



Council Agenda Report

To: Mayor Grisanti and the Honorable Members of the City Council

Prepared by: Mark Johnson, Environmental Programs Coordinator

Reviewed by: Rob DuBoux, Public Works Director
Yolanda Bundy, Environmental Sustainability Director

Approved by: Steve McClary, Interim City Manager

Date prepared: June 9, 2021 Meeting date: June 28, 2021

Subject: Approval and Submittal of the Enhanced Watershed Management Program Update for the North Santa Monica Bay Coastal Watersheds to the Los Angeles Regional Water Quality Control Board

RECOMMENDED ACTION: Adopt Resolution No. 21-37 approving and authorizing the submittal of the North Santa Monica Bay Coastal Watersheds (NSMBCW) Enhanced Watershed Management Program (EWMP) Update to the Los Angeles Regional Water Quality Control Board.

FISCAL IMPACT: There is no fiscal impact associated with the recommended action at this time. However, as the Enhanced Watershed Management Program is implemented, actual compliance improvement projects will be identified and cost estimates developed. The total cost for the NSMBCW Group for EWMP Update implementation is an estimated \$22.9 million of which the City's share will be an estimated \$8.1 million. The City anticipates receiving approximately \$400,000 annually from the Safe Clean Water Municipal Program (Measure W funds). The City will need to secure additional funding through the Safe Clean Water LA Regional Program and other water quality grants listed in Table 37 of the Update. Actual costs and the additional funding needed for the projects will be unknown until planning and design stages are underway.

WORK PLAN: This item was included as Item 5d in the Adopted Workplan for Fiscal Year 2020-2021.

DISCUSSION: On November 8, 2012, the Los Angeles Regional Water Quality Control Board (Regional Board) issued a National Pollutant Discharge Elimination System

Permit [Order No. R4-2012-0175] (Permit), which became effective on December 28, 2012. On June 16, 2015, Order No. R4-2012-0175 was amended by the State Water Resources Control Board. The Permit establishes conditions, requirements, and programs to protect beneficial uses in the receiving waters in the Los Angeles region. Permit requirements aim to ensure that the Municipal Separate Storm Sewer Systems (MS4) are not causing adverse impacts associated with pollutants in urban runoff.

After the 2012 Permit adoption, the City partnered with the Los Angeles County Flood Control District (District) and the County of Los Angeles (County) to develop an EWMP for the NSMBCW within Malibu city limits and County unincorporated areas from Arroyo Sequit through Topanga Canyon, excluding the areas of Malibu Creek Watershed that are outside city limits. The EWMP describes what programs and activities will be taken to protect water quality. This document summarizes water quality priorities specific to the NSMBCW area; outlines the program plan, including specific strategies, control measures and Best Management Practices (BMPs) necessary to achieve water quality targets; and describes the quantitative analysis performed to obtain compliance with Permit requirements.

On June 22, 2015, Council approved the submittal of the EWMP to the Regional Board and adopted the District's Environmental Impact Report and the corresponding Findings, Mitigation Monitoring and Reporting Program, and Statement of Overriding Considerations. Due to the devastating Woolsey Fire and COVID-19 pandemic, proposed projects were delayed while rebuild projects were given high priority status. Consequently, the Permittees must submit an EWMP Update to the Regional Board by June 30, 2021 for approval. This Update is required by both the MS4 Permit Order No. R4-2012-0175 and the State Water Resources Control Board Final Order WQ 2020-038.

The EWMP Update has a revised project schedule with some of the project areas deemed infeasible being replaced with more practical areas. These new project areas were determined based on a recent water quality priority analysis using the monitoring data collected through June 2020. All water quality projects in the EWMP document will need time for planning, design, and construction phases. This Update includes Time Schedule Orders (TSOs) which Permittees must request from the Regional Board specifying a timeline and associated BMPs for compliance.

The Regional Board adopted Resolution No. R21-001 extending the Santa Monica Bay Beaches Bacteria Total Maximum Daily Load (SMBB Bacteria TMDL) compliance deadline to July 15, 2024. Regional Board staff characterized this three-year extension as a potential 13-year extension since it may allow for two five-year Time Schedule Orders (TSO) to be approved by the Regional Board subsequent to the 2024 deadline. Moreover, this Update will provide an alternative schedule with a final compliance date of July 15, 2034, including the submission of two TSOs.

Additionally, the schedule for SMBB Bacteria TMDL defines the pace of implementation of watershed control measures. The EWMP Update prescribes a schedule that is consistent with those TMDL extension dates. Numerous technical, logistical, and financial factors make it inconceivable to execute all the control measures by the 2024 deadline. The Regional Board has acknowledged that these tasks cannot be achieved with the existing and extended schedules and, during the Public Workshop on December 16, 2020, Regional Board staff stated that the TMDL deadline extensions may not provide enough time to complete all projects. Therefore, the City is proposing a combination of TMDL extensions and possible future TSOs in the Update.

On February 22, 2021, Council authorized an agreement with a consultant to assist with the preparation of the EWMP Update. This Update includes a limiting pollutant analysis that has demonstrated addressing bacteria impairments and other water quality priorities and control measures. This approach was taken because the results of the analysis for managing bacteria with the BMPs included in this document provide a reasonable assurance of managing other pollutants.

The Update identifies five priority areas requiring BMPs to control bacteria in order to meet the water quality goals for the SMBB Bacteria TMDL. A model program was used to evaluate the amount of stormwater required to be retained or treated to meet this TMDL. The model identified the following areas for implementing green street projects:

- Marie Canyon: It is estimated that this area will need BMPs with a retention or treatment capacity of 0.12 acre-feet with a footprint of 0.05 acres. The City has allocated \$400,000 of annual Measure W funds for the Green Street project.
- Trancas Creek: It is estimated that this area will need BMPs with a retention or treatment capacity of 1.13 acre-feet of stormwater with a structural footprint of 0.35 acres. The City will engage with Los Angeles County for potential multi-agency efforts and partnerships.
- Puerco Canyon: It is estimated that this area will need BMPs with a total capacity of 0.22 acre-feet and a structural footprint of 0.09 acres. The City will engage with Caltrans for potential multi-agency efforts and partnerships.
- Topanga Canyon: It is estimated that the County will need BMPs with a total capacity of 0.74 acre-feet and a structural footprint of 0.19 acres.
- Escondido Creek: It is estimated that this area will need BMPs with a total capacity of 0.02 acre-feet and a structural footprint of 0.01 acres. The City will engage with Caltrans for potential multi-agency efforts and partnerships.

Although BMP project types in these areas have not yet been developed, the costs associated with constructing the projects have been outlined based on retention and treatment modeling. BMP costs were calculated depending on the volume of water

required to be retained and treated to meet the SMBB Bacteria TMDL objectives. Further, a feasibility study will be required prior to seeking the additional grant funding needed to implement the BMPs. The City intends to use Measure W grant funding to complete a Feasibility Study, which can then be utilized for obtaining additional grant monies. Table 37 of the EWMP Update includes a list of suitable grant sources.

The EWMP document provides a Near-Term Implementation Schedule (2021-2024) and a Long-Term Implementation Schedule (2024-2034). The Near-Term Implementation Schedule includes the completion of the Marie Canyon Green Street project, Kanan Dume Road Widening project, and the continued operation of existing BMP projects, such as Legacy Park and Paradise Cove. At the end of the Near-Term Implementation Schedule (2024), the City will evaluate progress toward compliance with TMDL and Area of Special Biological Significance (ASBS) requirements.

- By July 15, 2024, the SMBB Bacteria TMDL Final Compliance date, staff will review monitoring data and, if results indicate that additional progress is needed to meet TMDL and ASBS requirements, the City will submit a five-year TSO with projects to complete by July 15, 2029.
- Prior to the July 2029 deadline, staff will reassess monitoring data and, if additional progress is needed to meet the objectives, the City will submit another five-year TSO with projects to complete by July 15, 2034.

The Public Works and Environmental Sustainability Departments are recommending that the attached amendments be made to the NSMBCW EWMP and are advising that the City of Malibu submit the EWMP Update to the Regional Board by June 30, 2021.

Following submittal, the EWMP Update will also be posted on the Regional Board EWMP website, with a link posted on the City website at www.malibucity.org/EWMP. The Regional Board will either approve the document or provide comments. If the Regional Board has comments, the Council will be asked to approve any substantive amendments to the EWMP Update once it is in a form acceptable to the Regional Board staff.

ALTERNATIVES: No alternatives are recommended. State Water Resources Control Board Final Order WQ 2020-038 and the MS4 Permit Order No. R4-2012-0175 require the City of Malibu to authorize and submit an EWMP Update and any modifications thereto by June 30, 2021.

ATTACHMENTS:

1. Resolution No. 21-37
2. North Santa Monica Bay Coastal Watersheds Enhanced Watershed Management Program Update

RESOLUTION NO. 21-37

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MALIBU APPROVING AND AUTHORIZING SUBMITTAL OF THE NORTH SANTA MONICA BAY COASTAL WATERSHEDS ENHANCED WATERSHED MANAGEMENT PROGRAM UPDATE TO THE LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

The City Council of the City of Malibu does hereby find, order and resolve as follows:

SECTION 1. Recitals.

A. On November 8, 2012, the Los Angeles Regional Water Quality Control Board (LARWQCB) issued a Municipal Separate Storm Sewer System (MS4) Permit (Order No. R4-2012-0175; National Pollutant Discharge Elimination System [NPDES] Permit No. CAS004001) covering discharges within coastal watersheds from the collective storm sewer systems in Los Angeles County (except from the City of Long Beach) (MS4 Permit or Permit). The Permit regulates the discharge of stormwater runoff to waters of the United States from facilities owned and maintained by the Los Angeles County Flood Control District (LACFCD or District), the County of Los Angeles, and 84 incorporated cities within Los Angeles County (collectively referred to as Permittees). The purpose of the MS4 Permit is to achieve and maintain water quality objectives to protect beneficial uses of the receiving waters in the Los Angeles region. Each of the Permittees identifies in the MS4 Permit is responsible for meeting the conditions of the Permit for MS4 discharges occurring within their jurisdiction.

B. On June 16, 2015, Order No. R4-2012-0175 was amended by the State Water Resources Control Board (SWRCB).

C. The MS4 Permit gives Permittees the option of implementing an innovative approach to permit compliance through development of an Enhanced Watershed Management Program (EWMP). An EWMP is a Watershed Management Plan that comprehensively evaluates 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 such retention is not feasible, EWMPs must include other watershed control measures to ensure that the MS4 discharges achieve compliance with water quality standards and do not cause or contribute to exceedances of receiving water limitations.

D. The LACFCD, along with County of Los Angeles, have opted to exercise this EWMP compliance option for the North Santa Monica Bay Coastal Watersheds.

E. The Permittees submitted the EWMP to the LARWQCB for review, comment, and approval on June 28, 2015.

F. The Permittees have been working collaboratively to create an EWMP Update for the North Santa Monica Bay Coastal Watersheds.

G. The MS4 Permit requires that Permittees submit the EWMP Update to the LARWQCB for review, comment, and approval by June 30, 2021.

SECTION 2. The City Council hereby approves the EWMP Update and directs the City Manager, or designee, to submit the EWMP Update to the LARWQB for review and approval, and to submit revisions to the plan as necessary following review by the LARWQCB.

SECTION 3. The City Clerk shall certify to the passage and adoption of this resolution and enter it into the book of original resolutions.

PASSED, APPROVED, and ADOPTED this 28th day of June 2021.

PAUL GRISANTI, Mayor

ATTEST:

KELSEY PETTIJOHN, Acting City Clerk
(seal)

APPROVED AS TO FORM:

THIS DOCUMENT HAS BEEN REVIEWED
BY THE CITY ATTORNEY'S OFFICE
JOHN COTTI, Interim City Attorney

JUNE 8, 2021

DRAFT

Enhanced Watershed Management Program (EWMP) for North Santa Monica Bay Coastal Watersheds

SUBMITTED TO





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Executive Summary

Following adoption of the 2012 Los Angeles Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit¹ (Permit), the City of Malibu (Malibu), County of Los Angeles (County), and Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an Enhanced Watershed Management Program (EWMP) for the North Santa Monica Bay Coastal Watersheds (NSMBCW). The NSMBCW EWMP Group submitted a final EWMP in March 2016, which was approved by the Executive Officer (EO) of the Los Angeles Regional Water Quality Control Board (Regional Board) in April 2016. Additionally, consistent with Section VI.B and Attachment E of the Permit, the NSMBCW EWMP Group submitted a Coordinated Integrated Monitoring Plan (CIMP), which was approved by the Regional Board EO in November 2015. Per Part VI.C.8.b.i of the MS4 Permit, Permittees must submit an updated EWMP that includes an updated Reasonable Assurance Analysis (RAA) by June 30, 2021. In addition to requirements outlined in the MS4 Permit for the development and update of the EWMP, the State Water Resources Control Board (State Board) adopted an Order in November 2020 outlining additional expectations.² The updated EWMP is consistent with the requirements of the MS4 Permit and the 2020 State Board Order.

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

- Summarizes watershed-specific water quality priorities identified by the NSMBCW EWMP Group;
- Outlines the program plan, including specific strategies, control measures and best management practices (BMPs)³ 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 meet Permit requirements.

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 intended to facilitate Permit implementation and water quality target achievement. An EWMP is a WMP which comprehensively evaluates 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 protection and water supply. Where it is not feasible for regional projects to retain all non-stormwater runoff and runoff from the 85th percentile 24-hour storm, the EWMP must demonstrate through a Reasonable Assurance Analysis (RAA) that applicable water quality targets should be achieved. The EWMP allows Permittees to collaboratively or individually develop comprehensive watershed-specific control plans which:

1 Order No. R4-2012-0175-A01 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 Own Motion Review of Approval of Nine Watershed Management Programs (WMPs) and One Enhanced Watershed Management Program (EWMP) Pursuant to Los Angeles Regional Water Quality Control Board (Los Angeles Regional Board) Order R4-2012-0175: SWRCB/OCC FILES A-2386, A-2477, A-2508.

³ 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.



- Prioritize water quality issues;
- Identify and implement focused strategies, control measures, and BMPs;
- Execute an integrated monitoring and assessment program; and
- Allow for modification over time.

This EWMP is applicable to the NSMBCW EWMP area, which consists of the coastal subwatersheds within Santa Monica Bay Beaches (SMBB) Bacteria Total Maximum Daily Load (TMDL) Jurisdictional Groups 1 (J1) and 4 (J4) and the portion of Malibu Creek Watershed (SMBBB TMDL Jurisdictional Group 9 [J9]) within the City of Malibu's jurisdiction, as shown in **Figure ES-1**. While the NSMBCW EWMP excludes areas not under the jurisdiction of the City or County, the NSMBCW is surrounded by land owned by agencies not addressed by the MS4 Permit, including the State of California and Federal lands. The NSMBCW EWMP area encompasses 55,121 acres, including 20 subwatersheds and 28 freshwater coastal streams as defined by the Basin Plan (Regional Board, 2011).

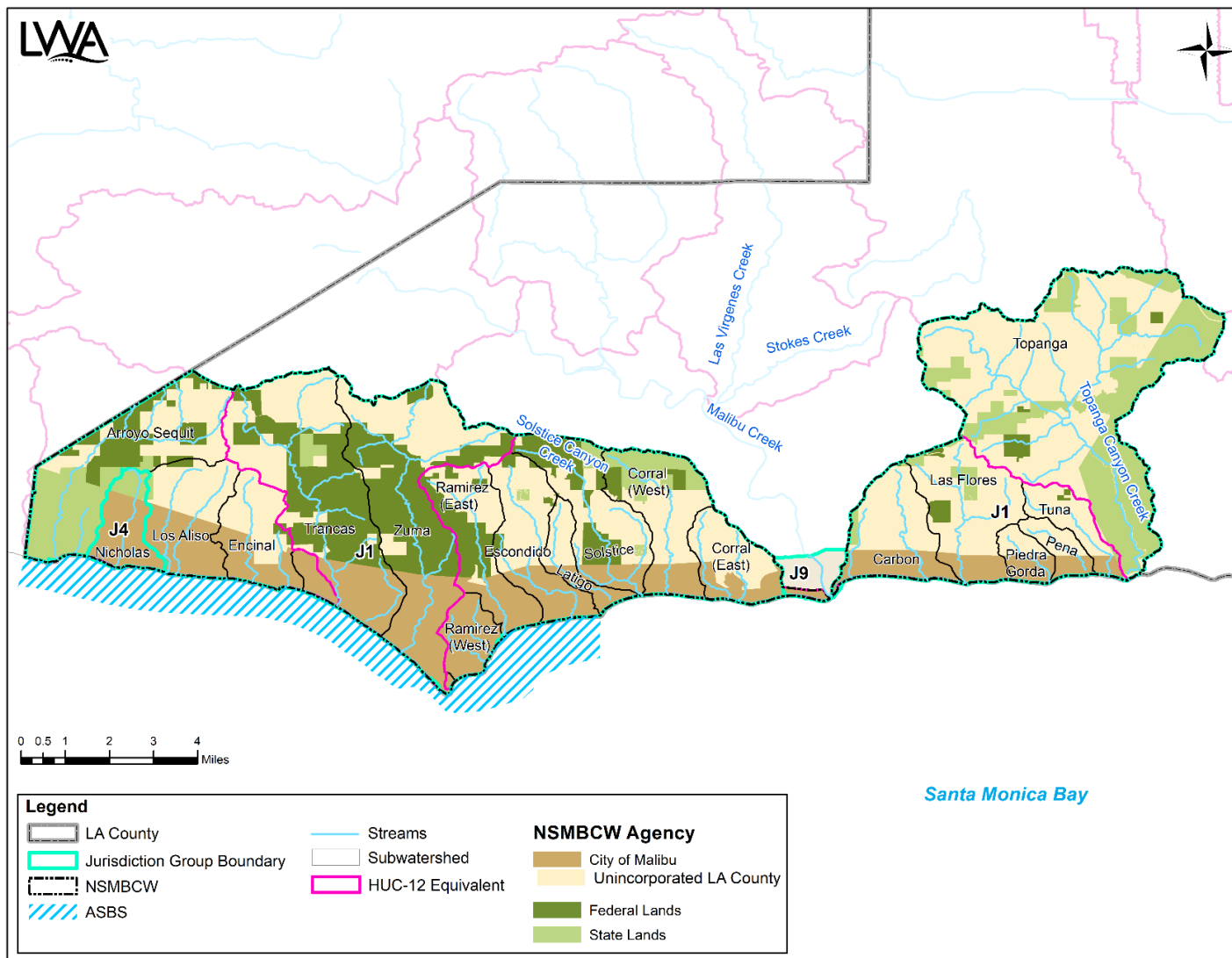


Figure ES-1 NSMBCW EWMP Area



WATER QUALITY PRIORITIES

Receiving waters in the NSMBCW 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 was categorized as a water body-pollutant combination (WBPC) in accordance with Section VI.C.5(a).ii of the Permit. A source assessment was conducted, which found current (e.g., bacteria) and historical (e.g., DDTs) anthropogenic sources as well as natural sources were contributing to water quality issues in the EWMP area. **Table ES-1** presents the WBPCs.

Table ES-1. Water Body Pollutant Prioritization for the NSMBCW EWMP Area

Category	Water Body	Parameters Addressed	Basis
1	Malibu Creek	<i>E. coli</i>	Malibu Creek and Lagoon Bacteria TMDL
	Malibu Lagoon	Enterococcus	
		Fecal coliform	
		Total coliform	
	SMB Beaches	Enterococcus	SMBB Bacteria TMDL
		Fecal coliform	
		Total coliform	
	Malibu Creek and Lagoon	Algae (% coverage)	Nutrients TMDL and Benthic Community Effects and Sediment TMDL
		Ammonia	
		Benthic Community Effects ¹	
		Chlorophyll <i>a</i>	
		Dissolved Oxygen ¹	
		Scum/Foam (unnatural)	
		Sedimentation	
		Total Nitrogen ²	
		Total Phosphorus	
	SMB	Trash and Plastic Pellets	Marine Debris TMDL
		DDTs	DDTs and PCBs TMDL
		PCBs	
2	Malibu Creek	Selenium ³ (dry/wet)	2016 303(d) list
		Sulfates ³ (dry/wet)	
		Toxicity (wet)	
	Malibu Lagoon	pH ¹ (dry)	2016 303(d) list
		Ammonia-N (dry)	
	Trancas Canyon Creek	4,4'-DDE (wet)	Exceedances meet 303(d) listing criteria
		4,4'-DDT (wet)	
		Copper, Dissolved (wet)	
		<i>E. coli</i> (wet)	
		Total PCBs (wet)	
	Topanga Canyon Creek	<i>E. coli</i> (wet)	2016 303(d) list
	Santa Monica Bay	Arsenic ^{3, 4} (tissue)	
		Mercury ^{3, 4} (tissue)	



Category	Water Body	Parameters Addressed	Basis
3	Malibu Creek	Ammonia-N (dry)	Exceedances do not meet 303(d) listing criteria
		Copper, Dissolved (dry/wet)	
	Malibu Lagoon	Bis(2-Ethylhexyl)phthalate ⁴ (dry/wet)	
		Cyanide, Total ⁴ (dry)	
		Selenium ³ (dry)	
	Trancas Canyon Creek	4,4'-DDD (wet)	
		Total Chlordane (wet)	
	Topanga Canyon Creek	<i>E. coli</i> (dry)	
	Santa Monica Bay (Site S-02)	Selenium ³ (wet)	MS4 discharges have the potential to contribute to altered natural water quality within ASBS 24
		Total PAHs (wet)	
	Santa Monica Bay (Site 24-BB-03R)	Ammonia (wet)	
		Selenium ³ (wet)	

1. Exceedances not based on a pollutant.
2. Organic + Inorganic Nitrogen
3. May not be the result of MS4 discharge due to potential for natural sources to be causing exceedances.
4. May not be the result of MS4 discharge due to potential for sampling and/or laboratory contamination.

