.8	18%
11/12/2003	583,254	0.5	14.4	18%
12/6/2010	695,012	0.5	11.8	18%
4/11/2003	717,854	0.5	10.8	17%
2/23/2008	504,525	0.5	14.7	17%
11/6/2004	583,254	0.5	12.5	16%
3/6/2006	580,888	0.4	12.2	16%
1/2/2005	514,226	0.4	13.5	16%
10/4/2010	765,371	0.4	9.1	15%
5/21/2006	608,704	0.4	10.4	15%
4/10/2012	519,300	0.4	12.2	14%
12/26/2010	619,485	0.4	9.9	14%
12/26/2006	490,783	0.4	11.5	14%
9/20/2007	405,281	0.3	12.6	13%
1/14/2006	395,045	0.3	11.6	13%
2/18/2004	446,451	0.2	8.9	12%
3/14/2003	361,558	0.2	10.8	12%
10/12/2007	359,673	0.2	10.5	12%

Date	Inflow (cubic feet)	Lead		
		Pb Load (lb)	Pb Conc (ug/L)	Pb Load Percentile
12/21/2002	262,934	0.2	13.8	11%
3/2/2006	284,878	0.2	12.5	11%
12/13/2009	258,991	0.2	13.4	11%
3/19/2006	267,300	0.2	12.8	10%
1/10/2005	269,313	0.2	12.7	10%
3/18/2005	361,558	0.2	8.9	9%
4/13/2003	312,847	0.2	10.1	9%
12/9/2006	291,949	0.2	10.7	9%
3/31/2006	204,339	0.2	14.7	8%
12/10/2009	140,400	0.1	13.4	8%
3/3/2011	188,136	0.1	9.2	7%
11/25/2008	147,231	0.1	9.9	7%
5/5/2005	151,029	0.1	8.9	7%
1/7/2008	86,988	0.1	13.2	6%
1/23/2010	70,452	0.1	15.2	6%
4/27/2010	66,744	0.1	15.9	5%
2/19/2010	110,684	0.1	9.5	5%
2/15/2011	74,925	0.1	13.2	5%
9/19/2005	94,694	0.1	9.9	4%
12/23/2010	61,612	0.0	12.3	4%
11/24/2010	50,735	0.0	12.8	4%
10/13/2009	56,889	0.0	11.0	3%
2/14/2009	16,365	0.0	15.0	3%
12/14/2008	14,987	0.0	12.5	2%
4/1/2012	16,953	0.0	11.0	2%
10/5/2010	3,669	0.0	12.1	2%
2/18/2006	1,934	0.0	11.2	1%
12/6/2004	779	0.0	9.8	1%
12/18/2008	429	0.0	12.0	0%
3/7/2010	248	0.0	13.7	0%