REASONABLE ASSURANCE ANALYSIS

A key element of the EWMP is the RAA, which is prescribed by the Permit as a process to demonstrate “that the activities and control measures...will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term”. While the Permit prescribes the RAA as a quantitative demonstration that control measures will be effective, the RAA also promotes a modeling process to support the EWMP Group with selection of control measures. The Watershed Management Modeling System 2.0 (WMMS2) is the modeling system used to conduct the RAA for the NSMBCW EWMP. WMMS2 is a suite of three modeling tools to support BMP planning including a watershed model, a model for simulating the performance of control measures in terms of flow, concentration and load reduction, and a tool for running millions of potential scenarios and optimizing/selecting control measures based on cost-effectiveness.

The RAA baseline model was evaluated with performance metrics from the Regional Board’s RAA Guidelines, and it performs quite well for representing existing conditions in NSMBCW. The WMMS2 model performed ‘Good’ or ‘Very Good’ for all evaluated metrics according to the RAA guidelines.

The RWLs and WQBELs were used to formulate the RAA for NSMBCW, where the analysis of targets and reductions in current loads were organized into two components: attainment of the SMBB Bacteria TMDL and attainment of ASBS Special Provisions. The analysis identified three Wet Weather Priority Areas and two ASBS Priority Areas, as shown in **Figure ES-2**. Based upon the RAA, the EWMP is architected around the Priority Areas that have different critical conditions and therefore sizing of control measures to achieve the Permit requirements. For the other drainages in the NSMBCW area, existing BMPs and minimum control measures (MCMs) are expected to meet Permit requirements. A limiting pollutant analysis of non-modeled water quality priorities was conducted and demonstrates that addressing bacteria impairments through the identified BMPs will also address other water quality priorities.

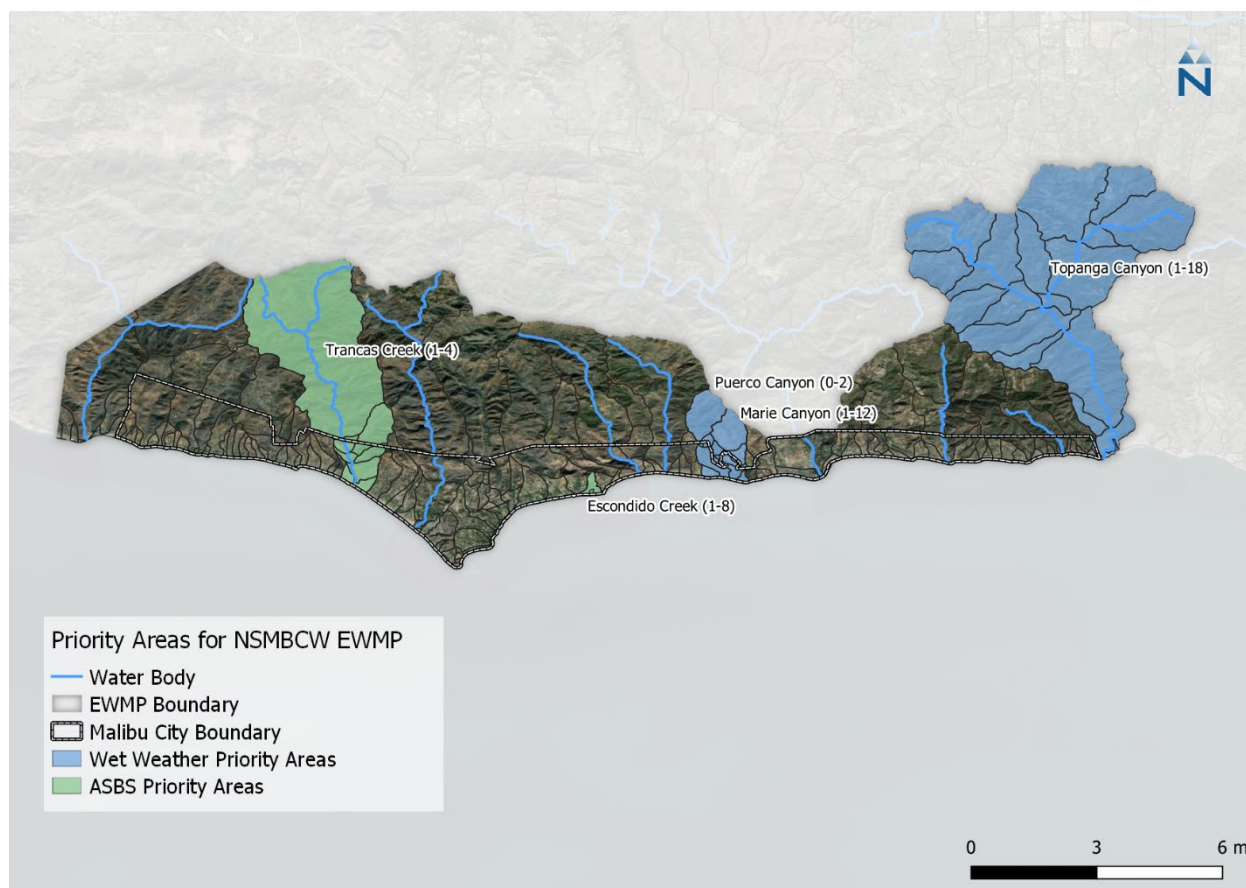


Figure ES-2. Priority Areas for the NSMBCW EWMP

EWMP IMPLEMENTATION PLAN

The EWMP Implementation Plan is the “recipe for implementation” for the NSMBCW Group to address Water Quality Priorities and attain the WQBELs and RWLs provisions of the MS4 Permit. The EWMP Implementation Plan is the output from the RAA and represents a “trajectory” toward long-term implementation of BMPs in the NSMBCW area. The Plan provides important context for understanding the forecasted number and size of BMPs required to meet the MS4 Permit requirements, the estimated economic impacts in terms of capital costs and operation and maintenance (O&M) costs, and the benefits that can be provided to the community. Implementation of the EWMP Implementation Plan provides a BMP-based compliance pathway for each jurisdiction under the MS4 Permit. If the EWMP is not implemented by the agencies in the NSMBCW Group, the default requirements within the MS4 Permit will apply to those agencies.

The EWMP Implementation Plan includes individual recipes for the City and County organized by the Priority Areas. The EWMP Implementation Plan is expressed in terms of [1] the control measures that will be implemented by each jurisdiction based on the RAA outputs to address Water Quality Priorities and [2] `Equivalency Metrics` that provide equivalency to the RAA-generated control measures so that



flexibility is provided over the course of EWMP implementation (e.g., to substitute alternative control measures if one or more regional projects are found to be infeasible).

The EWMP will guide stormwater management in NSMBCW for the coming years, and the control measures to be implemented will provide community benefits. The EWMP Implementation Plan identifies the location and type of control measures to be implemented by the City and County to achieve the SMBB Bacteria TMDL requirements and ASBS provisions while also addressing other water quality priorities. The EWMP Implementation Plan is presented through the following:

- Summary of total capacity of control measures to be implemented in each type of Priority Area and the specific canyons/creeks that drain the Priority Areas:
- Maps of regional BMPs that comprise the EWMP Implementation Plan
- Detailed recipe for implementation including Equivalency Metrics

Shown in **Figure ES-3** are the bar graphs that detail the various sub-categories of control measures to be implemented by the City and County across the entire EWMP area. Key regional projects within the EWMP Implementation Plan are shown in **Figure ES-4**. The network of control measures in the EWMP Implementation Plan is extensive and its implementation would represent a significant change in how stormwater will be managed in the NSMBCW.

The schedule for SMBB Bacteria TMDL defines the pace of implementation of watershed control measures. The Regional Board adopted Resolution No. R21-001 on March 11, 2021, which extended the final TMDL schedule for the SMBB Bacteria TMDL to July 15, 2024. The EWMP Implementation Plan outlines a schedule consistent with the TMDL extension. There are numerous technical, logistical, and financial factors which render it infeasible to implement all of the control measures by the revised deadline. The Regional Board and Regional Board staff have acknowledged on multiple occasions that the existing and extended schedules cannot be achieved. Regional Board staff reiterated this stance by stating that they acknowledged (during the Public Workshop on December 16, 2020) that the proposed TMDL deadline extensions on their own may not provide enough time to complete all projects, and that is why a combination of TMDL extensions and possible future Time Schedule Orders (TSOs) are proposed.

While funding is an important issue, especially as the City and County continue to recover from fires and address the current pandemic, funding is not the only issue. Even if the NSMBCW EWMP Group had the financial capability to fund all of the control measures outlined in the EWMP Implementation Plan over the next three years, it is not possible to complete the design, construction, and optimization phases needed for all of these complex, multi-benefit projects given that this process takes up to seven years. That being said, the NSMBCW EWMP Group will take meaningful actions which can be completed in the next three years to work toward implementing watershed control measures identified in the Implementation Plan. This includes implementing the non-structural control measures, maintaining structural BMPs that have already been completed, and reaching critical project phases for additional structural BMPs that cannot be feasibly completed over the next three years. Additionally, as the City continues to recover from the recent fires and rebuild infrastructure, opportunities to coordinate the completion of a drainage master plan and other projects identified in its capital improvement program will be leveraged.

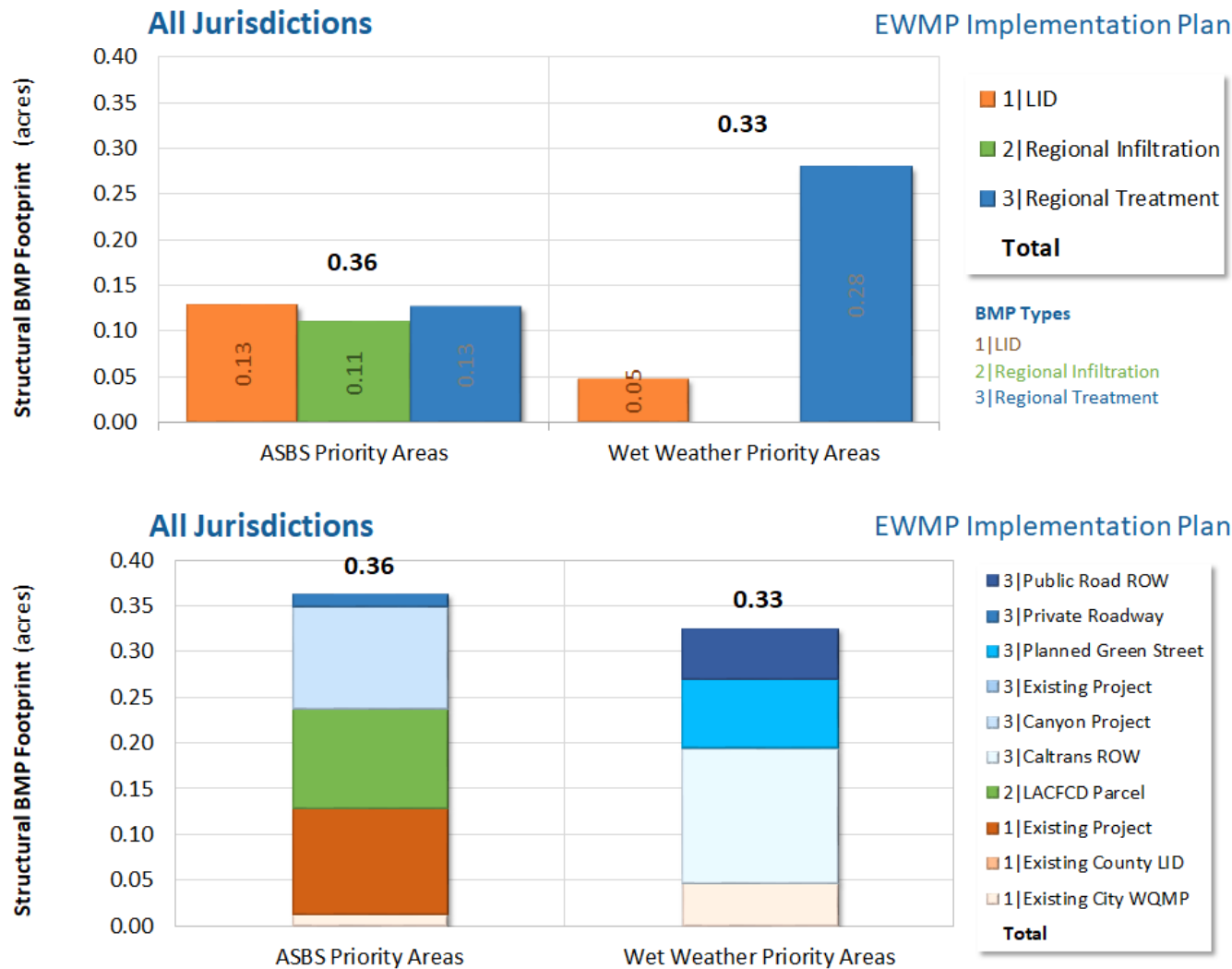


Figure ES-3. NSMBCW EWMP Implementation Plan by Priority Area Type

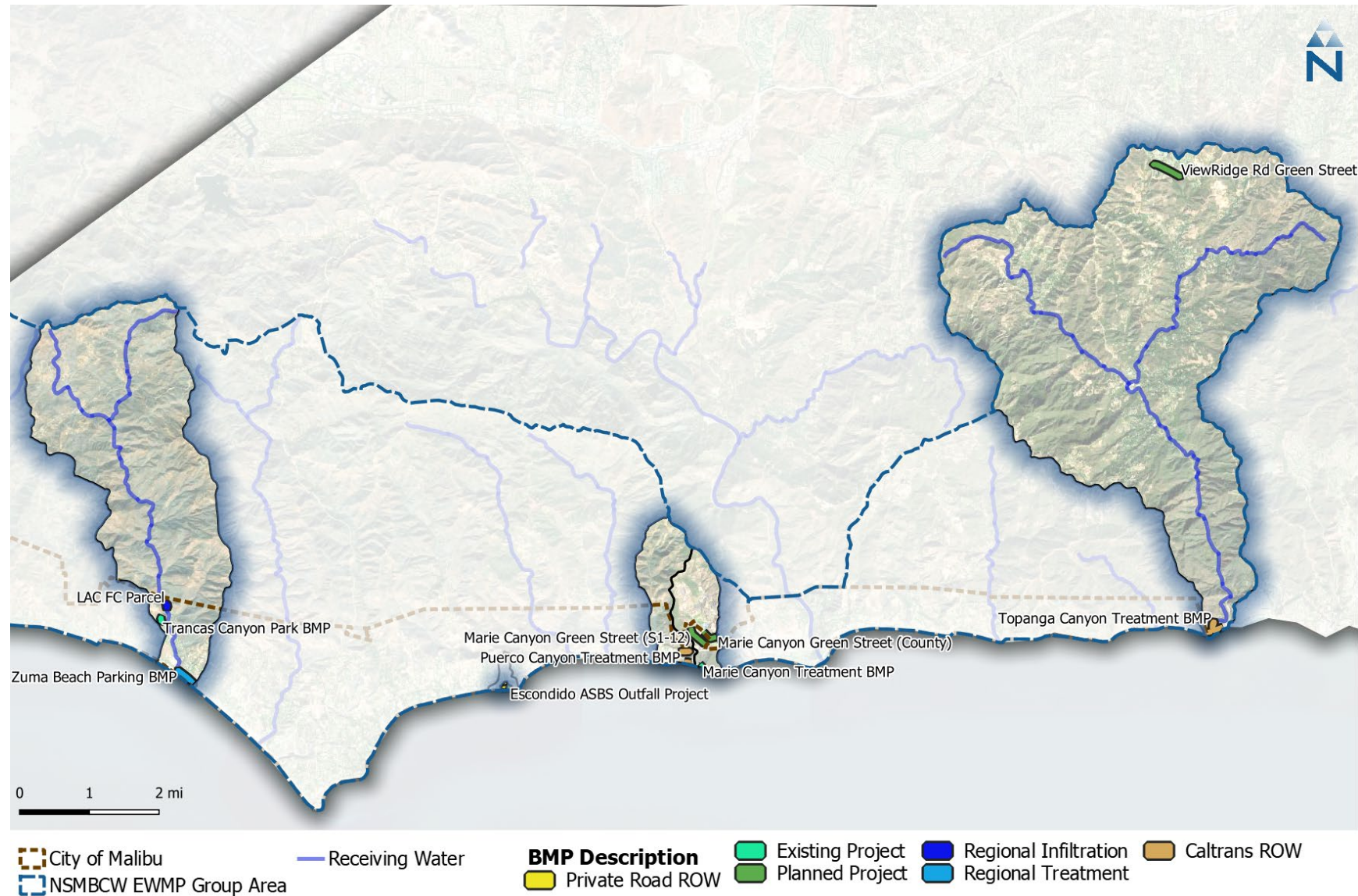


Figure ES-4. Key Existing, Planned and Proposed Regional Projects in EWMP Implementation Plan



EWMP IMPLEMENTATION COSTS

The EWMP cost estimate is based on several local sources of cost information to ensure that cost estimates are relevant to Los Angeles County Permittees and reasonably accurate for projecting the cost of EWMP implementation. Structural BMPs include “hard” costs, such as construction and materials, as well as “soft” costs, such as design, construction management, and permitting. Based the RAA outputs, the total cost for the NSMBCW Group for EWMP implementation through 2024 (or 2034 with the proposed alternative schedule) is \$22.9M for capital costs. **Figure ES-5** provides a capital cost estimate summary and watershed-wide scheduling thru 2024 (or 2034 with proposed alternative schedule). It is important to note the costs provided here are planning level and can be refined as EWMP implementations continues to progress as actual BMP implementation costs are documented.

The creation of the Safe Clean Water Program (SCWP) after the approval by Los Angeles County votes of Measure W in 2018 resulted in sustained source of funding is now available for local stormwater programs. However, revenues still fall short of those needed to implement programs and projects necessary to meet current regulatory schedules. The shortfalls in revenue, evident under “normal” operating conditions, have been further exacerbated by the Woolsey Fire and COVID-19 pandemic. The COVID-19 pandemic has impacted municipalities that are largely dependent on local tax revenues (e.g., sales, tourism) to support the general fund. With declines in these revenues, programs have been severely impacted, especially those that are dependent on general funds. **Table ES-2** summarizes the existing annual funding anticipated from the SCWP and compares the totals to the projected needs. The exact amount of SCWP funding may be less than estimated due to exemptions or credits. Additional funding will be pursued to reduce the funding gap to the extent feasible.

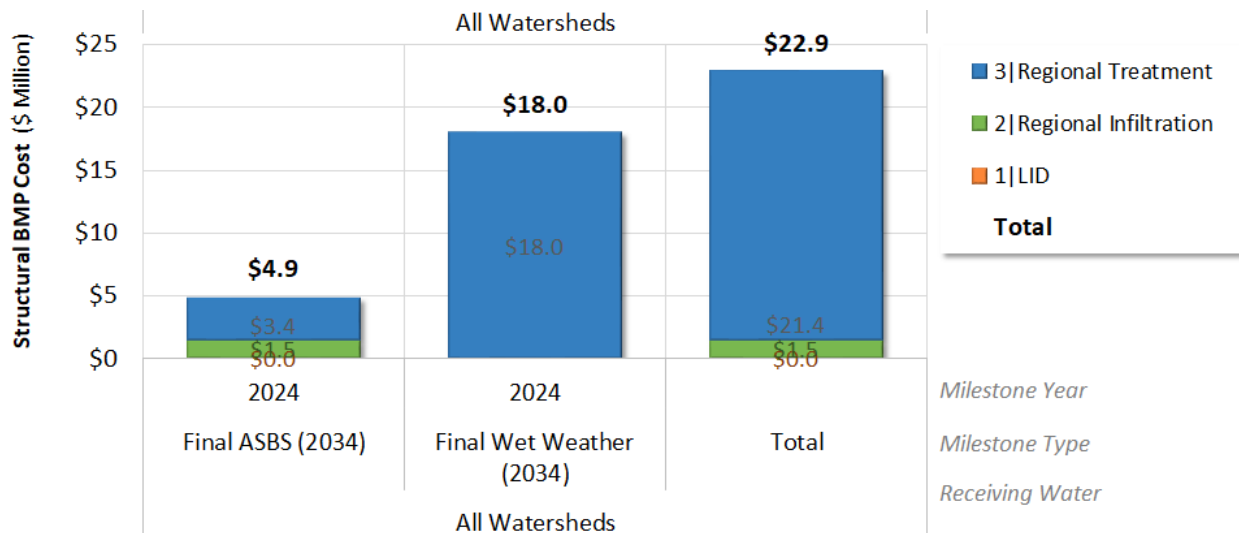


Figure ES-5. Watershed-wide Capital Costs for EWMP Implementation



Table ES-2. Summary of Anticipated Program Annual Revenues and Total EWMP Implementation Plan Capital Costs for Municipalities in the NSMBCW EWMP

Municipality	Total Capital Costs (\$ Million)	Total Annual Funding Need for Full EWMP Implementation (\$ Million/Year)		Safe Clean Water Program Expected Revenue Generation (\$ Million/Year) ¹
		By 2024	By 2034	
County of Los Angeles	\$14.80	\$4.93	\$1.14	\$0.40
Malibu	\$8.10	\$2.70	\$0.62	\$0.78
Total	\$22.90	\$7.63	\$1.76	\$1.18

1. Includes Regional and Municipal Program Infrastructure Program revenues. Regional and Municipal Program Revenues are based on information contained on the SCWP website (www.safecleanwaterla.org) accessed on May 20, 2021. Assumes distribution of SCWP Regional Program funds are proportional to the tax revenues collected within the jurisdiction in the NSMBCW EWMP area. However, Regional Program funds are competitive and the neither the City nor the County can rely on receiving the proportion of Regional Program funds generated by taxpayers in their jurisdictions. The exact amounts may be less than estimated due to exemptions or credits.

ADAPTIVE MANAGEMENT

Adaptive management is a critical component of the EWMP implementation process. Data collected through the CIMP on receiving water conditions and stormwater/non-stormwater quality 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. As the EWMP Implementation Plan is targeting attainment of the SMBB Bacteria TMDL and the ASBS provisions, an evaluation of monitoring data and implementation progress will follow the process outlined in **Figure ES-6**. 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, or if otherwise required by the Regional Board or State Board. However, at any point, the NSMBCW Agencies could choose to update the EWMP and the associated RAA, particularly if deemed appropriate based on monitoring data.

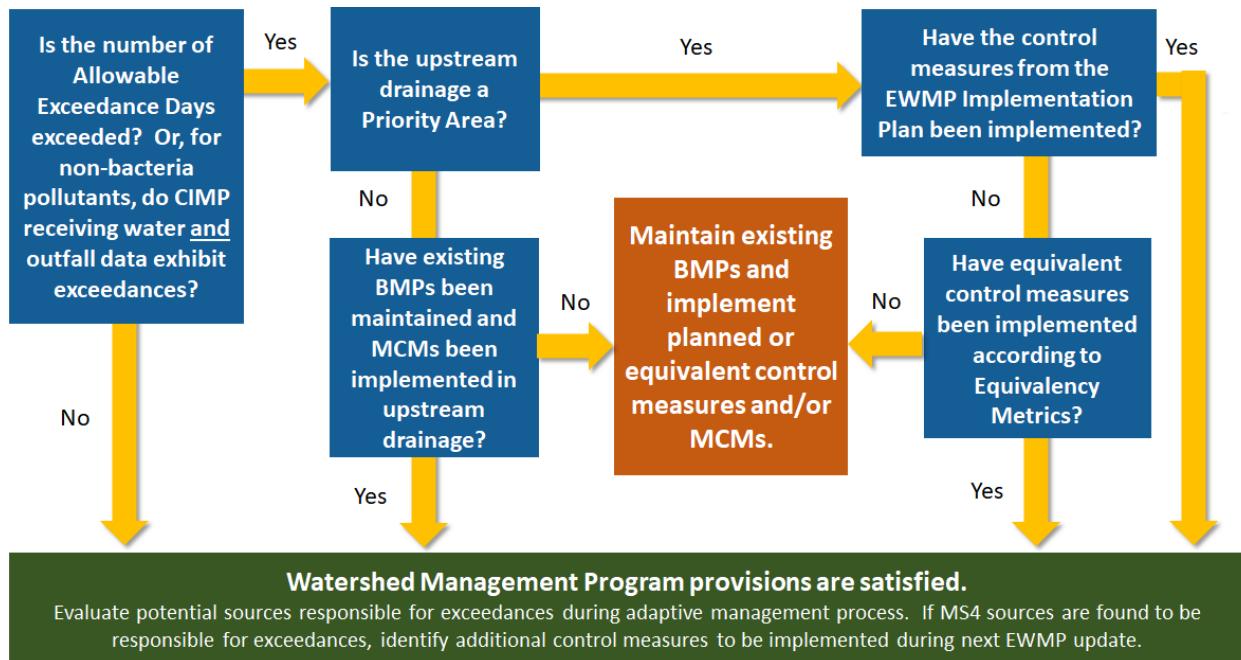


Figure ES-6. Adaptive Management Approach



1. Introduction

Following adoption of the 2012 Los Angeles Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit⁴ (Permit), the City of Malibu (Malibu), County of Los Angeles (County), and Los Angeles County Flood Control District (LACFCD) agreed to collaborate on the development of an Enhanced Watershed Management Program (EWMP) for the North Santa Monica Bay Coastal Watersheds (NSMBCW). This NSMBCW EWMP is intended to facilitate effective, watershed-specific Permit implementation strategies in accordance with Permit Part VI.C. This document summarizes the NSMBCW-specific water quality priorities identified jointly by Malibu, the County, and LACFCD (collectively referred to as the NSMBCW EWMP Group), outlines the program plan, including specific strategies, control measures, and best management practices (BMPs) necessary to achieve water quality targets (Water Quality-Based Effluent Limitations [WQBELs] and Receiving Water Limitations [RWLs]), and describes the quantitative analysis performed to support target achievement and meet Permit requirements. The NSMBCW EWMP Group submitted a final EWMP in March 2016, which was approved by the Executive Officer (EO) of the Los Angeles Regional Water Quality Control Board (Regional Board) in April 2016. Additionally, consistent with Section VI.B and Attachment E of the Permit, the NSMBCW EWMP Group submitted a Coordinated Integrated Monitoring Plan (CIMP), which was approved by the Regional Board EO in November 2015.

Per Part VI.C.8.b.i of the MS4 Permit, Permittees must submit an updated EWMP that includes an updated Reasonable Assurance Analysis (RAA) by June 30, 2021. In addition to requirements outlined in the MS4 Permit for the development and update of the EWMP, the State Water Resources Control Board (State Board) adopted an Order in November 2020 outlining additional expectations.⁵ The updated EWMP is consistent with the requirements of the MS4 Permit and the 2020 State Board Order.

Background and introductory information are provided in **Section 1**. **Section 2** describes water quality conditions and priorities addressed by the EWMP. **Section 3** provides information on the suite of BMPs and implementation measures that will be utilized. **Section 4** describes the approach and results of the RAA. **Section 5** presents the EWMP Implementation Plan, which is the “recipe for implementation” and schedule to address water quality priorities. **Section 6** provides a cost estimate and financial strategy followed by the adaptive management process for revising the EWMP in **Section 7**. **Section 8** confirms that the NSMBCW EWMP Group possesses sufficient legal authority to implement the EWMP. Lastly, **Section 9** provides the references cited in the EWMP.

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 facilitate Permit implementation and water quality target achievement. An EWMP is defined in

4 Order No. R4-2012-0175-A01 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 Own Motion Review of Approval of Nine Watershed Management Programs (WMPs) and One Enhanced Watershed Management Program (EWMP) Pursuant to Los Angeles Regional Water Quality Control Board (Los Angeles Regional Board) Order R4-2012-0175: SWRCB/OCC FILES A-2386, A-2477, A-2508.



the Permit as a WMP which 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 retention of all non-stormwater runoff and runoff from the 85th percentile, 24-hour storm, the EWMP must demonstrate that applicable water quality targets are achieved through a RAA. Additional details on the regulatory background (NPDES Permit, Water Quality Standards, and California Ocean Plan) and the Permit specifics of 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 Storm Water 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 Storm Water Program were required to obtain permit coverage for municipal discharges of stormwater and non-stormwater to waters of the United States.

The Regional Board designated the MS4s owned and/or operated by the LACFCD, 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 the Permit. General permit requirements, which are relevant to and must be met through EWMPs, 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 Regional Board has determined appropriate for the control of such pollutants.

1.1.2 WATER QUALITY STANDARDS AND TMDLS

The CWA also required that Regional Water Quality Control Boards establish water quality standards for each water body in their 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 Regional Board 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. Beneficial use designations for water bodies within the NSMBCW EWMP area are summarized in **Table 1**.

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-pollutant combination,



the state is required to establish a Total Maximum Daily Load (TMDL) to 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). Provisions regarding TMDLs are then incorporated into NPDES Permits once they have been developed and adopted. The 2014/2016 CWA Integrated Report and updated 303(d) list (referred to herein as the 2016 303(d) List) were approved by the State Board on October 3, 2017 and by the USEPA on August 6, 2018. Specific TMDLs developed for the NSMBCW EWMP area are discussed in more detail in **Section 2**.



Table 1. NSMBCW Water Bodies and Beneficial Uses Designated in the Basin Plan^a

Water Body	MUN	IND	GWR	NAV	REC1	REC2	COM	SHELL	WAR	COLD	EST	MAR	WILD	BIOL ^d	RARE	MIGR	SPWN	WET ^b
Santa Monica Bay Nearshore and Offshore		E		E	E	E	E	E				E	E	E	E	E	E	
Los Angeles County Coastal Beaches ^c				E	E	E	E	E				E	E			E ^e	P	
Malibu Lagoon				E	E	E					E	E	E		E	E	E	E
Malibu Creek	P*				E	E			E	E			E		E	E	E	E
Arroyo Sequit	P*		I		E	E			E	E			E		E	E	E	E
Nicholas Canyon	P*				I	I			I				E					
Los Alisos Canyon	P*				I	I			I				E		E			
Lachusa Canyon	P*				I	I			I				E					
Encinal Canyon	P*				I	I			I				E		E			
Trancas Canyon Creek	E*				E	E			E				E		E			
Zuma Canyon Creek	E*				E	E			E	E			E		E	P	P	
Zuma (aka "Dume") Lagoon				E	E	E	E				E		E		E	P	P	E
Ramirez Canyon Creek	I*				I	I			I				E				P	
Escondido Canyon Creek	I*				I	I			I				E		E			
Latigo Canyon	I*				I	I			I				E		E			
Puerco Canyon	I*				I	I			I				E					
Solstice Canyon Creek	E*				E	E			E				E			P	P	
Corral Canyon Creek	I*				I	I			I				E					
Carbon Canyon	P*				I	I			I				E					
Las Flores Canyon Creek	P*				I	I			I				E					
Piedra Gorda Canyon	P*				I	I			I				E					
Pena Canyon	P*				I	I			I	E			E					
Tuna Canyon	P*				I	I			I				E					
Topanga Canyon Creek	P*				I	I			E	E			E			P	I	
Topanga Lagoon				E	E	E	E				E		E		E	E	E	E

E = Existing beneficial use; I = Intermittent beneficial use; P = Potential beneficial use

*Asterisked MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date.

^a From Los Angeles Regional Water Quality Control Board, February 2015. Since beneficial uses may be updated periodically, this table will be updated periodically to reflect the most current information.

^b 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.

^c Applicable beaches include Nicholas Canyon Beach, Trancas Beach, Zuma County (Westward) Beach, Dume State Beach, Escondido Beach, Dan Blocker Memorial (Corral) Beach, Corral Canyon Beach, Puerco Beach, Amarillo Beach, Malibu Beach, Carbon Beach, La Costa Beach, Las Flores Beach, Las Tunas Beach, and Topanga Beach.

^d Only applicable to the Nearshore Zone of Santa Monica Bay.

^e Only applicable to Malibu Beach.



1.1.3 OCEAN PLAN AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

In 1972, the State of California adopted the Ocean Plan and subsequently adopted amendments to regulate waste discharges to protect the quality of ocean waters for use and enjoyment by the general public (SWRCB, 2019). The Ocean Plan designates Areas of Special Biological Significance (ASBS), which are areas requiring special protection of species or biological communities to the extent that maintenance of natural water quality is assured. One of these ASBS designations is within the NSMBCW EWMP Area and includes the minimally-developed area from Laguna Point to Latigo Point, known as ASBS 24 (see **Figure 1**). The Permit defines this area as:

“Ocean water within a line originating from Laguna Point at 34° 5’ 40” north, 119° 6’30” west, thence southeasterly following the mean high tideline to a point at Latigo Point defined by the intersection of the mean high tide line and a line extending due south of Benchmark 24; thence due south to a distance of 1000 feet offshore or to the 100 foot isobath, whichever distance is greater; thence northwesterly following the 100 foot isobath or maintaining a 1,000-foot distance from shore, whichever maintains the greater distance from shore, to a point lying due south of Laguna Point, thence due north to Laguna Point.”

There are 26 identified outfalls owned, operated/maintained, or monitored by the NSMBCW Agencies that are located within the ASBS 24 drainage area; ten of these outfalls have been identified as major outfalls.⁶ As a result of this ASBS designation, the NSMBCW agencies were required by the State Board to either cease the discharge of stormwater and nonpoint sources of waste into ASBS 24 or request an exception to the California Ocean Plan. The NSMBCW agencies each submitted a request for an exception. In March of 2012, the State Board granted these exceptions, finding that such discharge exceptions will not compromise protection of ocean waters for beneficial uses. As a stipulation of the exceptions, discharges by the NSMBCW agencies are required to meet the following criteria:

- The discharges must be covered under an appropriate authorization to discharge waste to the ASBS, such as an NPDES permit and/or waste discharge requirements;
- The authorization must incorporate all of the Special Protections required by the State Board in Resolution No. 2012-0012 (SWRCB, 2012); and
- The exception applies to stormwater and nonpoint source waste discharges only.

The details of the California Ocean Plan exceptions are provided in State Board Resolution No. 2012-0012 (SWRCB, 2012).

In September 2015, the NSMBCW EWMP Group submitted a Compliance Plan and Pollution Prevention Plan to the State Board in order to provide a comprehensive approach to dealing with potential pollutant sources to ASBS 24 (NSMBCW EWMP Group, 2015a and NSMBCW EWMP Group, 2015b). To satisfy comments from the State Board on the Draft Compliance Plan (NSMBCW EWMP Group, 2014), in August 2016, the County and LACFCD submitted a monitoring report providing the results of monitoring conducted during the 2015-2016 wet weather season at their two ocean receiving water stations (located on Zuma Beach and Escondido Beach) and their respective beach outfalls. Similarly, and also in response

⁶ The ASBS 24 Compliance Plan identifies 21 outfalls owned, operated/maintained, or monitored by the NSMBCW Agencies that discharge directly to ASBS 24. The additional five outfalls identified in this EWMP discharge to other receiving water bodies upstream of ASBS 24.



to comments from the State Board, in December 2016, the City submitted a monitoring report providing the results from the two storm events monitored during the 2015-2016 wet season at the City's receiving water station (located on Broad Beach) and the respective beach outfall.

Assessments of the potential pollutant load reductions that would protect the water quality of the ASBS presented in the Compliance Plan and Monitoring Reports determined that structural BMPs would not be required to meet targets. Instead, non-structural source controls would be relied upon to ensure ongoing protection of ASBS 24 and to meet the requirements of the ASBS Special Protections. As such, this was the approach outlined in the 2016 EWMP to address all ASBS-related requirements. However, as previously stated, the State Board adopted an Order in November 2020 outlining additional expectations for the updated EWMP. Amongst these expectations, the State Board Order stated that the NSMBCW EWMP Group:

"...failed to appropriately react to alterations of natural water quality – or, at least, that it failed to appropriately document its reactions in the EWMP. In response, we require that the NSMBCW Group update its ASBS Compliance Plan and EWMP to appropriately address these alterations".

As described in more detail herein, this EWMP update includes similar findings; namely, that additional structural BMPs are required within the NSMBCW EWMP area tributary to ASBS 24. The RAA and structural control measures to be implemented to address the potential for discharges through the MS4 to cause or contribute to alterations of natural water quality are described in further detail in **Sections 4 and 5**, respectively. The non-structural BMPs described in the 2015 ASBS 24 Compliance Plan (NSMBCW EWMP Group, 2015a) will also continue to be implemented. Please note that updates to the 2015 ASBS 24 Compliance Plan will be completed after this EWMP update is approved by the Regional Board.

1.1.4 WMPs AND ENHANCED WMPs (E/WMPs)

The voluntary E/WMPs 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, E/WMPs are intended to facilitate Permit implementation and water quality target achievement and must ensure: 1) that discharges from covered MS4s achieve applicable WQBELs and RWLs and do not include prohibited non-stormwater discharges; and 2) that control measures are implemented to reduce the discharge of pollutants to the maximum extent practicable (MEP). Per Permit Section VI.C.1.e, E/WMPs are to be developed based on the Regional Board's Watershed Management Areas (WMAs) or subwatersheds thereof. 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 regional projects which retain stormwater from the 85th percentile, 24-hour storm;



5. Include watershed control measures to achieve compliance with all interim and final WQBELs in drainage areas where retention of the 85th percentile, 24-hour storm is infeasible;
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.

The EWMP must also include an adaptive management process that allows the EWMP to be modified based on consideration of items such as, but not limited to, water quality data, implementation progress, and Regional Board recommendations. Given the long-term nature of EWMP implementation and the numerous factors that affect implementation of water quality programs, adaptive management is expected to lead to revisions of control measures identified in the EWMP.

1.2 EWMP JURISDICTIONAL CHARACTERISTICS

This EWMP is applicable to the NSMBCW EWMP area, which consists of the coastal watersheds within Santa Monica Bay Beaches Bacteria (SMBB Bacteria) TMDL Jurisdictional Groups 1 (J1) and 4 (J4) and the portion of Malibu Creek Watershed (SMBB Bacteria TMDL Jurisdictional Group 9 [J9]) within the City of Malibu's jurisdiction. It represents collaboration amongst the NSMBCW EWMP Group, all of whom maintain jurisdiction over a portion of the NSMBCW EWMP area. The NSMBCW EWMP area excludes lands owned by jurisdictions other than the NSMBCW EWMP Group, including the State of California and Federal lands. The NSMBCW EWMP area is shown in **Figure 1**.

Although the NSMBCW EWMP Group does not have responsibility over Federal or State agencies, including Caltrans and California State Parks, the Mountains Recreation and Conservation Authority (MRCA), Santa Monica Mountains Conservancy (SMMC) and the National Park Service (NPS), the Group will continue to pursue coordination with these agencies via interagency agreements and/or other means. Efforts will be made to coordinate and pursue cost sharing on projects with Caltrans and the park agencies, as well as to properly identify storm drain ownership and maintenance responsibilities.