ZINC – 90TH PERCENTILE DAILY LOAD - DOMINGUEZ CHANNEL ANALYSIS REGION

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
12/27/2004	31,312,007	618.6	316.5	100%
3/20/2011	29,060,258	583.6	321.7	100%
2/12/2003	26,298,172	489.6	298.2	99%
1/7/2005	23,704,308	477.5	322.7	99%
12/19/2010	22,415,152	471.6	337.0	98%
12/28/2004	22,781,614	450.1	316.5	98%
3/15/2003	23,632,270	416.3	282.2	98%
1/1/2005	22,887,234	373.7	261.5	97%
1/27/2008	17,368,762	334.6	308.6	97%
2/20/2004	16,833,095	331.2	315.2	96%
1/25/2008	18,665,740	321.0	275.5	96%
12/20/2010	14,546,645	306.0	337.0	96%
12/18/2010	14,369,712	302.3	337.0	95%
12/15/2008	15,951,698	292.3	293.5	95%
2/6/2010	15,729,036	286.8	292.1	95%
12/31/2005	13,537,145	279.1	330.2	94%
12/7/2009	14,264,586	278.9	313.2	94%
1/20/2010	15,798,848	278.6	282.5	93%
10/19/2004	14,063,955	275.4	313.6	93%
12/22/2010	12,190,852	256.5	337.0	93%
5/1/2003	13,244,040	256.2	309.9	92%
2/24/2008	14,917,722	254.5	273.3	92%
2/17/2009	13,278,389	252.3	304.3	91%
1/6/2008	13,704,266	241.8	282.7	91%
2/20/2005	12,442,688	237.8	306.2	91%
2/11/2005	11,861,441	230.4	311.2	90%
2/26/2006	**12,677,625**	**229.7**	**290.2**	**90%**
2/11/2003	12,156,135	226.3	298.2	89%
2/24/2004	13,785,525	225.8	262.4	89%
10/25/2004	12,937,482	224.5	278.0	89%
11/30/2007	13,129,863	218.6	266.6	88%
2/5/2010	11,979,000	218.4	292.1	88%
3/25/2012	10,919,891	216.7	317.9	88%
3/28/2006	12,817,317	204.7	255.9	87%
1/23/2008	10,620,633	199.6	301.0	87%
2/16/2009	9,744,219	197.5	324.7	86%
2/19/2005	10,206,811	197.2	309.5	86%

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
12/15/2002	9,230,222	193.7	336.1	86%
2/3/2008	10,016,045	178.1	284.8	85%
12/21/2010	8,348,384	175.6	337.0	85%
1/18/2010	9,036,992	173.1	306.8	84%
2/9/2005	9,110,565	170.1	299.2	84%
1/19/2010	8,943,577	169.8	304.1	84%
11/6/2002	9,155,190	167.2	292.5	83%
1/4/2008	8,313,372	166.7	321.2	83%
2/23/2003	7,980,165	165.3	331.9	82%
2/18/2005	9,756,024	160.7	263.9	82%
10/14/2009	9,486,034	160.6	271.1	82%
12/12/2009	8,404,272	153.5	292.5	81%
12/12/2011	7,726,019	152.3	315.9	81%
1/28/2008	8,364,151	149.1	285.5	81%
1/8/2005	7,479,474	148.2	317.4	80%
2/27/2010	7,098,103	142.9	322.4	80%
11/26/2008	7,467,163	134.9	289.3	79%
10/15/2004	7,252,323	133.1	293.9	79%
1/2/2004	6,720,802	132.8	316.6	79%
4/13/2012	6,585,692	130.4	317.1	78%
1/21/2012	7,512,682	128.5	273.9	78%
10/6/2010	7,242,584	126.6	279.9	77%
12/29/2010	7,517,626	123.6	263.4	77%
11/9/2005	5,533,232	123.3	357.0	77%
3/17/2012	6,313,983	121.5	308.3	76%
10/13/2007	5,927,135	120.9	326.7	76%
2/29/2004	6,634,305	120.7	291.4	75%
4/12/2010	6,482,727	120.3	297.2	75%
2/17/2005	7,218,537	118.9	263.8	75%
3/21/2005	6,138,728	116.9	305.1	74%
11/8/2002	6,698,336	115.4	276.0	74%
11/4/2008	5,574,369	113.8	327.0	74%
12/18/2007	5,653,928	112.3	318.2	73%
4/4/2006	6,967,943	111.8	257.0	73%
12/31/2004	5,506,833	109.8	319.3	72%
2/21/2005	6,282,137	107.6	274.4	72%
1/2/2011	5,753,882	105.8	294.5	72%
3/23/2011	5,715,041	102.6	287.7	71%