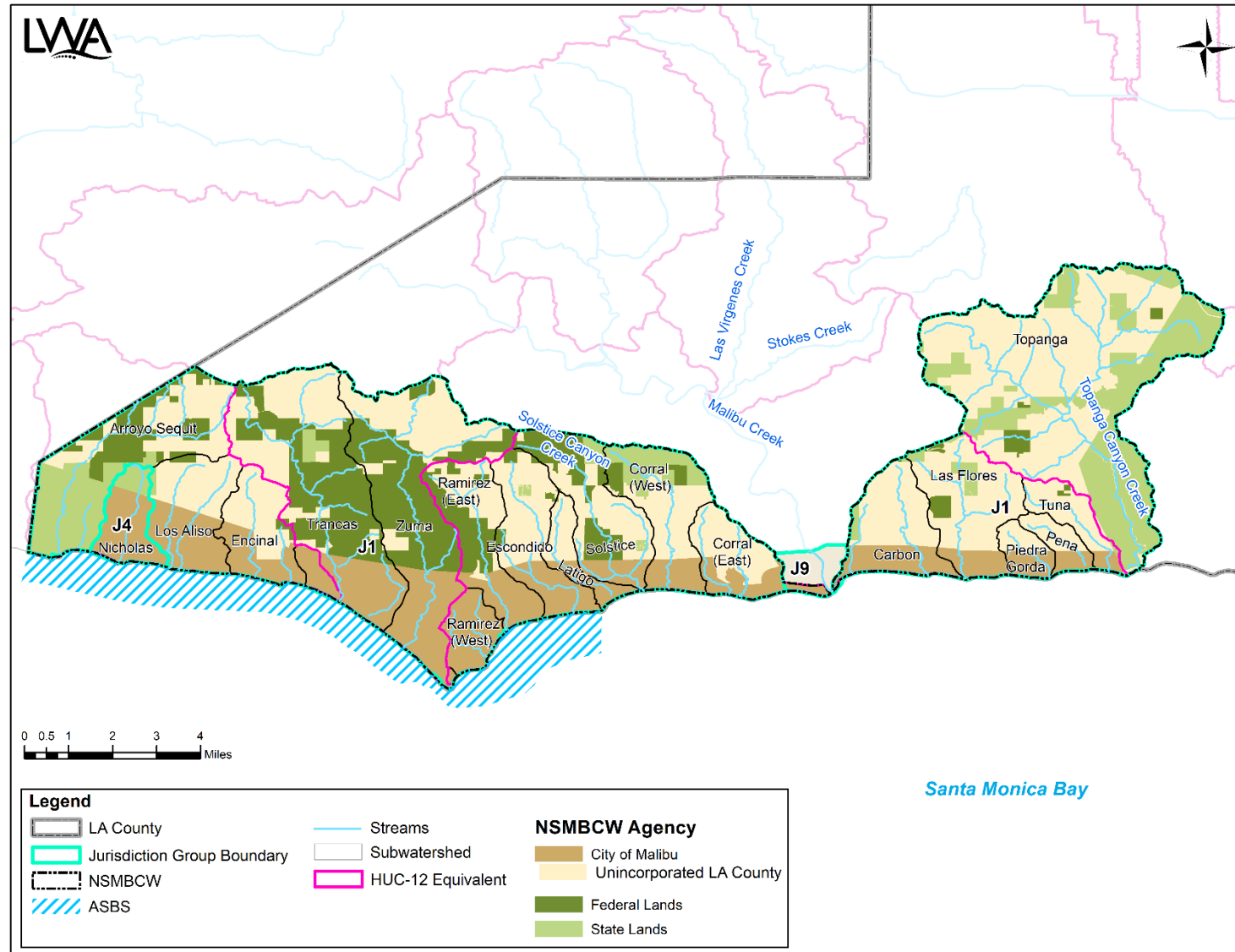


Figure 1. NSMBCW EWMP Area



1.3 GEOGRAPHICAL CONTEXT

The NSMBCW EWMP area encompasses 55,121 acres, including 20 subwatersheds and 28 freshwater coastal streams as defined by the Basin Plan (Regional Board, 2011). The subwatersheds within J1 from east to west include: Topanga Canyon, Tuna Canyon, Pena Canyon, Piedra Gorda Canyon, Las Flores Canyon, Carbon Canyon, Corral Canyon, Solstice Canyon, Latigo Canyon, Escondido Canyon, Ramirez Canyon, Zuma Canyon, Trancas Canyon, Encinal Canyon, Los Alisos Canyon, and Arroyo Sequit. Nicholas Canyon, located between Los Alisos Canyon and Arroyo Sequit, is the only subwatershed within J4 and Malibu Creek is the only watershed within J9.

1.3.1 TOPOGRAPHY

The topography of the NSMBCW EWMP area is dominated by the Santa Monica Mountains, an east-west trending mountain range (also referred to as a transverse range) that rises steeply from the Pacific Ocean. Elevations range from sea level to 3,111 feet at Sandstone Peak in the northern portion of Arroyo Sequit subwatershed (USGS, 1975), which is approximately 5.5 miles inland from the Pacific Ocean. Drainage is characterized by steep, narrow canyons which run out of the Santa Monica Mountains across a very narrow coastal plain.

1.3.2 CLIMATE

Annual rainfall within the Malibu coastal plain averages 12-13 inches, though annual rainfall can vary significantly from year-to-year as well as geographically throughout the EWMP area, primarily due to the Santa Monica Mountains.

Although rainfall in the area is generally low and infrequent, passing storms (coinciding with the southern California rainy season from November to April) are generally intense, capable of releasing large rain amounts in relatively short periods of time (Malibu Bay Company, 2002).

1.3.3 GEOLOGY

The Santa Monica Mountains are relatively young, having formed approximately 20 million years ago as a result of repeated episodes of uplift and submergence. Considered part of the east-west trending Transverse Range, they are believed to be an extension of the Channel Islands. The Santa Monica Mountains can be characterized as an anticline ruptured by faulting and intrusions, the most dominant of which being the Malibu Fault. The Malibu Coast fault runs from offshore just west of Point Dume to offshore just east of Malibu and separates Catalina Schist basement rocks, offshore south of the coast, from granitic and meta-sedimentary rocks north of the fault. Due to the folding and faulting that has affected the Santa Monica Mountains, bedrock formations have fractures, joints, and tilted bedding planes at both steep and shallow angles.

The bedrock formations exposed in the Santa Monica Mountains north of the Malibu Coast fault consist of two main sequences (Yerkes and Campbell, 1980). The lower sequence consists of basement rocks of middle Mesozoic age, including slates, schists, and granitic rocks which are overlain by marine sedimentary series of late Cretaceous and early Tertiary age sandstone and siltstone formations. The upper sequence is a varied group of sedimentary and volcanic formations of middle Tertiary (Oligocene and Miocene) age that make up part of the south-central and western Santa Monica Mountains. These



are the Sespe, Vaqueros, and Topanga Formations, Conejo Volcanics (intrusive volcanics into the Sespe and Vaqueros Formations), Monterey/Modelo Formation, and Trancas Formation. A comprehensive water quality report by the Las Virgenes Municipal Water District (LVMWD) in 2011 and updated in 2012 (LVMWD, 2012) found that the Monterey/Modelo Formation in particular is known to contain high levels of sulfur, selenium, and phosphate.

South of the Malibu Coast fault, the upper sequence bedrock formations found consist of Trancas Formation siltstone, sandstone and claystone (found at Trancas) and Monterey/Modelo Formation shales (found at Point Dume). Trancas and Point Dume also have associated Pleistocene terrace deposits or Quaternary alluvium, beach, or estuarine deposits.

The shallowest surface geologic units consist of colluvium/soil, alluvium, estuarine deposits, landslide deposits, and terrace deposits. These range in age from very recent (historic) to early Quaternary (Pleistocene), and may be locally covered by artificial fill. All of the natural units were deposited by either water (streams, debris flows, long shore currents, and high tidal surges), gravity (slow creep or rapid slippage), or by in-place weathering (soil).

1.3.4 SOILS

The USDA Soil Conservation Service (now the Natural Resources Conservation Services) prepared a study in 1967 entitled “Soils of the Malibu Area, California with Farm and Non-farm Interpretations” that characterized soils in the Malibu area. Based on this study, the majority of soils in the NSMBCW EWMP area are classified as clay loams or silty clay loams. Specific examples of soil types found in the area include Castaic silty clay loams, Gazos silty clay loams, Gilroy clay loams, and Linne silty clay loams. Due to their clay nature, soils within the NSMBCW EWMP area tend to have low infiltration capacity and high runoff potential.

Figure 2 presents an overview of soil conditions that would impede large-scale infiltration within the NSMBCW EWMP area. When coupled with developed conditions near the ocean and lack of undeveloped, publicly owned parcels near storm drains, the opportunity for implementation of infiltration projects within the EWMP area becomes challenging. This EWMP presents several ways to address these limitations, including use of treatment (filtration devices), canyon BMPs.

1.3.5 LAND USE

As summarized in **Table 2** and illustrated in **Figure 3**, the land within the NSMBCW EWMP area is largely undeveloped (93 percent vacant land use), the majority of which is designated as natural open space presently owned by State Parks, SMMC, MRCA, the NPS, Los Angeles County, and the City of Malibu. These public parklands and beaches attract more than 20 million annual visitors who enjoy the natural resources. The entire coastal watershed is traversed by the popular Backbone Trail that crosses every subwatershed and attracts hikers, bikers and equestrians. All major coastal subwatersheds are crossed by Pacific Coast Highway; owned and operated by the California Department of Transportation (Caltrans). The transportation infrastructure needed to bridge the coastal streams generally includes hard or soft bottom concrete box culverts. Where concrete culverts are located, scour ponds generally form either upstream or downstream of the box culvert and impede natural stream flows before reaching the ocean.



The majority of developed land is located along or adjacent to the narrow stretch of coastal plain, with a few exceptions where development is dispersed in the mid- to upper areas (e.g., in Topanga Canyon subwatershed). Low density and rural residential development are the most prevalent developed land uses. Commercial lands are sparse and there are currently no industrial uses, with the shoreline area of the Carbon subwatershed and the western side of Malibu Creek Watershed within the City of Malibu having the most concentrated areas of commercial development within the NSMBCW EWMP area. The largest non-residential development within the NSMBCW EWMP area is Pepperdine University, which is found within the Corral Canyon Creek subwatershed and includes Puerco, Marie, and Winter Canyons. Developments within the unincorporated County areas, as well as the incorporated areas of Malibu, are predominantly serviced by onsite wastewater treatment systems (OWTS), however some City and unincorporated areas are sewered.⁷

As summarized in **Table 2** and illustrated in **Figure 3**, the land within the NSMBCW EWMP area is largely undeveloped (93 percent vacant land use), the majority of which is designated as natural open space presently owned by State Parks, SMMC, MRCA, the NPS, Los Angeles County, and the City of Malibu. The NSMBCW EWMP used the Watershed Management Model System 2.0 (WMMS2) modeling systems. The land use data in WMMS2 was provided by the Los Angeles County Office of the Assessor and is representative of January 2019 land use conditions.

Table 2. Land Use Distributions within the NSMBCW EWMP Area

Description	Percent of Total Land Use
Primary Road	1.06%
Minor Road	1.12%
High density residential	0.06%
Low density residential	0.95%
Commercial	0.13%
Industrial	0.01%
Institutional	0.24%
Roof	1.25%
Developed Pervious	2.85%
Agriculture	0.20%
Vegetation low	20.95%
Vegetation high	71.11%
Water	0.07%

⁷ Within the City of Malibu there are 5 sewered neighborhoods served by small wastewater treatment facilities: Malibu West, Point Dume Club (mobile homes), Paradise Cove Mobile Home Park, Tivoli Cove Condominiums, Malibu County Estates, and the three condominiums in the Civic Center area.



Figure 2. NSMBCW Low Infiltration Soils

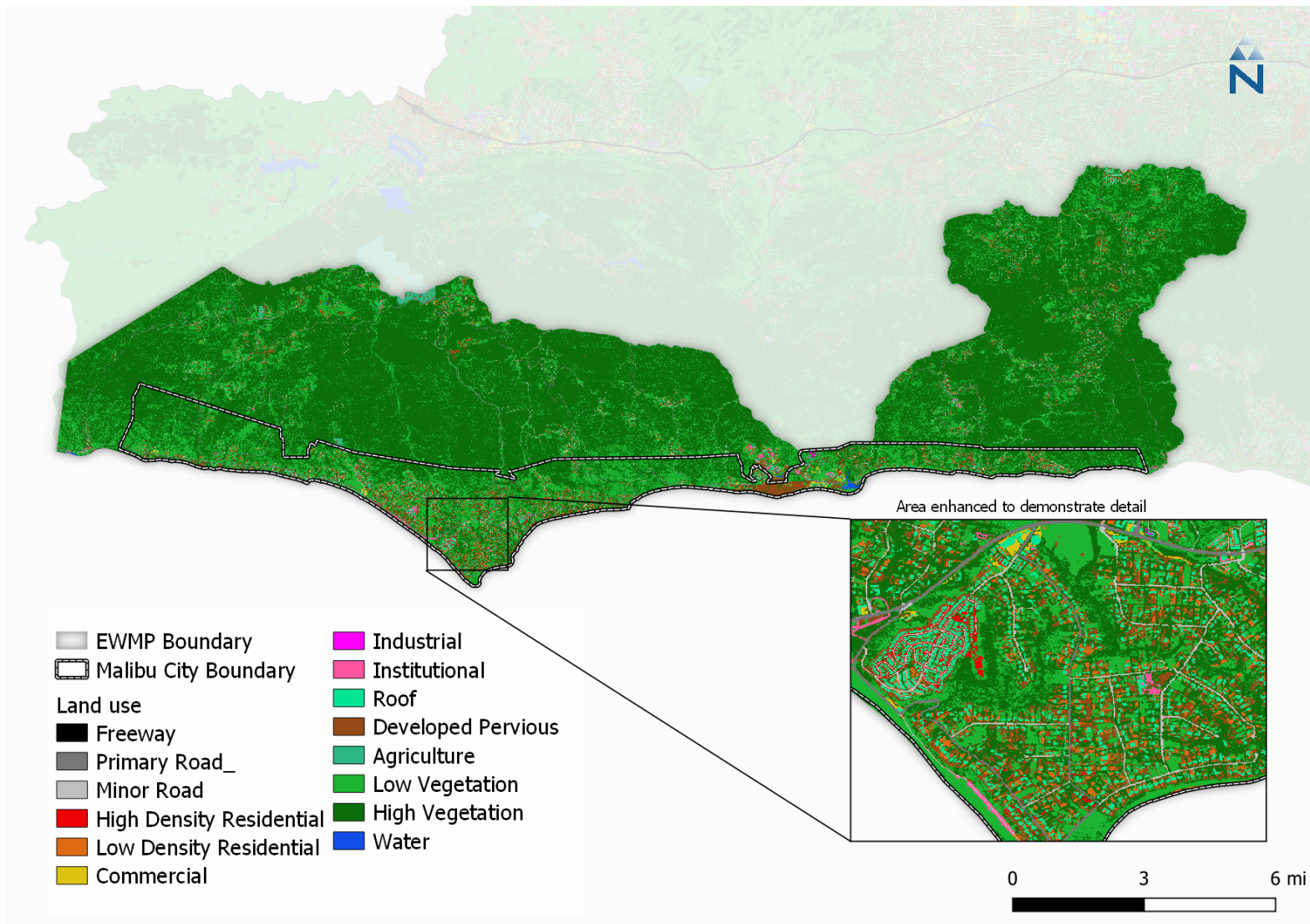


Figure 3. NSMBCW Land Uses



The NSMBCW EWMP area includes six HUC-12 units. Within four of these units, there are several distinct subwatersheds, each with unique environmental characteristics and management challenges. When the Santa Monica Bay Bacteria TMDL was established, general subwatersheds were delineated based most often on a primary drainage area or canyon, the outlet of which became the basis for establishing TMDL monitoring locations. These delineated areas in many instances also include other separate prominent canyons, gullies, or other sub-drainages which may or may not be tributary to the main canyon or sample site. Descriptions of each of these historic subwatersheds in the NSMBCW EWMP area, including their land use characteristics and other prominent features, are provided below.

1.3.5.1 ARROYO SEQUIT FRONTAL PACIFIC OCEAN – HUC 12 - 180701040202

Arroyo Sequit. Arroyo Sequit, at 12 square miles, is the most undeveloped subwatershed in the Santa Monica Bay watershed with 98 percent open space and little evidence of human impact (Regional Board, 2012). Therefore, it is the reference subwatershed used by the Regional Board for setting allowable exceedance days for fecal indicator bacteria in the Santa Monica Bay Beaches Bacterial TMDL, as well as limits in other TMDLs in southern California. Much of the open space within the subwatershed belongs to State Parks. At the bottom of the subwatershed, State Parks operates a beach park and campground facilities including restrooms, parking lots, and a general store. There is a small remnant lagoon at the outlet of Arroyo Sequit, separated from the ocean by a sand berm barrier. Creek flow has been insufficient in recent years to breach this berm. State Parks completed a fish passage barrier removal project and creek restoration project in the lower reaches in 2016.⁸

Primary government and land management agencies within this subwatershed include Los Angeles County, State Parks, NPS, and Caltrans. The outlet of Arroyo Sequit is at Leo Carrillo State Beach, where sample site SMB 1-1 is located. There is a single non-major, NSMBCW-owned MS4 outfall known to exist in this subwatershed.

Nicholas (J4). Nicholas Canyon is a 1,220 acre subwatershed with approximately six percent (74 acres) residential development and 94 percent natural and managed open space. It is the sole subwatershed in the Jurisdiction 4 area. The subwatershed can generally be characterized as predominately undeveloped. Nicholas Canyon Beach operated by Los Angeles County is a moderately popular, fairly open beach that provides restroom facilities, and parking for approximately 150 vehicles. A small, low-flow, intermittent creek outlets to the east of a rocky point downcoast of the main open beach area. Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, NPS, and Caltrans. Sample site SMB 4-1 is collected on the open beach part of the shore, upcoast of the outlet of the creek. There are no NSMBCW-owned MS4 outfalls known to exist in this subwatershed.

Los Alisos. Los Alisos is a 2,380-acre subwatershed with approximately 11 percent residential development (267 acres), and 89 percent natural and managed open space. Within this subwatershed are multiple small canyons, the most prominent of which are Aliso Canyon, Decker Canyon, Lachusa Canyon, and an unnamed canyon. The upper region of the subwatershed is generally open space with scattered rural residential development. Much of the upper subwatershed is under the jurisdiction of the NPS in the

⁸ https://www.parks.ca.gov/?page_id=28350



Santa Monica Mountains National Recreation Area, with locally known features Nicholas Flats parkland and Decker Lake. Lachusa Canyon is home to Charmlee Wilderness Park operated by the SMMC. The lower region of the subwatershed includes mostly low density residential with some medium to high density residential development. The coast of this subwatershed includes portions of Robert H. Meyer Memorial State Beach, which is made up of a number of cove or cliff-foot strands known as "pocket beaches" along the west end of the City of Malibu, including El Pescador State Beach - the westernmost of the three major pocket beaches. State Parks operates a parking lot and portable toilets on the bluff above this beach.

Primary government and land management agencies within these three subwatersheds include Los Angeles County, City of Malibu, NPS, and Caltrans. Sample site SMB 1-2 is located within this watershed at El Pescador State Beach. It is located just east of Lachusa Canyon below an unnamed canyon of less than 600 acres with approximately 99 percent open space. This is an open beach, with no direct drainage to the sample site. Due to safety concerns, sampling has not occurred at this site since 2011. There are no NSMBCW-owned MS4 outfalls known to exist in these subwatersheds.

Encinal. Encinal Canyon is a 1,830-acre subwatershed with approximately 10 percent (179 acres) of residential development, and 90 percent natural and managed open space. Scattered rural residential development is found beyond the incorporated boundaries of the City of Malibu and is located primarily along streams. Medium to high density development dominates the shoreline with some intermingling of low density development. Two small agricultural parcels comprising a total of about 14 acres are located relatively close to the shoreline. This subwatershed includes portions of Robert H. Meyer Memorial State Beach, which is made up of a number of cove or cliff-foot strands known as "pocket beaches" along the west end of the City of Malibu, including, from west to east, La Piedra and El Matador State Beaches. State Parks operates parking lots and portable toilets on the bluffs above these beaches, and rustic trails to the beaches below.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, NPS, and Caltrans. Sample site SMB 1-3 is located just within the western edge of this subwatershed at El Matador State Beach. This is an open beach site, with no direct drainage to the sample site. There are three NSMBCW-owned MS4 outfalls known to exist in this subwatershed, one of which is classified as a major outfall.

1.3.5.2 ZUMA CANYON FRONTAL PACIFIC OCEAN – HUC 12 - 180701040203

Trancas. Trancas Canyon is a 6,580-acre subwatershed with approximately 10 percent (635 acres) residential development, one percent commercial/industrial development, and 89 percent natural and managed open space. A mixture of land uses, including medium-to-high and low density residential, educational, commercial, and rural residential, is found in the western portion of the subwatershed. The middle and upper regions of the subwatershed are mostly undeveloped, with a scattering of rural residential parcels, a private golf course, public parks, and agricultural land uses in the upper part of the subwatershed. Approximately 26 acres of land within the northeastern section of the subwatershed is classified as cropland and pasture. There are 3 mapped horse ranches within the subwatershed. A commercial center is located at the bottom of the subwatershed. Trancas Lagoon, a less than a half-acre lagoon at the outlet of Trancas Canyon Creek, is separated from the ocean by a sand berm barrier. Due to insufficient rain in recent years, this berm remains closed most of the time. Nearly half of the shoreline is



comprised of Zuma Beach operated by Los Angeles County, with parking, restroom facilities, and a snack bar. It is one of the largest and most popular beaches in Los Angeles County, based on County Lifeguard attendance reports.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, NPS, and Caltrans. Trancas Canyon Creek outlets at sample site SMB 1-4 at the up coast extent of Zuma Beach downcoast of Broad Beach. There are eight NSMBCW-owned MS4 outfalls known to exist in this subwatershed, four of which are classified as major outfalls.

Zuma. Zuma Canyon is a 6,290-acre subwatershed with approximately 12 percent (796 acres) of residential development, one percent commercial development, and 87 percent natural and managed open space. Low density residential development scattered with commercial, agricultural, horse ranch, and medium to high density residential development comprises the western portion of the subwatershed. Development is also found in the far upper portion of the subwatershed and is mostly characterized by rural residential, agricultural, and public park land uses. There are seven mapped horse ranches in this subwatershed. A large proportion of the shoreline is comprised of Zuma County Beach operated by the County of Los Angeles. It is one of the largest and most popular beaches in Los Angeles County and is with parking, restroom facilities with separate advanced OWTS facilities, and a snack bar. Zuma Lagoon, an approximately 1.5 acre restored lagoon located at the outlet of Zuma Canyon, is separated from the ocean by a sand berm barrier. Due to insufficient rain in recent years, this berm remains closed most of the time. Some USGS maps refer to this subwatershed and lagoon as Dume Creek and Dume Lagoon, however, this name is not commonly used or known.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, NPS, and Caltrans. Zuma Canyon outlets at sample site SMB 1-5 on the downcoast end of Zuma Beach toward Westward Beach Road. There are six NSMBCW-owned MS4 outfalls known to exist in this subwatershed, four of which are classified as major outfalls.

1.3.5.3 SOLSTICE CANYON FRONTAL SANTA MONICA BAY – HUC 12 - 180701040204

Ramirez. Ramirez is a 3,350-acre subwatershed with approximately 25 percent (854 acres) residential development, one percent industrial/commercial, and 74 percent natural and managed open space lands. The subwatershed includes Ramirez Canyon, Walnut Canyon, and some smaller canyons and gullies. The upper subwatershed includes a 22-acre park and conference center operated by the SMMC. Most of the development, representing various types of land uses, is in the lower portion of the subwatershed, with low density residential comprising the greatest proportion of the developed land. The middle area includes single-family residential, multifamily residential, and a church. The bottom of Ramirez Canyon includes privately-owned Paradise Cove comprised of an approximately 270-unit mobile home park and restaurant with separate advanced OWTS facilities, parking lot, pier, and beach. Ramirez Canyon Creek experiences intermittent dry areas and day-lighted flows throughout its reaches, and scour ponds form above and below the Pacific Coast Highway Bridge culvert. A cement open box channel was constructed by the private property owner to protect developed parts of the property in the last reach of the creek. There are dense, kelp forests and rich tide pools in the near-shore habitat.

Primary government and land management agencies within this subwatershed include Los Angeles



County, City of Malibu, NPS, SMMC, MRCA, and Caltrans. Walnut Canyon outlets at sample site SMB 1-6 on Point Dume in an area between Paradise Cove and Little Dume Beach at the end of Zumirez Drive. A 102-acre area is tributary to the unnamed gully that outlets in a scour pond at the beach at sample site SMB O-1, located upcoast beyond the extent of the Paradise Cove mobile home park. Ramirez Canyon Creek outlets at sample site SMB 1-7 on Paradise Cove Beach; the City of Malibu constructed a stormwater treatment facility in 2010 at the outfall to address uncontrollable natural sources of indicator bacteria in the creek prior to discharge. There are two NSMBCW-owned MS4 outfalls known to exist in this subwatershed, none of which are classified as major outfalls.

Escondido. Escondido is a 2,300-acre subwatershed with approximately 14 percent (318 acres) residential development, one percent commercial development, and 85 percent natural and managed open space. Low density rural residential development is found scattered throughout the subwatershed and includes 43 acres of property with equestrian facilities, or approximately 2 percent of the subwatershed. Medium to high density residential development is found along the shoreline and low density residential development is found just inland of the shoreline. Escondido Canyon Park is operated by the SMMC, covers about a third of this subwatershed, and includes a popular hiking trail. Escondido Canyon Creek is separated from the ocean by a sand berm barrier. Due to insufficient rain in recent years, this berm remains closed most of the time. Scour ponds form in the creek upstream and downstream of the Pacific Coast Highway Bridge concrete box culvert. A small pocket beach with an access gate is adjacent to the outlet of the creek.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, SMMC, MRCA, and Caltrans. Escondido Canyon Creek outlets at sample site SMB 1-8. There are six NSMBCW-owned MS4 outfalls known to exist in this subwatershed, one of which is classified as a major outfall.

Latigo. Latigo is a 824-acre subwatershed with approximately 10 percent (80 acres) residential development and 90 percent natural open space. It is one of the smallest subwatersheds in the NSMBCW EWMP area. Developed land within the Latigo subwatershed is characterized by some high-density small lot subdivisions in the upper part of the subwatershed, but mostly by rural residential development in the central area of the subwatershed along the rim of Latigo Canyon, and low and medium to high density residential development near the shoreline. Managed lands of the SMMC are found along the eastern slopes of the subwatershed.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, SMMC, MRCA, and Caltrans. Latigo Canyon Creek flows through a concrete box culvert under the Tivoli Cove condominiums and outlets on Latigo Beach at sample site SMB 1-9. There are no NSMBCW-owned MS4 outfalls known to exist in this subwatershed.

Solstice. Solstice Canyon is a 2,840-acre subwatershed with approximately three percent (96 acres) residential development and 97 percent natural open space. It is the second least developed subwatershed in Santa Monica Bay. The minimal development includes rural residential and a couple commercial properties consisting of a gas station and restaurant near the coast. Solstice Canyon Park in the Santa Monica Mountains National Recreation is a prominent feature of this subwatershed. The park



facilities managed by NPS include trails, very limited vehicle parking, restrooms, and picnic areas. Dan Blocker Beach, operated by Los Angeles County, has a public view area, 15-space parking lot, restrooms, and picnic tables, located just up coast of the intersection of Corral Canyon Road on PCH.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, NPS, and Caltrans. Sample site SMB 1-10 is located near the outlet of Solstice Creek at the western extent of Corral Beach. A scour pond formed in the creek downstream of the Pacific Coast Highway Bridge concrete box. There are no NSMBCW-owned MS4 outfalls known to exist in this subwatershed, with the exception of two 18-inch roadway drains preventing flooding on Solstice Creek Bridge.

Corral. Corral subwatershed is a 4,300-acre subwatershed bounded by the Malibu Creek Watershed to the north and east, with approximately 10 percent (425 acres) residential development, 2 percent commercial development, and 88 percent natural and managed open space. The subwatershed includes Corral Canyon, Puerco Canyon, Marie Canyon, and Winter Canyon. Developed features include two small lot subdivisions in the upper watershed, the Pepperdine University campus, limited commercial land uses near Pacific Coast Highway. Pepperdine University (approximately 180-acres total) is within unincorporated County. Except for a concentrated area of rural residential development in the east, most of the developed area in the subwatershed is surrounding the university or near the shoreline. The residential development near the shoreline is primarily medium to high density. Corral Canyon is largely undeveloped but features the 1,000-acre Corral Canyon Park with trails and facilities operated by SMMC/MRCA including a parking lot, picnic areas, and portable restrooms on the landside of Pacific Coast Highway near Corral Beach. Puerco Canyon is approximately 620 acres on the east of Corral Canyon with about 95 percent open space, limited medium to high-density residential, commercial, and institutional land uses near the shore. Marie Canyon is approximately 600 acres, about 34 percent of which is developed with areas of medium to high-density residential and institutional land uses. Winter Canyon is less than 500 acres with institutional and high-density residential land uses on the eastern extent of the Malibu Civic Center area.

Primary government and land management agencies within this subwatershed include Los Angeles County, City of Malibu, SMMC, MRCA, and Caltrans, as well as the private Pepperdine University. Sample site SMB 1-11 is located at the outlet of Corral Canyon at the eastern extent of Corral Beach. Sample station SMB O-2 is at the outlet of Puerco Canyon at Puerco Beach. Sample site SMB 1-12 is located at the outlet of Marie Canyon in the middle of Puerco Beach. The County constructed the Marie Canyon Water Quality Improvement Project on Malibu Road upstream of the outlet of Marie Canyon to address unknown sources of indicator bacteria in Marie Canyon Creek prior to discharge at the beach. Dense kelp forests are near shore in this coastal area. There are 18 NSMBCW-owned MS4 outfalls known to exist in this subwatershed, three of which are classified as major outfalls.

1.3.5.4 COLD CREEK AND MALIBU CREEK - HUC 12 180701040104

Malibu Creek (J9). The NSMBCW EWMP Group is responsible for the portion of the Malibu Creek Watershed within the City of Malibu. This area is approximately 618 acres in size, or 0.87 percent of the entire 70,651 acre Malibu Creek Watershed. Approximately 306 acres of the 618-acre watershed are tributary to Malibu Legacy Park, a regional EWMP project capable of retaining the 85th percentile, 24-hour



storm over the entire tributary area. The western side of the creek is the Malibu Civic Center area, which is predominately commercial, municipal, and institutional land uses. In 2007, the City of Malibu installed the Malibu Civic Center Stormwater Treatment Facility that includes filtration and disinfection. The Legacy Park project made it possible to detain and treat more of each rain event due to the construction of the 8-acre foot detention pond that attenuates the flows from the storm drain system. A major outfall is present in this subwatershed, immediately downstream of Malibu Legacy Park. The remaining area, which is almost entirely on the eastern side of Malibu Creek, contains approximately 312 acres of sparsely developed space, with a total impervious coverage of approximately 12 percent. The development in this area contains mostly low density (rural) single family residential. There are no NSMBCW-owned storm drains in this analysis region and streets do not have curbs or gutters. Besides the 85 acres of state- and federally-owned land, the developed neighborhood is privately owned property, including private roads. The lower reach also includes the Adamson House, a State Parks historical site hosting tours and public and private events. The last reach of the Malibu Creek watershed includes the 30-acre Malibu Lagoon, which was reconstructed by State Parks in 2010 to improve circulation and reduce entrapment of fine sediment. Malibu Lagoon is separated from Surfrider Beach and Malibu Lagoon State Beach by a sand berm barrier. Higher tides and waves have been known to overtop the berm. Los Angeles County operates the middle section of this stretch of beach, and State Parks generally operates the area upcoast and seaward of Malibu Lagoon, and at the Malibu Pier.

Primary government and land management agencies with land use responsibility in this watershed are Los Angeles County, City of Malibu, State Parks, and Caltrans. There are four sample locations in this area. Sample site MCW-1 is located in Malibu Lagoon, seaward of the Pacific Coast Highway Bridge. Sample site SMB-MC-1 is collected at the most western extent of Surfrider Beach, just downcoast of the Malibu Colony. SMB-MC-2 is collected 5 days per week at the most recent location of the sand barrier breach. SMB-MC-3 is collected approximately 50 yards downcoast of Malibu Pier at the border of the Carbon subwatershed at the downcoast extent of Surfrider Beach between the Pier and Carbon Beach.

1.3.5.5 SANTA MONICA BEACH FRONTAL SANTA MONICA BAY – HUC 12 - 180701040403

Carbon. Carbon is a 2,310-acre subwatershed with approximately 14 percent (315 acres) residential development, two percent commercial development, and 84 percent natural open space, bounded by the Malibu Creek Watershed to the west. Rural residential development is found scattered within the eastern and western portions of the subwatershed. Medium to high density residential and commercial development is located adjacent to Pacific Coast Highway. It includes Carbon Canyon and Sweetwater Canyon. The beach located within this subwatershed beyond the State-operated Malibu Pier and Surfrider Beach is considered Carbon Beach.

Primary government and land management agencies within this subwatershed are Los Angeles County, City of Malibu, State Parks, and Caltrans. Sample site SMB 1-13 is located at the bottom of Sweetwater Canyon on Carbon Beach. There are no NSMBCW-owned MS4 outfalls known to exist in this subwatershed.

Las Flores. Las Flores is a 2,921-acre subwatershed with approximately 10 percent (282 acres) residential development, one percent commercial development, and 89 percent natural open space in Las Flores Canyon. Within this subwatershed, medium to high density development flanks the shoreline along with



commercial development. Scattered low density development is found within the lower subwatershed and rural residential development is found scattered within the central and eastern areas of the subwatershed. A large proportion of the land is comprised of SMMC lands. In 2008, the City of Malibu restored the lower reaches of Las Flores Creek and constructed a small neighborhood park just upstream of Pacific Coast Highway, including a small playground, 1/3 mile of walking trails, and picnic areas. As part of the park construction, measures were taken to preserve and naturalize the creek through the removal of non-native invasive vegetation and planting of over 45 varieties of native plant species and the installation of a vegetated swale to mitigate runoff from the roadway. Las Flores Canyon Creek has a small remnant lagoon with a sand berm barrier separating it from the ocean except when flow conditions in the creek increase the level of the lagoon sufficiently to breach.

Primary government and land management agencies in this subwatershed include Los Angeles County, City of Malibu, NPS, SMMC, MRCA, and Caltrans. Las Flores Creek outlets at sample site SMB 1-14 on Las Flores Beach. There is a single NSMBCW-owned MS4 outfall known to exist in this subwatershed. It is classified as a major outfall.

Piedra Gorda. Piedra Gorda is a 629-acre subwatershed with approximately 19 percent (121 acres) residential development, and 81 percent natural and managed open space. The developed area includes a mixture of single-family and multi-family residential, and limited commercial land use along the coast. Primary government and land management agencies in this subwatershed include Los Angeles County, City of Malibu, SMMC, MRCA, and Caltrans. Sample site SMB 1-15 is an open beach site located on Big Rock Beach adjacent to a public access stairway. There is a single NSMBCW-owned MS4 outfall known to exist in this subwatershed. It is not classified as a major outfall.

Pena. Pena Canyon is a 625-acre subwatershed with approximately three percent (18 acres) residential development and 97 percent natural open space. Medium to high density residential development and a County beach park are the only other uses within the subwatershed, and both are along the shoreline. Primary government and land management agencies in this subwatershed include Los Angeles County, City of Malibu, SMMC, MRCA, and Caltrans. Sample site SMB 1-16 is located at the outlet of Pena Canyon at the eastern extent of Las Tunas County Beach. There are no NSMBCW-owned MS4 outfalls known to exist in this subwatershed.

Tuna. Tuna Canyon is a 1,007-acre subwatershed with approximately four percent (39 acres) residential development and 96 percent natural open space. This subwatershed is virtually undeveloped with the exception of a few scattered areas of rural residential development in the east and medium to high density and commercial development along the shoreline. The SMMC/MRCA owns the majority of open space. Primary government and land management agencies in this subwatershed include Malibu, Los Angeles County, SMMC, MRCA, and Caltrans. Sample site SMB 1-17 is located at the wave wash of Tuna Canyon. There are no NSMBCW-owned MS4 outfalls known to exist in this subwatershed.

1.3.5.6 GARAPITO CREEK – HUC 12 – 180701040401

Topanga. Topanga Canyon is a 12,611-acre subwatershed with approximately 11 percent (1,407 acres) residential development, and 88 percent natural open space. There are only 34 acres designated as industrial/commercial. It is the largest subwatershed within the NSMBCW EWMP area and has nearly



every category of land use represented within its borders. Garapito Creek is a small tributary to Topanga Creek in the upper watershed. The central and eastern areas of the subwatershed are marked by rural and small lots residential subdivisions, commercial, public, horse ranch, educational, and mixed urban/construction land uses. This subwatershed has a relatively high concentration of horse ranches, the majority of which are in the upper subwatershed. State Parks has completed restoration projects that removed non-native vegetation and fill, helping return flows in Topanga Canyon Creek to a more natural meander. There is little development near the coast other than a small commercial area in the lower subwatershed, much of which is owned by State Parks, a small (2-acre) maintenance facility zoned as industrial land use, and County Beach facilities. Topanga Lagoon is a 1.8-acre lagoon at the outlet of Topanga Canyon Creek, separated from the ocean by a sand berm barrier that generally breaches when flow conditions in the creek increase the level of the lagoon sufficiently.

Primary government and land management agencies in this subwatershed include Los Angeles County, State Parks, and Caltrans. The City of Los Angeles received an exception by the Regional Board for the very small portion of its land in this subwatershed. Topanga Canyon Creek outlets at sample site SMB 1-18. There is only one NSMBCW-owned MS4 outfall known to exist in this subwatershed. It is not classified as a major outfall.

1.4 OUTREACH AND STAKEHOLDER PROCESS

Section VI.C.1.f.v of the Permit outlines the requirements for a stakeholder process for collaboration on development of the initial EWMP, which included:

- Providing 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.

No specific requirements related to outreach for the EWMP update are identified in the Permit. As part of the development of the 2016 EWMP, the NSMBCW EWMP Group conducted public outreach to engage the public and other interested parties to support EWMP development. These efforts are described in more detail below.

Public Workshops. Public workshops were held jointly with the Malibu Creek Watershed EWMP Group in May 2014, November 2014, and May 2015 at King Gillette Ranch in Calabasas, California. For each workshop, an informational presentation was provided followed by a question and answer period. Comments were collected and concerns were noted and considered during EWMP development by the NSMBCW EWMP Group. The presentations were made available following each respective meeting, and can be found at the City of Malibu's EWMP webpage (www.malibucity.org/EWMP).

Website. As the lead agency in the EWMP development, the City of Malibu has maintained an EWMP webpage (www.malibucity.org/EWMP) where information regarding EWMP development, public workshops, and links to the Regional Board where relevant document submittals are posted. Additionally, contact information for NSMBCW EWMP Group leads from each agency is provided in case further information is desired.



Technical Advisory Committee: The NSMBCW EWMP Group actively participated in the Los Angeles Region EWMP TAC throughout the process of developing the 2016 EWMP. The TAC was not reconvened by the Regional Board as part of the EWMP update process. However, TAC guidance was incorporated into both the 2016 EWMP and retained in the updated EWMP. In particular, TAC guidance on RAA development has been thoroughly integrated into the EWMP modeling process.

Outreach to City and County Departments: Throughout the EWMP development process, the City and County have attended various division meetings, providing internal informational seminars and presenting relevant information for feedback from senior staff. Additionally, the City presented the EWMP to the City of Malibu Public Works Commission.



2. Water Quality Conditions and Priorities

As part of the EWMP, the Permit requires the NSMBCW EWMP Group to identify water quality priorities within their WMA. To accomplish this per Permit Section VI.C.5.a, the NSMBCW EWMP Group conducted the following for the NSMBCW EWMP area:

1. Characterized the water quality of MS4 discharges, as well as receiving water bodies based on available data;
2. Classified water body-pollutant combinations (WBPCs) into one of three Permit-specified categories;
3. Assessed sources for high priority WBPCs; and
4. Prioritized WBPCs.

The result of these efforts is provided in the following subsections.

2.1 WATER QUALITY CHARACTERIZATION

Receiving water quality were characterized based on (TMDLs, 303(d) listings, and available monitoring data, including data derived from the following monitoring programs or agencies/ organizations: SMBB Bacteria TMDL Coordinated Shoreline Monitoring Plan (CSMP), NSMBCW CIMP, and the Joint Powers Authority of the Las Virgenes Municipal Water District (LVMWD)/Triunfo Sanitation District. Data collected by monitoring programs run by the City of Malibu and Los Angeles County within ASBS 24 were also considered. Stormwater and non-stormwater discharge data collected through the CIMP, ASBS, and regional monitoring programs were also considered.

2.1.1 TMDLs

There are seven TMDLs for the water bodies within the NSMBCW EWMP area; six of which are incorporated into Attachment M of the MS4 Permit. The Malibu Creek and Lagoon TMDL for Sedimentation and Nutrients to address Benthic Community Impairments (Benthic TMDL) is not currently incorporated into the MS4 Permit as it was incorporated into the Basin Plan after adoption of the MS4 Permit. The TMDLs relevant to the NSMBCW EWMP are summarized in **Table 3**. **Table 4** presents the specific parameters addressed by each TMDL.