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
2/22/2005	5,938,403	101.7	274.4	71%
10/5/2011	5,321,098	99.9	300.7	70%
2/9/2003	5,690,745	99.2	279.2	70%
10/31/2003	6,043,495	99.0	262.4	70%
12/5/2004	4,949,169	96.7	313.1	69%
12/25/2003	5,245,611	95.7	292.3	69%
2/6/2009	4,867,387	92.2	303.6	68%
1/22/2008	5,130,327	92.2	287.8	68%
11/20/2011	5,155,535	90.2	280.4	68%
3/21/2011	4,486,104	90.1	321.7	67%
10/18/2004	4,587,728	89.8	313.6	67%
11/4/2011	5,106,680	89.6	281.2	67%
12/17/2010	4,248,719	89.4	337.0	66%
4/11/2012	4,446,967	88.4	318.4	66%
1/22/2010	4,414,439	87.8	318.4	65%
2/25/2011	4,769,946	87.1	292.5	65%
12/25/2010	5,010,113	86.8	277.5	65%
2/22/2008	4,216,191	86.7	329.6	64%
4/26/2005	5,030,015	86.4	275.2	64%
1/21/2010	4,344,942	86.4	318.4	63%
4/14/2003	4,548,122	84.8	298.7	63%
12/19/2007	4,220,534	83.8	318.2	63%
1/23/2012	4,308,546	82.3	305.9	62%
10/16/2005	3,685,195	80.5	349.9	62%
12/18/2002	4,210,652	75.8	288.3	61%
10/19/2010	3,474,342	74.6	343.7	61%
2/5/2009	3,865,855	73.3	303.6	61%
1/24/2008	4,227,769	72.7	275.5	60%
12/4/2004	3,884,430	72.1	297.1	60%
1/5/2008	3,533,926	70.9	321.2	60%
1/28/2005	3,733,545	69.9	300.1	59%
2/11/2007	3,515,013	69.9	318.7	59%
4/20/2007	3,776,909	68.4	290.1	58%
12/17/2008	3,607,544	66.2	294.0	58%
1/30/2007	3,318,231	66.1	318.9	58%
10/30/2010	3,807,601	65.2	274.2	57%
2/16/2005	3,923,685	64.6	263.8	57%
11/28/2002	3,341,100	63.5	304.6	56%

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
2/1/2004	4,141,935	62.9	243.2	56%
12/16/2002	2,948,589	61.9	336.1	56%
9/21/2007	2,945,352	60.1	327.1	55%
11/6/2011	3,030,571	59.4	313.8	55%
1/9/2005	3,150,007	58.0	295.1	54%
2/27/2006	3,135,758	56.8	290.2	54%
1/17/2010	2,930,670	56.1	306.8	54%
5/2/2003	2,832,986	54.8	309.9	53%
5/20/2006	2,839,899	53.7	303.1	53%
2/9/2009	2,870,133	52.9	295.4	53%
12/6/2007	2,755,304	52.3	303.8	52%
2/26/2011	2,837,279	51.8	292.5	52%
3/5/2006	2,962,988	51.7	279.5	51%
2/25/2004	3,135,821	51.4	262.4	51%
2/18/2011	2,862,405	51.3	287.0	51%
11/5/2004	2,572,500	51.0	317.9	50%
4/14/2006	2,869,020	50.4	281.6	50%
2/20/2008	2,828,230	50.3	285.1	49%
4/12/2003	2,841,017	49.9	281.1	49%
12/11/2009	2,795,477	49.8	285.1	49%
10/26/2004	2,854,466	49.5	278.0	48%
1/3/2005	2,497,319	48.8	313.1	48%
1/26/2008	2,182,482	48.8	357.9	47%
12/5/2010	2,400,536	48.3	322.4	47%
2/19/2011	2,294,198	47.6	332.1	47%
11/11/2003	2,572,500	45.6	283.7	46%
4/25/2012	2,308,536	44.3	307.4	46%
1/13/2010	2,066,943	44.0	341.4	46%
5/18/2011	2,306,463	43.9	305.1	45%
1/23/2009	2,053,799	43.5	339.6	45%
12/24/2003	2,251,256	42.0	299.0	44%
1/24/2009	2,374,682	41.3	278.7	44%
11/12/2011	2,174,554	41.3	304.2	44%
3/26/2006	1,911,518	39.3	329.3	43%
2/24/2003	1,885,761	39.1	331.9	43%
2/20/2010	2,015,114	39.0	310.2	42%
3/17/2005	2,023,658	38.6	305.6	42%
9/22/2007	1,823,679	37.5	329.5	42%

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
12/25/2006	2,020,322	36.9	292.5	41%
3/13/2003	2,023,658	36.9	292.0	41%
2/10/2005	1,967,186	36.7	299.2	40%
4/26/2012	1,897,335	36.4	307.4	40%
11/7/2002	1,992,933	36.4	292.5	40%
2/22/2007	2,076,926	36.2	279.3	39%
2/17/2004	2,074,455	36.0	277.7	39%
12/3/2004	1,835,372	35.5	309.8	39%
2/15/2012	2,082,349	34.9	268.5	38%
3/25/2011	1,760,492	34.8	316.5	38%
12/23/2003	1,951,005	34.6	284.4	37%
12/27/2006	1,776,634	33.7	304.3	37%
3/24/2011	1,696,950	33.5	316.5	37%
2/13/2009	1,876,970	33.0	281.6	36%
3/26/2012	1,661,845	33.0	317.9	36%
1/3/2011	1,769,701	33.0	298.3	35%
1/26/2010	1,637,395	32.6	318.5	35%
3/2/2011	1,629,468	32.3	317.5	35%
3/1/2006	1,433,024	30.7	342.7	34%
5/17/2011	1,556,834	29.7	305.1	34%
10/20/2010	1,625,021	29.6	291.6	33%
12/5/2007	1,555,742	29.5	303.8	33%
3/1/2004	1,589,905	28.9	291.4	33%
11/3/2003	1,454,949	28.9	317.8	32%
2/17/2006	1,505,022	28.2	299.6	32%
10/16/2004	1,502,745	27.6	293.9	32%
3/27/2006	1,600,858	27.2	272.4	31%
2/9/2010	1,570,402	26.8	273.4	31%
1/13/2006	1,500,212	26.4	281.6	30%
3/31/2012	1,483,027	25.1	270.8	30%
3/30/2006	1,214,504	24.5	323.1	30%
12/20/2002	1,428,401	24.2	270.9	29%
3/22/2005	1,255,348	23.9	305.1	29%
2/21/2008	1,149,453	23.7	330.9	28%
12/22/2008	1,419,467	23.6	266.6	28%
12/8/2006	1,284,662	23.6	293.9	28%
11/8/2010	1,333,938	23.0	276.2	27%
2/10/2003	1,309,194	22.8	279.2	27%

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
9/18/2005	999,623	22.1	353.4	26%
5/4/2005	1,047,657	22.0	337.1	26%
2/18/2009	1,143,216	21.7	304.3	26%
5/22/2006	1,241,330	21.6	278.6	25%
4/20/2010	1,001,782	21.0	335.3	25%
3/6/2010	937,382	20.5	350.3	25%
4/27/2005	1,149,309	19.7	275.2	24%
11/29/2002	1,004,502	19.1	304.6	24%
2/7/2009	1,006,627	19.1	303.6	23%
11/23/2010	1,119,060	18.9	270.4	23%
3/20/2006	1,046,843	18.7	286.8	23%
12/19/2002	1,003,535	18.1	288.3	22%
2/16/2011	876,853	18.0	329.1	22%
2/19/2007	923,357	17.1	297.0	21%
2/2/2004	1,090,598	16.6	243.2	21%
11/2/2008	925,436	16.5	284.8	21%
4/11/2010	878,904	16.3	297.2	20%
3/18/2012	807,317	15.5	308.3	20%
2/20/2011	732,343	15.2	333.2	19%
10/4/2010	765,371	14.1	294.5	19%
12/6/2010	695,012	14.0	322.4	19%
10/24/2010	820,995	13.9	271.9	18%
4/11/2003	717,854	13.8	307.8	18%
4/28/2010	620,033	12.3	317.1	18%
10/25/2010	710,814	12.1	271.9	17%
11/6/2004	583,254	11.6	317.9	17%
5/21/2006	608,704	11.5	302.7	16%
12/26/2010	619,485	10.7	277.5	16%
11/12/2003	583,254	10.3	283.7	16%
4/10/2012	519,300	10.3	318.4	15%
3/6/2006	580,888	10.1	279.5	15%
1/2/2005	514,226	10.1	313.1	14%
12/26/2006	490,783	9.0	292.5	14%
2/23/2008	504,525	8.6	273.3	14%
9/20/2007	405,281	8.1	320.8	13%
2/18/2004	446,451	7.7	277.7	13%
10/12/2007	359,673	7.3	326.7	12%
1/14/2006	395,045	6.9	281.6	12%