Table 3. NSMBCW TMDLs

TMDL Name	Approving Agency	Regional Board Resolution Number(s)	Effective Date	Final Deadline
SMBB Bacteria TMDL, Reconsideration of Certain Technical Matters of the SMBB Bacteria TMDL	Regional Board TMDL	2002-004 and 2002-022	July 15, 2003	Summer Dry Weather: July 15, 2006 Winter Dry Weather: November 1, 2009 Wet Weather: July 15, 2021
		R12-007	July 2, 2014	Wet Weather: July 15, 2021
		R21-001	Not Yet Effective	Wet Weather: July 15, 2024
Malibu Creek and Lagoon Bacteria TMDL	Regional Board TMDL	2004-019R	January 24, 2006	Summer Dry Weather: January 24, 2009 Winter Dry Weather: January 24, 2012 Wet Weather: January 24, 2016
		R12-009	July 2, 2014	Dry Weather: January 24, 2012 Wet Weather: July 15, 2021
		R21-001	Not Yet Effective	Wet Weather: July 15, 2026
Malibu Creek Watershed Nutrients TMDL (Nutrient TMDL)	USEPA TMDL	NA	March 21, 2003	December 28, 2017
	Regional Board Implementation Plan	R16-009	May 16, 2017	December 28, 2021
		R21-001	Not Yet Effective	July 15, 2026
Malibu Creek and Lagoon TMDL for Sedimentation and Nutrients to Address Benthic Community Impairments (Benthic TMDL)	USEPA TMDL	NA	July 2, 2013	NA
	Regional Board Implementation Plan	R16-009	May 16, 2017	Nutrients: December 28, 2023 Sedimentation: December 28, 2025
		R21-001	Not Yet Effective	Nutrients: July 15, 2026 Sedimentation: July 15, 2026
SMB Nearshore and Offshore Debris TMDL	Regional Board TMDL	R10-010	March 20, 2012	March 20, 2020
		R19-004	Not Yet Effective	County: March 20, 2020 City: March 20, 2023
Malibu Creek Watershed Trash TMDL	Regional Board TMDL	2008-007	July 7, 2009	July 7, 2017
		R18-006	May 6, 2020	
SMB TMDL for DDT and PCBs	USEPA TMDL	NA	March 26, 2012	NA



Table 4. Parameters Addressed in Relevant NSMBCW EWMP Area TMDLs

TMDL	Parameters Addressed
SMBB Bacteria TMDL	Enterococcus
	Fecal coliform
	Total coliform
Malibu Creek and Lagoon Bacteria TMDL	Malibu Lagoon
	Enterococcus
	Fecal coliform
	Total coliform
	Malibu Creek
	<i>E. coli</i>
Malibu Creek Watershed Nutrients TMDL	Algae (% coverage)
	Ammonia
	Chlorophyll <i>a</i>
	Dissolved Oxygen
	Scum/Foam (unnatural)
	Total Nitrogen ¹
	Total Phosphorus
Malibu Creek and Lagoon Benthic TMDL	Algae (% coverage)
	Benthic Community Effects
	Chlorophyll <i>a</i>
	Dissolved Oxygen
	Sedimentation
	Total Nitrogen ²
	Total Phosphorus
SMB Nearshore Debris TMDL	Trash
	Plastic Pellets
Malibu Creek Watershed Trash TMDL	Trash
SMB DDTs and PCBs TMDL	DDTs
	PCBs

1. Nitrate as N + Nitrite as N
2. Organic + Inorganic Nitrogen

Grouped RWLs for the SMBB Bacteria TMDL and Malibu Creek and Lagoon Bacteria TMDL are also expressed in the Permit as allowable exceedance days (AEDs), which vary by season and by monitoring location. TMDL monitoring locations within the NSMBCW EWMP area include 21 SMBB Bacteria monitoring locations (SMB 1-1 through SMB 1-18; SMB O-1 and SMB O-2; and SMB 4-1) and a single Malibu Creek Watershed TMDL monitoring location (MCW-1). These AEDs are summarized in **Table 5** below. The final grouped RWLs for dry weather are currently effective, and the final wet weather RWLs for the SMBB Bacteria TMDL were scheduled to be effective on July 15, 2021 but were amended to July 15, 2024 by Regional Board Order No. R21-001. The SMBB Bacteria TMDL monitoring locations are shown on **Figure 4**.



Receiving water monitoring locations identified as MC-1, MC-2, and MC-3 in the SMBB Bacteria TMDL CSMP are not included in Permit Attachment M. Attainment of limitations at these receiving water locations is also dependent upon the overall effectiveness of the plans developed to comply with the Malibu Creek Bacteria TMDL (e.g., Malibu Creek Watershed Management Group [WMG] EWMP, Ventura County TMDL Implementation Plan), since these sites were selected to be representative of the entire Malibu Creek Watershed (Jurisdictional Group 9), and addresses a significantly larger contributory area than what lies in the City of Malibu. The NSMBCW EWMP Group's modeling and implementation efforts are therefore limited to MS4 discharges from the City-owned areas within the Malibu Creek Watershed.



Table 5. Single Sample Allowable Exceedance Days for NSMBCW Bacteria Monitoring Stations

Station	Station Name	Summer Dry Weather (Apr 1 – Oct 31)		Winter Dry Weather (Nov 1 – Mar 31)		Wet Weather (Year-Round)	
		Daily Sample ¹	Weekly Sample	Daily Sample ¹	Weekly Sample	Daily Sample ¹	Weekly Sample
SMB 1-1	Leo Carrillo Beach at Arroyo Sequit Crk	0	0	9	2	17	3
SMB 4-1	Nicholas Beach	0	0	4	1	14	2
SMB 1-2	El Pescador State Beach ²	0	0	1	1	5	1
SMB 1-3	El Matador State Beach ²	0	0	1	1	3	1
SMB 1-4	Zuma Beach at Trancas Crk	0	0	9	2	17	3
SMB 1-5	Zuma Beach at Zuma Crk	0	0	9	2	17	3
SMB 1-6	Walnut Canyon on Point Dume at Zumirez Drive	0	0	9	2	17	3
SMB O-1	Unnamed gully between Point Dume and Paradise Cove	0	0	9	2	15	3
SMB 1-7	Paradise Cove Beach at Ramirez Crk	0	0	9	2	17	3
SMB 1-8	Escondido Beach at Escondido Crk	0	0	9	2	17	3
SMB 1-9	Latigo Beach at Tivoli Cove Condos	0	0	9	2	17	3
SMB 1-10	Corral Beach at Solstice Cyn Crk	0	0	5	1	17	3
SMB 1-11	Corral Beach at Corral Canyon Crk	0	0	9	2	17	3
SMB O-2	Puerco Beach at Puerco Cyn	0	0	0	0	6	1
SMB 1-12	Puerco Beach at Marie Cyn	0	0	9	2	17	3
SMB MC-1	Malibu Point at west end of Surfrider Beach ²	0	0	9	2	17	3
MCW-1 ³	Malibu Creek at PCH	9	2	-	-	17	3
SMB MC-2	Surfrider Beach at Malibu Lagoon breach	0	0	9	2	17	3
SMB MC-3	Malibu Pier at Surfrider Beach ²	0	0	9	2	17	3
SMB 1-13	Carbon Beach at Sweetwater Cyn	0	0	9	2	17	3
SMB 1-14	Las Flores Beach at Las Flores Crk	0	0	6	1	17	3
SMB 1-15	Big Rock Beach at Piedra Gorda Cyn ²	0	0	9	2	17	3
SMB 1-16	Las Tunas Beach at Pena Cyn	0	0	3	1	14	2
SMB 1-17	Las Tunas Beach at Tuna Cyn	0	0	7	1	12	2
SMB 1-18	Topanga Beach at Topanga Cyn	0	0	9	2	17	3

1. SMB MC-2, SMB 1-17, and SMB 1-18 are the only monitoring sites that are sampled approximately daily; all others are sampled weekly (on average).
2. SMB 1-2, SMB 1-3, SMB MC-1, SMB MC-3, and SMB 1-15 are open beach monitoring locations which are not associated with creeks or storm drain outfalls.
3. MCW-1 is also titled LVMWD (R-11). The Malibu Creek and Bacteria TMDL does not distinguish between summer and winter seasons for dry weather AEDs. Instead, the AEDs represent the total AEDs for all dry weather for the entire monitoring year.

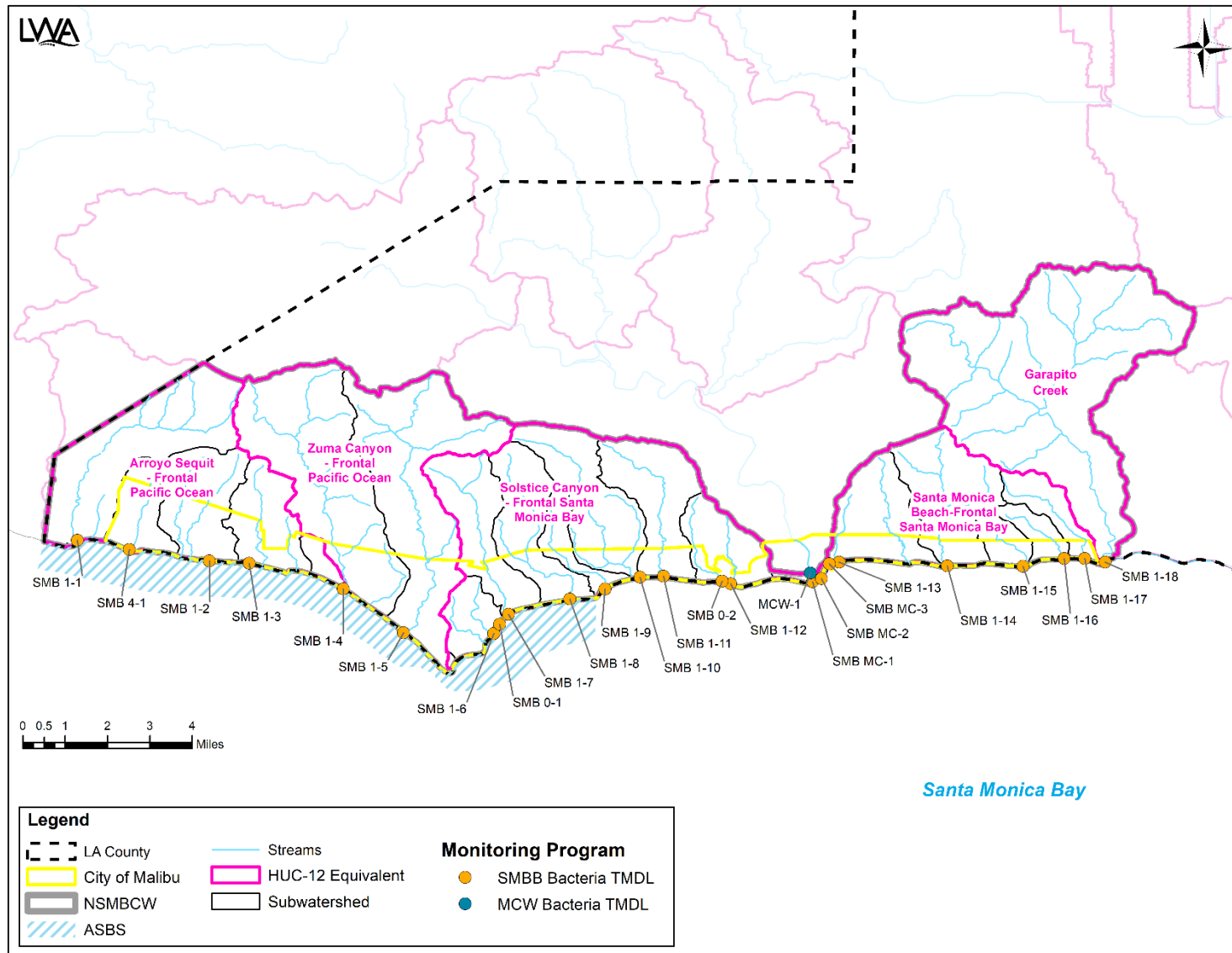


Figure 4. Monitoring Station Locations for NSMBCW EWMP Area Bacteria TMDLs



2.1.2 303(d) LISTINGS

The 2016 Clean Water Act (CWA) Integrated Report and updated 303(d) list were approved by the State Board on October 3, 2017 and by the USEPA on April 6, 2018. The 2016 303(d)-listed water bodies and associated pollutants within the NSMBCW EWMP area are summarized in **Table 6** below. Note that 303(d) listings addressed by a TMDL were presented in the previous section.

Table 6. 2016 303(d)-Listed Water Bodies in NSMBCW EWMP Waterbodies

Water Body	Pollutant Class	Pollutant
Solstice Canyon Creek	Miscellaneous	Invasive species
Topanga Canyon Creek	Metals/Metalloids	Lead
Malibu Creek	Hydromodification	Fish Barriers (Fish Passage)
	Metals/Metalloids	Selenium
	Toxicity	Toxicity
	Other Inorganics	Sulfates
	Miscellaneous	Invasive Species
Malibu Lagoon	Miscellaneous	pH
Santa Monica Bay	Metals/Metalloids	Arsenic
		Mercury

2.1.3 ASBS WATER QUALITY

The portion of the NSMBCW upstream of ASBS 24, shown previously in **Section 1**, is subject to additional discharge limitations intended to preserve natural water quality. As was discussed in **Section 1.1.3**, discharge of waste is prohibited by the California Ocean Plan, but an exception to this prohibition was granted by the State Board in 2012 to the City of Malibu, Los Angeles County, and LACFCD (General Exception). To qualify for the General Exception, discharges must demonstrate that they are not altering natural ocean water quality within the ASBS. The State Board's 2020 Order⁹, concluded that where data indicate that MS4 discharges may be causing or contributing to alterations of natural quality, they "must be addressed in the EWMP and RAA as Category 3 pollutants".

The General Exception's Special Protections outline how to determine whether discharges are causing or contributing to alterations of natural water quality. If during two consecutive monitoring events concentrations of a constituent are higher after a storm than before a storm and post-storm concentrations exceed the 85th percentile of the reference distribution (based on monitoring conducted by the Southern California Bight Regional Monitoring Program), then natural water quality is considered to be altered. MS4 discharges are determined to be causing or contributing to this alteration if discharge concentrations are also greater than the 85th percentile receiving water reference threshold.

As required by Part IV.B of the Special Protections, the City of Malibu and Los Angeles County conducted discharge and receiving water monitoring to determine whether discharges to the ASBS are causing or contributing to alterations of natural water quality. The results of this monitoring, which were

⁹ SWRCB, 2020, Order WQ 2020-0038

summarized previously in the ASBS 24 Compliance Plan (City of Malibu and LACDPW 2015) and in monitoring reports submitted to the Regional Board (City of Malibu 2016; LACDPW 2016), indicate that concentrations of the pollutants shown in **Table 7** were altered relative to natural conditions, and that MS4 discharges have the potential to cause or contribute to the alterations of natural water quality. **Figure 5** presents the locations of the receiving water monitoring locations (City of Malibu and LACDPW 2015). See **Appendix 1** for additional information and analysis related to identifying the constituents presented in **Table 7**.

Table 7. Constituents for which NSMBCW Discharges are Potentially Contributing to Alterations to Natural Water Quality within ASBS 24

Water Body	Receiving Water Monitoring Site	Pollutant ¹
Santa Monica Bay (within ASBS 24)	S-01	None
	S-02	Selenium
		Total PAHs
	24-BB-03R	Ammonia
		Selenium

1. As described in Section 2.2, local geology is a known source of selenium and PAHs may be a result of runoff from areas affected by fire.

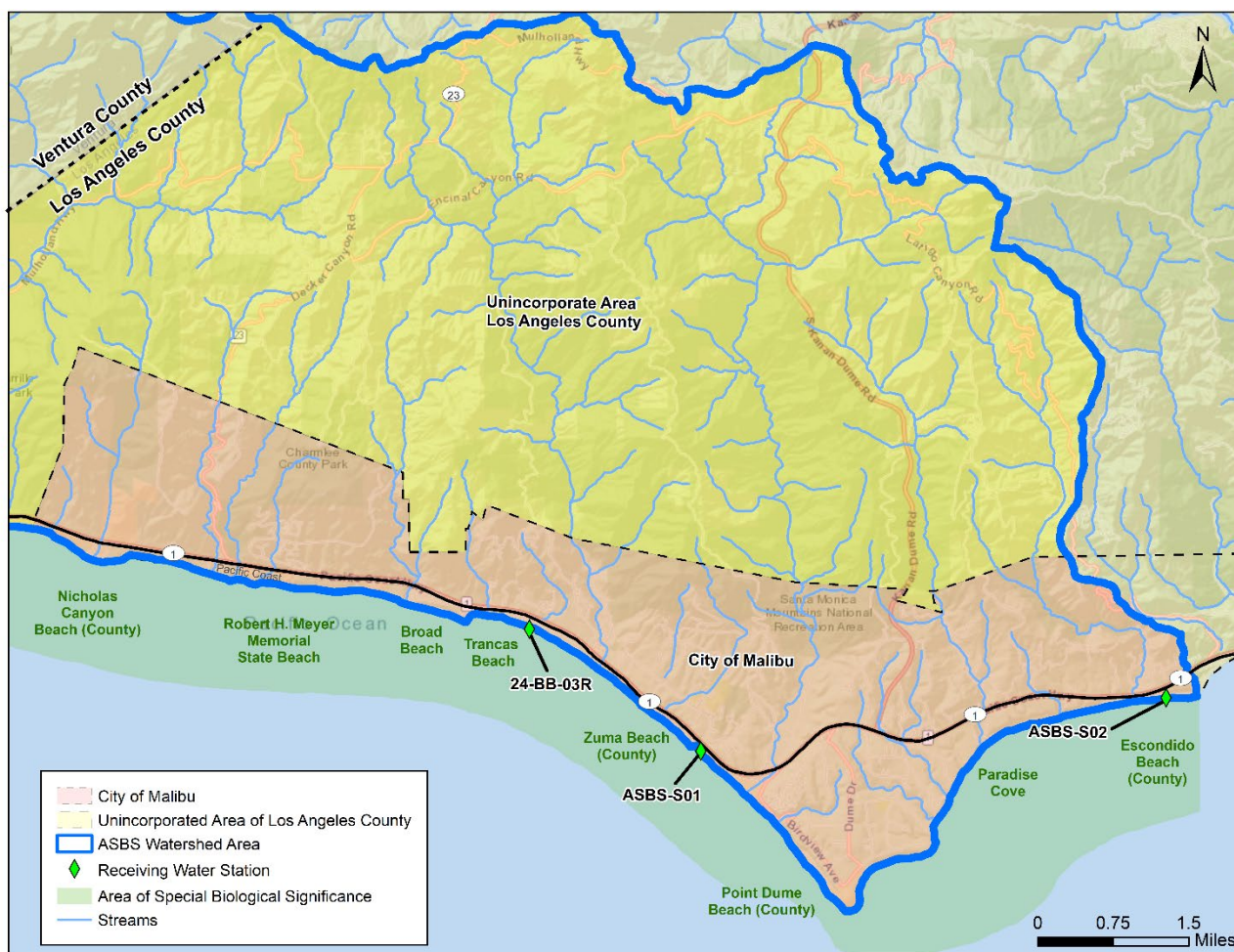


Figure 5. ASBS 24 Receiving Water Monitoring Locations



2.1.4 OTHER POLLUTANTS

In addition to considering TMDLs, the most recently approved 303(d) list, and water quality within ASBS 24, available monitoring data were reviewed with respect to applicable water quality objectives and criteria to characterize receiving water quality within the NSMBCW EWMP area. Available data collected by the NSMBCW CIMP and the Joint Powers Authority of the LVMWD/Triunfo Sanitation District were assessed to identify potential WBPCs that are not addressed by a TMDL or listed on the 303(d) list and that may need to be addressed as part of the EWMP. **Table 8** presents the results of this assessment.

Table 8. Other Potential Water Quality Priorities Based on Receiving Water Exceedances

Waterbody	Analyte	Weather Condition	Meets 303(d) Listing Policy
Malibu Creek	Ammonia-N	Dry	No
	Copper, Dissolved	Dry/Wet	No
Malibu Lagoon	Ammonia-N	Dry	Yes
	Bis(2-Ethylhexyl)phthalate	Dry/Wet	No
	Cyanide, Total	Dry	No
	Selenium, Total	Dry	No
Trancas Canyon Creek	4,4'-DDD	Wet	No
	4,4'-DDE	Wet	Yes
	4,4'-DDT	Wet	Yes
	Copper, Dissolved	Wet	Yes
	<i>E. coli</i>	Wet	Yes
	Total Chlordane	Wet	No
	Total PCBs	Wet	Yes
Topanga Canyon Creek	<i>E. coli</i>	Dry/Wet	No (Dry)/ Yes (Wet)

2.2 SOURCE ASSESSMENT

To complement the water quality prioritization process, the Permit requires that Permittees identify known and suspected stormwater and non-stormwater sources for WBPCs. The intent of the Source Assessment is to identify potential sources within the watershed for the WBPCs and to support prioritization and sequencing of management actions. In addition, the 2020 State Board Order sets out broad guidelines for what the State Board expects of a source assessment. The following subsections describe how the requirements of the MS4 Permit and guidelines provided in the 2020 State Board Order were met. Please refer to **Appendix 1** for detailed information.

2.2.1 SOURCE ASSESSMENT APPROACH

The following data sources were reviewed as part of the source assessment for the WBPCs presented in **Section 2.1**:

- Findings from the Permittees' Illicit Connections and Illicit Discharge Elimination (IC/IDE) 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 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.

Available information is considered relevant to the source assessment process based on the information's representativeness of conditions within the NSMBCW EWMP area. Given the Los Angeles region's unique characteristics, local information is considered to be most relevant, as it is most representative of conditions within the NSMBCW EWMP area. Relevant information was compiled to generate this source assessment for the purpose of identifying known and suspected stormwater and non-stormwater pollutant sources as they pertain to discharges to the MS4 and from the MS4 to receiving waters. Additional stressors relating to MS4 discharges that cause or contribute to the potential water quality priorities are also evaluated. Source information is used to identify the WBPCs for which the NSMBCW WMG may be causing or contributing, as well as to support the identification of appropriate BMPs and completion of the RAA.