Date	Inflow (cubic feet)	Zinc		
		Zn Load (lb)	Zn Conc (ug/L)	Zn Load Percentile
3/18/2005	361,558	6.9	305.6	12%
3/14/2003	361,558	6.6	292.0	11%
3/2/2006	284,878	6.1	342.7	11%
4/13/2003	312,847	5.5	280.5	11%
12/9/2006	291,949	5.4	293.9	10%
1/10/2005	269,313	5.0	295.1	10%
3/19/2006	267,300	4.8	286.8	9%
12/13/2009	258,991	4.7	292.5	9%
12/21/2002	262,934	4.4	270.9	9%
3/31/2006	204,339	4.1	323.1	8%
3/3/2011	188,136	3.7	317.5	8%
5/5/2005	151,029	3.2	337.1	7%
11/25/2008	147,231	2.7	289.3	7%
12/10/2009	140,400	2.5	285.1	7%
2/19/2010	110,684	2.1	310.2	6%
9/19/2005	94,694	2.1	353.4	6%
2/15/2011	74,925	1.5	329.1	5%
1/7/2008	86,988	1.5	282.7	5%
1/23/2010	70,452	1.4	318.4	5%
4/27/2010	66,744	1.3	317.1	4%
12/23/2010	61,612	1.3	337.0	4%
10/13/2009	56,889	1.0	271.1	4%
11/24/2010	50,735	0.9	270.4	3%
2/14/2009	16,365	0.3	281.6	3%
4/1/2012	16,953	0.3	270.8	2%
12/14/2008	14,987	0.3	293.5	2%
10/5/2010	3,669	0.1	279.9	2%
2/18/2006	1,934	0.0	299.6	1%
12/6/2004	779	0.0	326.3	1%
12/18/2008	429	0.0	294.0	0%
3/7/2010	248	0.0	350.3	0%

Appendix R

Ammonia Monitoring Data from Sites S28 and TS19

S28 Ammonia Monitoring Data and Exceedance Analysis									
Field Sample ID	Analyzed Date	Constituent	Reported Ammonia Value	Overall Qualifier	Units	Constituent	Reported pH Value	RWL (mg/L)	Exceed?
ME00000074	11/14/2006	Ammonia	0.24		mg/l	pH	7.77	12.7984	0
ME00000130	12/20/2006	Ammonia	2.07		mg/l	pH	6.96	37.3428	0
ME00000296	2/16/2007	Ammonia	0.40		mg/l	pH	6.96	37.3428	0
ME00000352	3/14/2007	Ammonia	0.13		mg/l	pH	7.82	11.71385	0
ME00000388	3/21/2007	Ammonia	0.28		mg/l	pH	7.55	18.4301	0
ME00000475	4/16/2007	Ammonia	0.23		mg/l	pH	8.11	6.815946	0
ME00000667	5/18/2007	Ammonia	0.94		mg/l	pH	6.84	40.89159	0
ME00001234	10/18/2007	Ammonia	3.35		mg/l	pH	7.17	30.53988	0
ME00001366	10/30/2007	Ammonia	1.79		mg/l	pH	6.55	47.87218	0
ME00001489	12/3/2007	Ammonia	0.11		mg/l	pH	8.37	4.115071	0
ME00001442	12/20/2007	Ammonia	1.37		mg/l	pH	6.82	41.44925	0
ME00001524	12/24/2007	Ammonia	0.51		mg/l	pH	6.73	43.82447	0
ME00001572	1/9/2008	Ammonia	0.38		mg/l	pH	6.60	46.84359	0
ME00001674	4/23/2008	Ammonia	0.70		mg/l	pH	8.24	5.298706	0
ME00001725	11/14/2008	Ammonia	0.44		mg/l	pH	6.85	40.60888	0
ME00001774	12/19/2008	Ammonia	0.79		mg/l	pH	6.82	41.44925	0
ME00001840	1/6/2009	Ammonia	0.30		mg/l	pH	6.70	44.56522	0
ME00001937	1/21/2009	Ammonia	0.11		mg/l	pH	8.28	4.901947	0
ME00002018	2/17/2009	Ammonia	-99.00	ND	mg/l	pH	7.08	33.51687	0
ME00002059	2/24/2009	Ammonia	0.27		mg/l	pH	6.79	42.26586	0
ME00002124	4/3/2009	Ammonia	0.17		mg/l	pH	8.67	2.328529	0
ME00002203	5/20/2009	Ammonia	0.23		mg/l	pH	8.72	2.126167	0
ME00002333	7/21/2009	Ammonia	-99.00	ND	mg/l	pH	8.49	3.264834	0
ME00002351	7/23/2009	Ammonia	-99.00	ND	mg/l	pH	7.90	10.13104	0
ME00002469	9/21/2009	Ammonia	0.29		mg/L	pH	8.59	2.70106	0
ME00002505	10/30/2009	Ammonia	1.31		mg/L	pH	7.70	14.44076	0
ME00002548	12/9/2009	Ammonia	0.22		mg/L	pH	8.43	3.663922	0

ME00002565	1/8/2010	Ammonia	1.54		mg/L	pH	6.35	51.28039	0
ME00002626	1/13/2010	Ammonia	0.40		mg/L	pH	6.46	49.54166	0
ME00002681	2/3/2010	Ammonia	0.68		mg/L	pH	6.96	37.3428	0
ME00002912	4/1/2010	Ammonia	0.11		mg/L	pH	8.83	1.751264	0
ME00003053	10/5/2010	Ammonia	0.17		mg/L	pH	8.89	1.581813	0
ME00003101	10/15/2010	Ammonia	0.40		mg/L	pH	7.15	31.20576	0
ME00003186	12/10/2010	Ammonia	0.48		mg/L	pH	8.12	6.685928	0
ME00003247	12/28/2010	Ammonia	0.41		mg/L	pH	6.86	40.32366	0
ME00003314	2/14/2011	Ammonia	0.45		mg/L	pH	8.41	3.808246	0
ME00003370	2/25/2011	Ammonia	1.39		mg/L	pH	6.69	44.80632	0
ME00003452	4/11/2011	Ammonia	-99.00	ND	mg/L	pH	8.17	6.07013	0
ME00003651	9/28/2011	Ammonia	0.11		mg/L	pH	9.62	0.632657	0
ME00003666	10/24/2011	Ammonia	1.78		mg/L	pH	7.15	31.20576	0
ME00003783	12/13/2011	Ammonia	0.40		mg/L	pH	7.85	11.09848	0
ME00003864	1/29/2012	Ammonia	-99.00	ND	mg/L	pH	9.17	1.031403	0
ME00003895	2/4/2012	Ammonia	0.67		mg/L	pH	7.45	21.40648	0
ME00003978	3/21/2012	Ammonia	0.44		mg/L	pH	8.25	5.19663	0
ME00004115	10/22/2012	Ammonia	0.75		mg/L	pH	6.19	53.28074	0
ME00004132	10/22/2012	Ammonia	2.01		mg/L	pH	6.70	44.56522	0
ME00004206	11/28/2012	Ammonia	1.71		mg/L	pH	7.85	11.09848	0
ME00004154	12/28/2012	Ammonia	0.48		mg/L	pH	6.95	37.65062	0
ME00004248	1/10/2013	Ammonia	0.47		mg/L	pH	7.76	13.02418	0
ME00004289	1/16/2013	Ammonia	0.33		mg/L	pH	7.64	15.96191	0
ME00004305	1/22/2013	Ammonia	-99.00	ND	mg/L	pH	7.12	32.20081	0
ME00004364	1/30/2013	Ammonia	0.51		mg/L	pH	6.44	49.88178	0
ME00004389	2/8/2013	Ammonia	0.64		mg/L	pH	6.52	48.45435	0
ME00004480	4/18/2013	Ammonia	0.91		mg/L	pH	6.87	40.03594	0
ME00004507	7/11/2013	Ammonia	0.22		mg/L	pH	7.85	11.09848	0