2.2.2 SOURCE ASSESSMENT SUMMARY

The following provides a summary of the potential sources of the pollutants identified in the water quality characterization presented in **Section 2.1**. The source assessment and literature review conducted for the NSMBCW EWMP area is summarized in **Table 9**. Where source information specific to the watershed was unavailable, pertinent literature was utilized to provide for further assessment. Please refer to **Appendix 1** for detailed information, including MS4 outfall discharge data.



Table 9. Water Body Pollutant Source Assessment

Pollutant	Potential Sources
Indicator Bacteria	<ul style="list-style-type: none"> Human sources¹ – sanitary sewer overflows and leaks, on-site wastewater treatment systems (OWTS), illicit discharges and connections, homeless encampments, swimmers Non-human anthropogenic sources – waste from dogs, horses, and other domestic animals or livestock Non-anthropogenic sources – plants, algae, decaying organic matter, beach wrack, beach sands, creek and lagoon sediment, birds and other wildlife Dry weather runoff and stormwater from all developed and undeveloped land uses, which include and convey pollutants from origin sources listed above; this category includes MS4 permitted discharges as well as discharges from other sites and areas not covered under the Phase I MS4 Permit (e.g., Construction General Permit sites, Phase II MS4 General Permit sites, Caltrans' MS4s, State and Federal owned lands, other recreational areas, and private storm drains)
DDT and PCBs	<ul style="list-style-type: none"> Palos Verdes Shelf² Runoff from developed, undeveloped, and agricultural land uses
Trash	<ul style="list-style-type: none"> Litter from adjacent land areas Roadways Direct dumping and deposition Storm drains
Nutrients	<ul style="list-style-type: none"> Natural and legacy sources – decaying vegetation and organic litter, birds, tidal inflow, and release from lagoon sediments³ Human sources – sanitary sewer overflows and leaks, OWTS, illicit discharges and connections, homeless encampments, swimmers Non-human anthropogenic sources – fertilizer use, waste from dogs, horses and other domestic animals or livestock, and fertilizers and compost Dry weather runoff and stormwater from undeveloped and developed land (including agriculture, livestock, equestrian, and golf course areas), which include and convey pollutants from origin sources listed above Discharges from Tapia Water Reclamation Facility
Lead	<ul style="list-style-type: none"> Natural background soils Runoff from all developed and undeveloped land uses, including MS4 permitted discharges, as well as discharges from other sites and areas not covered under the Phase I MS4 Permit (e.g., Construction General Permit sites, Phase II MS4 General Permit sites, Caltrans' MS4s, State and Federal owned lands, other recreational areas, and private storm drains)
pH	<ul style="list-style-type: none"> Potentially driven by nutrient-related effects and sources
Dissolved Oxygen	<ul style="list-style-type: none"> Potentially driven by nutrient-related effects and sources
Selenium	<ul style="list-style-type: none"> Groundwater exfiltration and dissolution of minerals from northern tributaries of Malibu Creek, particularly areas with Monterrey Formation type geology (LVMWD, 2012)⁴
Sulfates	
Dissolved Copper	<ul style="list-style-type: none"> Runoff from all developed and undeveloped land uses, including brake pad wear Atmospheric deposition
Total PAHs	<ul style="list-style-type: none"> Atmospheric deposition from the combustion of fossil fuels, coal, oil, wood, gasoline, or other organic material Runoff from all developed and undeveloped land uses, including industrial and construction stormwater dischargers
Total Chlordane	<ul style="list-style-type: none"> Runoff from developed and agricultural land uses
Arsenic	<ul style="list-style-type: none"> Runoff from undeveloped, developed, and agricultural land uses Atmospheric deposition
Mercury	<ul style="list-style-type: none"> Runoff from undeveloped, developed, and agricultural land uses Laboratory contamination
Bis(2-Ethylhexyl)phthalate	<ul style="list-style-type: none"> Trash and debris Laboratory contamination



Pollutant	Potential Sources
Cyanide	<ul style="list-style-type: none"> Runoff from all developed land uses, including industrial facilities that do metal plating or finishing operations Atmospheric deposition from motor vehicle emissions Natural sources from incomplete combustion from forest fires, decomposition of plant material, and fungi

1. Monitoring results from multiple microbial source tracking studies conducted in surface waters in the NSMBCW EWMP area indicate that human fecal contributions are minor or non-existent (e.g., Dagit, et. al., 2014; Noble, et. al., 2005; Jay, et. al., 2011; Izbicki, et. al., 2012; findings summarized in City of Malibu, 2012).
2. The largest concentration of DDT and PCBs within Santa Monica Bay is contained within the Palos Verdes shelf, which is being addressed by the USEPA as a CERCLA site. Loadings from the shelf to the bay are large and have been well characterized (USEPA, 2012).
3. Sutula et al (2004) found that sediment enriched in particulate nitrogen and phosphorus was deposited in Malibu Lagoon during the wet season. These particulate nutrients were remobilized as dissolved inorganic nutrients to the surface waters during dry season. The study reported that sediment release approximately equals 18% of the total nitrogen source and 5% of the total phosphorus source from other nonpoint source inputs to the Lagoon during the dry season (Sutula et al, 2004).
4. Undeveloped areas with Monterey/Modelo Formation geology are a significant nonpoint source of phosphate within several subwatersheds in the upper Malibu Creek Watershed (LVMWD, 2012).

The findings of the TMDL source assessments and stormwater and non-stormwater discharge data collected by the NSMBCW EWMP Group as part of its CIMP were extremely helpful in evaluating the potential for discharges from the MS4 to contribute to WBPCs and identify water quality priorities (**Section 2.3**). While studies characterizing the quality of discharges from various land uses have been conducted globally, the land use discharge data which are most relevant are data collected within the Los Angeles region. As such, the available land use discharge data collected by the LACFCD and the Southern California Coastal Water Research Project (SCCWRP) were also utilized to support the identification of priorities and as inputs to the modeling tools utilized to identify BMPs and conduct the RAA. As further detailed in **Section 4**, WMMS2 is the modeling system used for the RAA. The Loading Simulation Program in C++ (LSPC) component of WMMS2 is a process-based watershed modeling system for simulating watershed hydrology, sediment erosion and transport, and water quality processes from both upland contributing areas and receiving streams (Shen et al. 2005). The NSMBCW stormwater and non-stormwater discharge data and land use discharge data were used in the calibration and validation of the LSPC model which produced the NSMBCW-specific land use modeling results, which in turn further supported identification of priorities. Additionally, WMMS2 also considers the MS4 infrastructure and outfalls as part of the identification and optimization of BMPs. A review of the NSMBCW EWMP WMG's IC/IDE, industrial/commercial facilities, development construction, and public agency activities programs reported in the past five annual reports did not identify any specific pollutant sources in the NSMBCW EWMP area that could be utilized in the source assessment.

The information from the source assessment indicates that both anthropogenic and natural sources of pollutants contribute to WBPCs of interest. Information gathered for the source assessments identifies anthropogenic sources that include wastewater discharges, onsite wastewater treatment systems, runoff from residential and commercial areas, horses and livestock, golf courses, leaks and overflows from wastewater collection systems, and illicit connections. In addition to well documented natural sources of fecal indicator bacteria, the Monterey/Modelo Formation is composed of marine sediments that are natural sources of sulfate, metals, phosphorus, nitrogen and selenium. As groundwater discharges to surface waters in the NSMBCW EWMP area, minerals and metals leached from the Monterey/Modelo



Formation may contribute to water quality impairments. Although the effects of high levels of phosphorus and nitrogen in the NSMBCW EWMP area have not been fully assessed, research data supports the probability that receiving waters are impaired by natural groundwater discharges originating from the Monterey/Modelo Formation. Impairments are expected to be more likely to occur during the summer months. These natural sources of pollutants have the potential to affect the amount, configuration, and schedule of the watershed control measures to be implemented as a part of this EWMP.

2.3 WATER BODY-POLLUTANT PRIORITIZATION

WBPCs were categorized based on Permit Section VI.C.5.b. **Figure 6** provides a brief conceptual overview of the process used to categorize the WBPCs within the NSMBCW EWMP area as water quality priorities.

As shown in **Figure 6**, identified WBPCs were prioritized as Category 1, 2, or 3, in accordance with Section IV.C.5(a).ii of the Permit, to guide the implementation of structural and institutional BMPs. The three priority categories are defined as follows:

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

Table 10 presents the resulting classifications for the WBPCs within the NSMBCW EWMP area. WBPCs categorized below are subject to change through the EWMP's adaptive management process (as described in **Section 7**) based on future data collected as part of the CIMP or other monitoring programs.

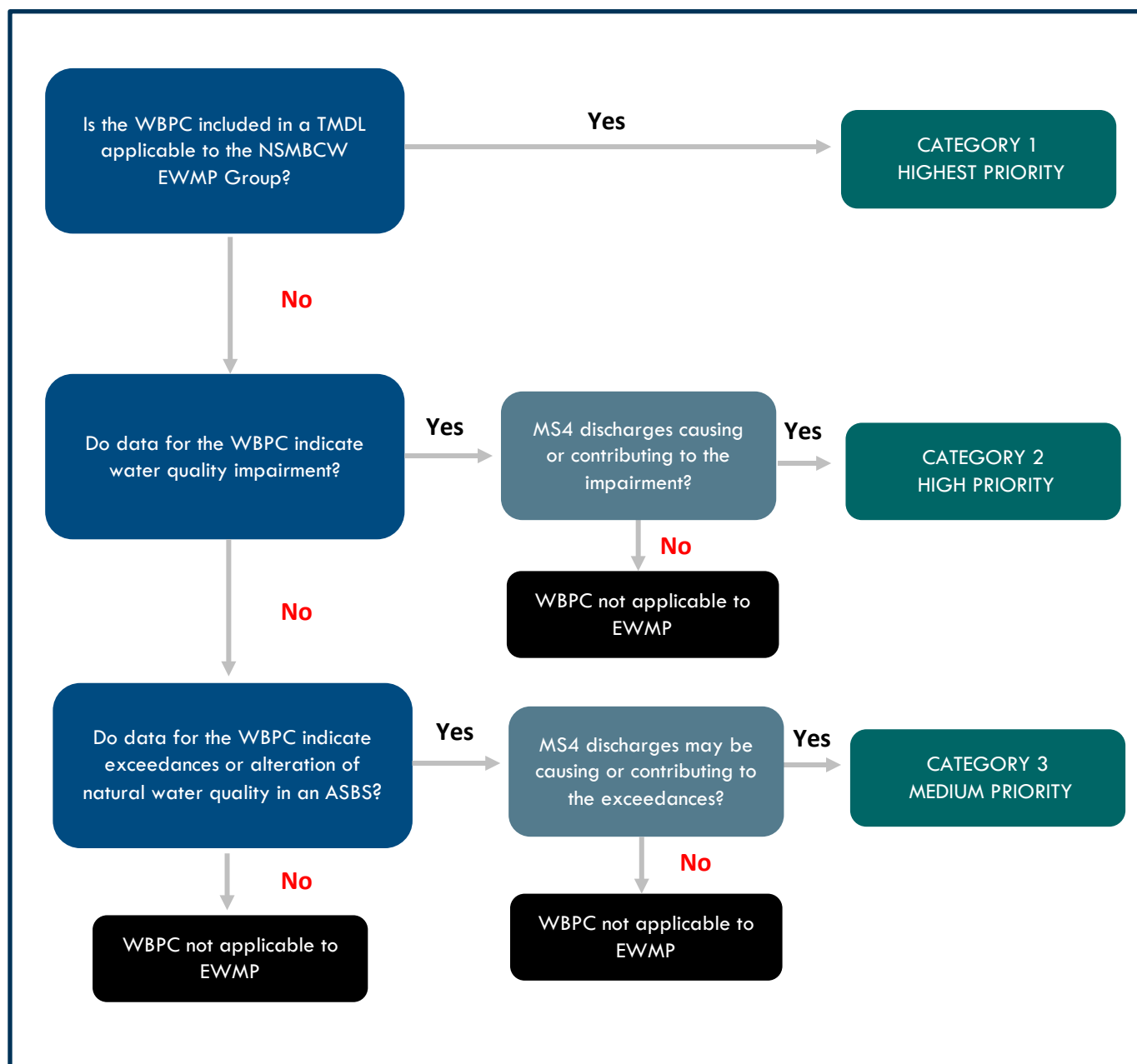


Figure 6. Process for Categorizing Water Body-Pollutant Combinations



Table 10. Water Body Pollutant Prioritization for the NSMBCW EWMP Area

Category	Water Body	Parameters Addressed	Basis
1	Malibu Creek	<i>E. coli</i>	Malibu Creek and Lagoon Bacteria TMDL
	Malibu Lagoon	Enterococcus	
		Fecal coliform	
		Total coliform	
	SMB Beaches	Enterococcus	SMBB Bacteria TMDL
		Fecal coliform	
		Total coliform	
	Malibu Creek and Lagoon	Algae (% coverage)	Nutrients TMDL and Benthic Community Effects and Sediment TMDL
		Ammonia	
		Benthic Community Effects ¹	
		Chlorophyll <i>a</i>	
		Dissolved Oxygen ¹	
		Scum/Foam (unnatural)	
		Sedimentation	
		Total Nitrogen ²	
		Total Phosphorus	
	SMB	Trash and Plastic Pellets	Marine Debris TMDL
		DDTs	DDTs and PCBs TMDL
		PCBs	
2	Malibu Creek	Selenium ³ (dry/wet)	2016 303(d) list
		Sulfates ³ (dry/wet)	
		Toxicity (wet)	
	Malibu Lagoon	pH ¹ (dry)	2016 303(d) list
		Ammonia-N (dry)	Exceedances meet 303(d) listing criteria
	Trancas Canyon Creek	4,4'-DDE (wet)	Exceedances meet 303(d) listing criteria
		4,4'-DDT (wet)	
		Copper, Dissolved (wet)	
		<i>E. coli</i> (wet)	
		Total PCBs (wet)	
	Topanga Canyon Creek	<i>E. coli</i> (wet)	Exceedances meet 303(d) listing criteria
	Santa Monica Bay	Arsenic ^{3, 4} (tissue)	2016 303(d) list
		Mercury ^{3, 4} (tissue)	
3	Malibu Creek	Ammonia-N (dry)	Exceedances do not meet 303(d) listing criteria
		Copper, Dissolved (dry/wet)	
	Malibu Lagoon	Bis(2-Ethylhexyl)phthalate ⁴ (dry/wet)	
		Cyanide, Total ⁴ (dry)	
		Selenium ³ (dry)	
	Trancas Canyon Creek	4,4'-DDD (wet)	
		Total Chlordane (wet)	



Category	Water Body	Parameters Addressed	Basis
3 (continued)	Topanga Canyon Creek	<i>E. coli</i> (dry)	Exceedances do not meet 303(d) listing criteria
	Santa Monica Bay (Site S-02)	Selenium ³ (wet)	MS4 discharges have the potential to contribute to altered natural water quality within ASBS 24
		Total PAHs (wet)	
	Santa Monica Bay (Site 24-BB-03R)	Ammonia (wet)	
		Selenium ³ (wet)	

1. Exceedances not based on a pollutant.
2. Organic + Inorganic Nitrogen
3. May not be the result of MS4 discharge due to potential for natural sources to be causing exceedances.
4. May not be the result of MS4 discharge due to potential for sampling and/or laboratory contamination.

The prioritization of the WBPCs guides both the selection of watershed control measures and the EWMP implementation schedule. The “Highest Priority” water bodies in the NSMBCW EWMP area are the primary focus of the NSMBCW EWMP and have a significant effect on the type, size, and implementation timing of the watershed control measures included in the NSMBCW EWMP implementation schedule. The NSMBCW EWMP prioritization approach (as shown on **Figure 6**) is consistent with the criteria in the MS4 Permit.

A few WBPCs within the NSMBCW EWMP area are included on the 2016 303(d) list but are not included in **Table 10** and are not directly addressed as part of this EWMP. These WBPCs, and the reasoning for excluding each, are as follows:

- WBPCs not related to MS4 discharges: Invasive species in Solstice Canyon Creek and Malibu Creek and fish barriers in Malibu Creek.
- Lead in Topanga Canyon Creek: There were no exceedances observed in 19 data points collected between 2016 and 2020. The original listing data are not available for inclusion in the analysis. Given that lead concentrations have been declining since the removal of lead from gasoline in 1991, and there have been no exceedances observed in the past five years, lead is not identified as a water quality priority.

3. Watershed Control Measures

The NSMBCW EWMP Group has identified a suite of BMPs and implementation measures for the watershed to address the water quality priorities. These BMPs and implementation measures are referred to in the Permit as watershed control measures. The following sections identify the existing and planned control measures in the watershed, as well as the approach to, and prioritization of the identified additional control measures.

3.1 STRATEGY AND APPROACH

An optimized BMP implementation strategy was developed for the NSMBCW EWMP based on water quality improvement, constructability, multiple benefits, and cost. Conceptually, this strategy is shown in **Figure 7** as a BMP implementation hierarchy. Here, non-structural BMPs (❶, **Section 3.2**) and existing and planned projects (❷, **Section 3.3**) form the basis of the cost-benefit curve. As described in the sections below, these projects are implemented earliest in the watershed (some are currently implemented). Next, additional control measures (regional BMPs, green streets, and Low Impact Development (LID) [❸, ❹, and ❺, **Section 3.4**]) are implemented until the cumulative pollutant reduction of all BMPs are able to meet water quality targets.

This hierarchy provides a guiding principle for evaluating BMPs to meet water quality targets in the NSMBCW. The BMPs identified in this hierarchy were developed and evaluated for pollutant reduction and integrated into the RAA model that ultimately identifies which BMPs are needed.

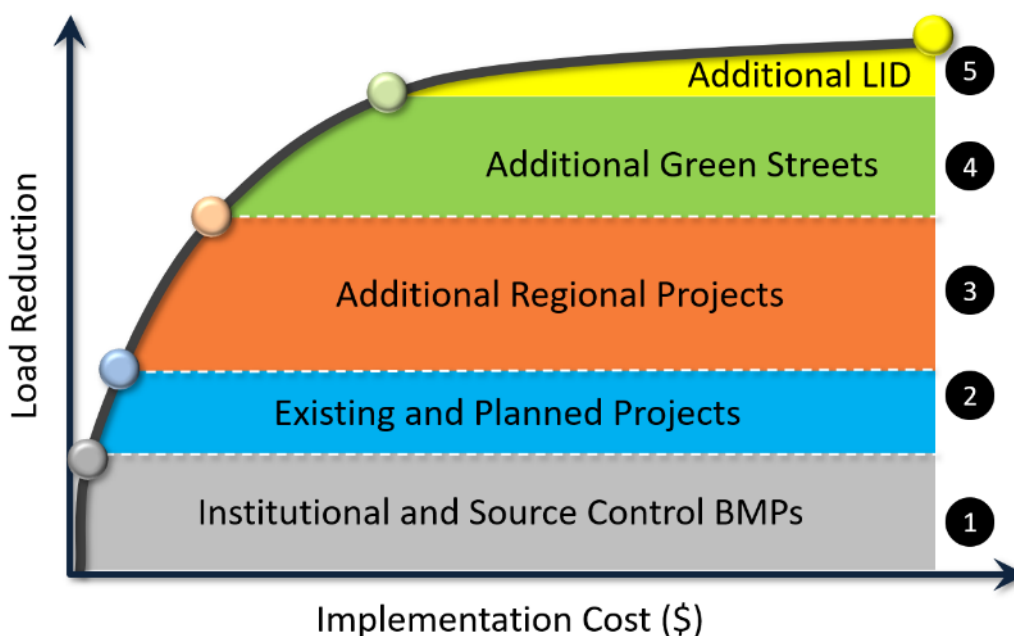


Figure 7. Overall Control Measures Hierarchy for EWMP



3.2 MINIMUM CONTROL MEASURES AND NON-STRUCTURAL BMPs

The Permit identifies minimum control measures (MCMs) that encompass six separate stormwater management program activities:

- Public Information and Participation Program (PIPP)
- Industrial/Commercial Facilities Program
- Planning and Land Development Program
- Development Construction Program
- Public Agency Activities Program
- Illicit Connections and Illicit Discharges Elimination Program

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

Summary assessments of each MCM contained in the Permit are provided in **Appendix 2**, including non-structural BMPs from the ASBS Compliance Plan, as well as a determination as to whether the NSMBCW EWMP Group will implement the MCM provisions as defined in the Permit, or whether modifications will be made. Additional (future) modifications may also be made through the adaptive management process, outlined in **Section 7**.