TS19 Ammonia Monitoring Data and Exceedance Analysis									
Field Sample ID	Analyzed Date	Constituent	Reported Ammonia Value	Overall Qualifier	Units	Constituent	Reported pH Value	RWL (mg/L)	Exceed?
TRIB001745	11/14/2008	Ammonia	2.03		mg/l	pH	6.52	48.45435	0
TRIB001762	12/19/2008	Ammonia	2.76		mg/l	pH	6.35	51.28039	0
TRIB001854	1/6/2009	Ammonia	0.76		mg/l	pH	6.97	37.03305	0
TRIB001940	1/18/2009	Ammonia	-99.00	ND	mg/l	pH	8.25	5.19663	0
TRIB002003	2/17/2009	Ammonia	-99.00	ND	mg/l	pH	6.79	42.26586	0
TRIB002041	2/26/2009	Ammonia	0.37		mg/l	pH	6.95	37.65062	0
TRIB002139	4/3/2009	Ammonia	0.27		mg/l	pH	8.17	6.07013	0
TRIB002221	5/20/2009	Ammonia	0.13		mg/l	pH	8.73	2.088255	0
TRIB002317	7/20/2009	Ammonia	5.17		mg/l	pH	8.17	6.07013	0
TRIB002365	8/20/2009	Ammonia	-99.00	ND	mg/l	pH	5.93	55.47025	0
TRIB002474	9/21/2009	Ammonia	0.63		mg/L	pH	7.96	9.063953	0
TRIB002513	10/30/2009	Ammonia	2.63		mg/L	pH	7.16	30.87302	0
TRIB002551	12/9/2009	Ammonia	-99.00	ND	mg/L	pH	8.84	1.721445	0
TRIB002587	1/8/2010	Ammonia	0.53		mg/L	pH	6.78	42.53262	0
TRIB002642	1/13/2010	Ammonia	0.30		mg/L	pH	7.20	29.53902	0
TRIB002697	2/3/2010	Ammonia	0.56		mg/L	pH	7.06	34.16883	0
TRIB002787	2/16/2010	Ammonia	0.42		mg/L	pH	6.82	41.44925	0
TRIB002914	4/1/2010	Ammonia	0.11		mg/L	pH	8.91	1.530134	0
TRIB003073	10/5/2010	Ammonia	0.53		mg/L	pH	8.59	2.70106	0
TRIB003109	10/15/2010	Ammonia	1.21		mg/L	pH	6.61	46.62905	0
TRIB003205	12/10/2010	Ammonia	0.50		mg/L	pH	8.01	8.25016	0
TRIB003263	12/28/2010	Ammonia	0.24		mg/L	pH	6.41	50.37162	0
TRIB003322	2/14/2011	Ammonia	0.24		mg/L	pH	8.59	2.70106	0
TRIB003372	2/25/2011	Ammonia	1.56		mg/L	pH	6.28	52.22741	0
TRIB003379	2/25/2011	Ammonia	0.38		mg/L	pH	6.31	51.83592	0
TRIB003442	4/11/2011	Ammonia	-99.00	ND	mg/L	pH	6.39	50.68488	0