3.2.1 GENERAL FRAMEWORK FOR MCM CUSTOMIZATION

The following steps were used as a general framework to evaluate existing MCMs and develop the customized MCMs:

- Identify MCMs for potential customization. This may include identifying:
 - MCM requirements prescribed by the Permit which are not already being implemented by the permittee;
 - Currently implemented MCMs which have been enhanced over the previous Permit as part of TMDL implementation (e.g., Clean Bay Restaurant Certification Program);
 - Programmatic solutions/non-structural controls identified in TMDL implementation plans which may not yet have been implemented; and



- MCMs which are currently being implemented but which may be excessive in scope.
- Identify MCMs which are not applicable. A control measure may be eliminated based on the justification that it is not applicable to a particular permittee. For example, if it is the policy of a permittee not to use pesticides in public agency activities, then there is no need for tracking of pesticide use and this MCM may be proposed for elimination.
- Assess the effectiveness of the incremental baseline MCM requirements with respect to water quality priorities. The data necessary to quantify this will vary greatly by MCM, but may include information such as: receiving water quality, inspection and reporting records, number of qualifying projects (e.g., number of construction projects greater than 1 acre), number of pet station bags used, amount of material picked up by street sweeping activities, number of employees trained, and maintenance records. Additionally, the California Stormwater Quality Association (CASQA) provides a tool to estimate the effectiveness of stormwater management programs. The tool recommends possible assessment metrics that can be used for various stormwater programs.
- Quantify the additional resources required to implement the incremental baseline MCMs. This may include estimating additional staff resources in terms of full-time employees, consulting resources, and contracted services.
- Assess the effectiveness and resources required to implement the customized MCM. The process to quantify these will be the same as the process used to quantify the baseline effectiveness of the existing MCM.
- Compare the assessed effectiveness and resources required to implement the incremental baseline MCMs and the customized MCMs. Customization can be justified in several ways:
 - If the customized MCM effectiveness is equal to or greater than the baseline MCM, customization can be justified.
 - If an MCM requirement is not applicable, then elimination is justified.
 - If the incremental MCM requires additional resources that are disproportionate to the increased effectiveness achieved, then retention of the existing MCM may be justified.
- Document the customized MCM justification.

MCMs were evaluated based on their effectiveness in addressing the WBPCs specific to the EWMP area and based on the Group's 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 in the EWMP area. **Table 11** summarizes the proposed MCM modifications and enhancements for the Group. The Group will implement the remaining MCMs identified in Part VI.D of the Permit with no additional modifications. Per the Group's adaptive management approach, additional enhancements or modifications will be made on an as-needed and ongoing basis. An overview of all MCMs to be implemented by the NSMBCW EWMP Group and the WBPCs which they target is provided in **Appendix 2**. Unless otherwise noted, implementation of each MCM is the responsibility of each NSMBCW EWMP Agency, as applicable.



Table 11. MCM Modifications/Enhancements

2012 Permit Requirement	Modification/Enhancements	Justification for Modification
D.5 Public Information and Participation Program (PIPP)		
Develop and distribute public education materials on: vehicle fluids; household waste; construction waste; pesticides, fertilizers, and integrated pest management (IPM); green wastes; and animal wastes.	<p>PIPP enhancements including:</p> <ul style="list-style-type: none"> - “Living Lightly in Our Watersheds – A Guide for Residents of the SMB Watershed.” Copies of this guide are regularly distributed at public counters and events. A partnership project with the Resource Conservation District of the Santa Monica Mountains and other local agencies, this guide is currently being updated for print production, and a new website for presenting the information was launched in 2015. It can be found at www.livinglightlyguide.org. - Malibu is founding member and facilitator of the Malibu Area Conservation Coalition (MACC). MACC is a partnership of local government agencies, utilities, resource districts, and community stakeholders working within Malibu and the North Santa Monica Mountains that share the common goal of empowering local communities to conserve and protect natural and economic resources and habitat. Recognizing that watersheds, oceans, water and power generation and delivery systems do not stop at jurisdictional boundaries, the coalition is dedicated to providing effective programs, environmental education and outreach. The MACC does this by providing resources to the community to improve resource conservation, and eliminate non-point source pollution. Programs have included promoting the Surfrider Foundation’s Ocean Friendly Gardens program, providing rebates and incentives for conservation devices and landscape retrofits, hosting workshops and training, and installing demonstration gardens. - Malibu actively participates in the Malibu Chamber of Commerce environmental Committee which provides education/outreach and recognition to local businesses and the community through events, awards, workshops, and outreach campaigns. - Special focused outreach directly to the equestrian community in neighborhoods known to have increased equestrian uses or facilities. Including direct contact with properties, offers to conduct site evaluations, education and outreach to property owner associations, 	This is an enhancement.
Distribute public education materials at points of purchase including automotive parts stores, home improvement centers, landscaping/garden centers, and pet shops/feed stores.		



2012 Permit Requirement	Modification/Enhancements	Justification for Modification
	<p>and educational materials. A new equestrian facilities best management practices guidelines was developed in 2017.</p> <ul style="list-style-type: none"> - Malibu has conducted landscaper/gardener training and certification programs multiple times in both Spanish and English. - Malibu will assess the feasibility and effectiveness of additional program enhancements that are detailed in Appendix E Section 6.1 (ASBS 24 Compliance Plan). This includes an Enhanced Collaborative Environmentally Friendly Alternative Services Program and ASBS Signage at Beaches. Final implementation of programs determined to be feasible and effective will be subject to City Council approval. 	
D.6. Industrial/Commercial		
Educate - notify each facility in inventory of BMP requirements once per permit cycle	<p>Outreach material content and distribution will be focused on industrial/commercial facilities with the potential to contribute to pollutants identified as water quality priorities, specifically bacteria. For example, BMPs related to trash management will be highlighted in outreach material, and additional recommendations that exceed the minimum requirements for these BMPs will be encouraged.</p> <p>Additionally, Malibu is implementing an Enhanced Dumpster Enforcement Program. City staff work with property owners to ensure trash storage areas are in a clean sanitary condition with the lids closed and locked at all times. This enhancement prevents trash generated from illegal scavenging assists with meeting the requirements of the SMB Marine Debris TMDL and reduces the use of rodenticides.</p>	Outreach to industrial/commercial facilities will focus on water quality priorities to most effectively utilize resources.
Inspect critical commercial/industrial facilities twice during the 5 year permit term, including inspection of 25% of facilities with No Exposure Certification	The NSMBCW EWMP Group conducts inspections of commercial facilities within the NSMBCW EWMP area on an annual basis rather than twice per five years as required in the Permit. This includes annual inspections of food service establishments including restaurants, grocery stores, and coffee shops to reduce this type of business' impact on water quality due to stormwater and dry weather runoff. Malibu is a partner in the Santa Monica Bay Restoration Foundation's Clean Bay Restaurant Certification program that far exceeds the minimum requirements of the previous MS4 Permit. Inspections include a comprehensive 30+ point stormwater inspection checklist that must be met in order for the facility to be awarded a Clean Bay Restaurant Certification.	This is an enhancement.



2012 Permit Requirement	Modification/Enhancements	Justification for Modification
D.7. Planning and Land Development		
Update ordinance/design standards to conform with new requirements (LID and Hydromodification)	The City of Malibu exceeds the Permit's LID requirements by requiring LID implementation on more projects than otherwise required by the Permit. In addition, the City of Malibu implements a Local Coastal Program, which is certified by the California Coastal Commission, including a Land Use Plan (LUP) and Local Implementation Plan (LIP) that detail many environmental quality and protection standards, objectives, and implementation measures for new development and redevelopment projects. These include requirements for water conservation, protection of native vegetation, and landscaping with native vegetation. All landscape plans are reviewed by Malibu's contract biologist. A water quality mitigation plan is required for all planning priority projects along with additional projects, including: beachfront development that creates, adds, or replaces 2,500 sf or more of impervious area; projects that result in the creation, addition, or replacement of 2,500 sf that discharge directly to or adjacent to an ASBS or are tributary to an ASBS; and single family residential projects that create, add, or replace 5,000 sf of impervious surface area. Lastly, all new and redevelopment over 5, 000 square feet of impervious surfaces are required to Mitigate increased runoff rate due to new impervious surfaces through on-site detention such that peak runoff rate after development does not exceed the peak runoff of the site before development for the one hundred (100) year clear flow storm event.	This is an enhancement.
D.9 Public Agency Activities		
Develop retrofit opportunity inventory (within public ROW or in coordination with TMDL implementation plan); evaluate and rank	EWMP regional and distributed project selection process will be utilized to meet these requirements for public projects rather than implementing separate evaluations for retrofit opportunities. The Group will continue to encourage private retrofit projects through the following: <ul style="list-style-type: none"> • Retrofit projects on public land that treat runoff from private property; • Education and outreach; • Development plan review process; • Ordinance enforcement. 	Separate procedures are not needed as these considerations are incorporated into the EWMP control measure selection process.
Develop procedures to assess impact of flood management projects on water quality of receiving waters; evaluate to determine if retrofitting is feasible		
Evaluate existing structural flood control facilities to determine if retrofitting facility to provide additional pollutant removal is feasible		
Implement controls to limit infiltration of seepage from sanitary sewers to the storm drains	Implement controls to limit sewage discharges from OWTS to the MS4 by maintaining a Septic System Management Plan and Comprehensive Onsite Wastewater Treatment System Inspection and Operating Permit Program.	Due to lack of municipal sanitary sewer in the majority of the NSMBCW EWMP area, the MCM



2012 Permit Requirement	Modification/Enhancements	Justification for Modification
Implement routine preventative maintenance for both systems, survey sanitary sewer and MS4.		will be implemented where applicable, otherwise, the modified MCM will apply where OWTS exists.
Street sweeping - Priority A: 2x/mo; B: 1x/mo; C: as needed, not less than 1x/yr	<p>The current street sweeping program in the City of Malibu includes sweeping of all City streets monthly (even Priority C streets) and PCH weekly. Vacuum trucks will be used, where feasible.</p> <p>Malibu will assess the feasibility and effectiveness of additional program enhancements that are detailed in Appendix E Section 6.1 (ASBS 24 Compliance Plan). This includes Equipment Upgrades, Increased Sweeping Frequency, and an Infrastructure Priority Re-Evaluation Program to determine if increased cleaning may be appropriate. Final implementation of programs determined to be feasible and effective will be subject to City Council approval.</p>	This is an enhanced program.
Inspect and/or clean Permittee-owned parking lots at least 2x/month	The County has implemented an aggressive street sweeping program at County Beach parking lots by sweeping three to four times per week with enhanced sweeping equipment.	This is an enhanced program.
D.10 Illicit Connections and Illicit Discharges Elimination		
Install signage adjacent to open channels to provide info regarding public reporting	Implement signage in prioritized areas only, only in areas where the NSMBCW EWMP Group has local jurisdiction or land control.	Modify to focus on water quality priorities, and to limit signage requirements to enforceable locations.



3.2.2 ADDITIONAL PROGRAMMATIC CONTROLS

In addition to these MCMs, Malibu originally enacted its water conservation ordinance in December 1991 (the City had recently incorporated in March 1991) to prevent waste or unreasonable use of water—a consequence of which is the reduction of incidental residential runoff. In December 2009, Malibu enacted Ordinance No. 343 – Landscape Water Conservation Ordinance, to comply with the requirements of the Water Conservation in Landscaping Bill (AB 1881) of the State of California. The 2009 ordinance adopted by Malibu was deemed to be “at least as effective” as the “Model Water Efficient Landscape Ordinance” set forth by the California Department of Water Resources (DWR). The City went above the minimum requirements established by the DWR in this ordinance to capture more redevelopment projects and limit the amount of turf that could be installed, among other restrictions. On June 8, 2015, the City of Malibu adopted Ordinance No. 390, which enhances water conservation efforts by further restricting water of landscape and lawns; prohibiting residential car washing unless all wash water is retained on site. Similarly, the County adopted Ordinance No. 2008-00052U on October 7, 2008, establishing water conservation requirements for all unincorporated areas of the County. Among other requirements, the ordinance set forth a hose watering prohibition, established landscape watering requirements, and placed limits on vehicle washing procedures.

Consistent with Permit requirements, the NSMBCW EWMP Group has adopted laws to protect and improve water quality throughout the EWMP area. The NSMBCW EWMP Group has banned smoking on public beaches, the use of expanded polystyrene food packaging, and the distribution of plastic shopping bags. The bans on smoking in public places, expanded polystyrene food packaging, and plastic shopping bags are TMDL implementation measures identified in the Santa Monica Bay Debris TMDL. Additionally, plastic straws, stirrers, and cutlery as well as plastic sandbags are also prohibited.

Malibu plants native and drought resistant vegetation and utilizes water efficient irrigation systems at City owned or operated facilities to reduce water consumption and the need for applying chemicals on landscaping, with the exception of limited fertilizer application to turf on ball fields. All municipal parks, except Legacy Park, are managed with an evapotranspiration (ET) based irrigation system that tracks rainfall, evaporation, and transpiration to determine irrigation requirements. The system also applies programmed “Crop Coefficients” (plant growth habits) that automatically adjust irrigation to specific seasonal needs, and other programming options to minimize runoff and water puddles. Malibu has also undertaken outreach programs and installed pet waste disposal bag dispensers at public parks within the NSMBCW and the Malibu Equestrian Center.

The NSMBCW EWMP Group recognizes that opportunities may arise for the implementation of additional programmatic controls. These opportunities may include:

- True source control, such as removal of metals from brake pads and pesticide bans;
- Landscaper/gardener training and certification program;
- Enhanced street sweeping;
- Enhanced illicit connection program;
- Enhanced inspection and enforcement programs;
- Enhanced enforcement of litter ordinances; and



- Installation of additional trash cans or increased trash collection services in high trash generating areas.

During implementation of the EWMP, the NSMBCW EWMP Group members may consider opportunities to enhance institutional control measures.

3.2.3 PERMITTEE RESTORATION EFFORTS

In 2008, the City of Malibu restored the lower reaches of Las Flores Creek. The project included construction of a neighborhood park including a small playground, 1/3 mile of walking trails, and picnic areas. To preserve and naturalize the creek, non-native invasive vegetation was removed and over 45 varieties of native plant species were planted. A vegetated swale was also installed to mitigate runoff from the roadway.

3.2.4 CONSISTENCY WITH ASBS 24 COMPLIANCE ACTIONS

The baseline and enhanced MCMs and additional programmatic controls described herein are inclusive of all non-structural watershed control measures enumerated in the ASBS 24 Compliance Plan (**Appendix 3**). While some ASBS 24 compliance actions are addressed directly by a MCM (i.e., street sweeping, IDDE), others may fall less explicitly under more general MCMs. For example, the ASBS 24 Compliance Plan describes various PIPPs in place to encourage public cooperation in waste management and water conservation. While the PIPPs described in the ASBS 24 Compliance Plan (i.e., Clean LA website, Malibu Green Room website, Landscape Irrigation Efficiency Program, Cash for Grass) are not individually called out as specific MCMs, they fall under the NSMBCW agencies implementation of MCMs in Section VI.D.5 Public Information and Participation Programs. There are no ASBS-specific watershed control measures called out in the ASBS 24 Compliance Plan that are not implemented elsewhere.

3.3 EXISTING AND PREVIOUSLY PLANNED STRUCTURAL BMPs

The NSMBCW EWMP Group has been implementing stormwater management programs for over 20 years, and many BMPs have already been implemented in the EWMP area. These implementation efforts have included construction of distributed and regional BMPs. In addition, at the time of EWMP development, the Permittees had identified multiple structural BMPs that were desirable for inclusion in the EWMP. A critical element of updating the EWMP was accounting for existing and already-planned BMPs. The following subsections identify the existing structural BMPs in the watershed.

A review of the existing and planned structural BMPs identified several regional and distributed projects that are (or are planned to be) operated and maintained within the NSMBCW area. A comprehensive inventory of these projects was compiled for EWMP development, as follows:

- **Existing Distributed Projects (green streets and LID)** were characterized based on information received from the City and County as well as through review of annual reporting information contained in the Watershed Form for the City, County, and LACFCD. Additionally, BMPs installed within the County portions of the EWMP area were also identified through the Watershed Reporting and Adaptive Management Planning System (WRAMPS). WRAMPS is a web-based platform that serves as the key repository for data regarding existing and planned BMPs, storing information for over 14,000 BMPs across Los Angeles County (County).



- **Existing and Previously Planned Regional Projects** generally have a number of complexities not present in distributed projects (e.g., diversion structures, pretreatment devices, potential for multiple treatment pathways). Direct interaction with the Group informed how these projects were characterized (e.g., volume, location) for inclusion in the EWMP.

3.3.1 EXISTING DISTRIBUTED BMPs

Existing green streets and LID projects were identified through discussions with the City and County. When available, the information collected included:

- Location
- BMP type (LID or green street)
- Storage capacity and footprint (acre-feet and square feet)
- Drainage area (acre)

The County has 11 existing LID BMPs in the EWMP area, which were pulled from the WRAMPS database. The City provided a list of 171 approved water quality mitigation plans (WQMPs) which included address, Assessor's Parcel Number (APN) if available, and type (residential/commercial/agriculture). Detailed sizing information on WQMP projects was not available; however, for the purposes of completing the EWMP update, they were assumed to be sized to treat the 85th percentile storm from 0.25 acres of imperviousness for residential locations and 0.5 acres of imperviousness for commercial and agricultural locations. **Table 12** presents the cumulative summary of completed distributed projects that retain/treat runoff since the Permit effective day within the watershed.

Table 12. Cumulative Summary of Projects that Retain Runoff Completed Since the Permit Effective Date (from the 2019-2020 Annual Report)

Municipality	Number of New Development/Re-development Projects Completed Since 12/28/2012	Number of Other Projects Designed to Intercept Runoff Completed Since 12/28/2012	Area Addressed by Projects (acres)	Total BMP Retention Capacity of Projects Completed Since 12/28/2012 (acre-feet)	Estimated Total Runoff Retained for the Reporting Year (acre-feet)
City of Malibu	22	4	53.20	N/A*	N/A
County	11	0	27.89	0.55	4.96
Total	33	4	81.09	0.55	4.96

N/A – Not Applicable

* Onsite retention of the SWQDv for New Development/Redevelopment projects, as stated in Section VI.D.6.c.i.2 of the Permit, is impossible for most projects in the City of Malibu due to high groundwater, geotechnical hazards and geologic instability, or due to conflicts with adjacent onsite wastewater treatment systems. For similar reasons, offsite infiltration or bioretention is also usually infeasible. The only feasible option for most projects in the City of Malibu is onsite biofiltration.



Figure 8. Location of Existing and Planned Regional Projects



3.3.2 EXISTING AND PREVIOUSLY PLANNED REGIONAL BMPs

Multiple regional projects have been implemented in the EWMP area to protect water quality. To ensure these projects' details and design specifications are accounted for in the RAA, direct coordination with the Group took place over the course of the project. **Figure 8** presents the locations of identified projects and **Table 13** presents their attributes (e.g., volume, drainage area).

Table 13. Existing and Planned Regional Projects Incorporated into the EWMP

Project Name	Status	Total Drainage Areas	Total Capacity (ac-ft)	Treatment Process
Legacy Park	Existing	330	8	Detention
Wildlife Road BMP	Existing	7.9	0.05	Biofiltration
Trancas Canyon Park BMP	Existing	22	0.27	Biofiltration
Paradise Cove Treatment Facility	Existing	2,153	0.002	Treatment facility
Marie Canyon Treatment Facility	Existing	515	0.002	Treatment facility
Las Flores Creek Restoration and Park	Existing	2,764	0.19	Biofiltration
Broad Beach Road Biofiltration	Planned	12.3	9,956	Biofiltration
Viewridge Road Green Street	Planned	80	3.93	Green street
Marie Canyon Green Street (S1-12)	Planned	93	0.10	Green street

3.3.3 EVALUATION OF POTENTIAL INTEGRATION WITH CAPITAL IMPROVEMENT PROJECTS

Ongoing infrastructure planning efforts were evaluated to identify stormwater BMP project opportunities that could be integrated into planned and funded future capital improvement efforts. Integrating stormwater BMPs into planned efforts is expected to allow for more cost and time-effective implementation of infrastructure when compared to retrofitting treatment infrastructure into urban landscape as individual capital projects. Integrated stormwater projects leverage and “piggy-back” on existing design and construction efforts to get BMPs implemented and, critically, often take advantage of the short period of time when infrastructure is being realigned. Integrating projects into existing capital improvement efforts therefore requires staff time to incorporate relevant elements into the design phase followed by securing additional funding for incremental increase in the overall integrated project cost. If, as an example, a major arterial is scheduled to be widened, stormwater BMPs could be incorporated into plans to push back sidewalks and realign drop inlets at a significantly lower cost, outlay of time, and disruption to traffic than retrofitting the same infrastructure into a road that had been widened a few years earlier.

The infrastructure projects outlined in the City of Malibu Department of Public Works Five Year 2019-2024 Capital Improvement Plan (Malibu CIP) were reviewed and eleven potential opportunities for stormwater BMP integration were identified. All of the integrated project opportunities fall under the "Street



Improvements" heading within the Malibu CIP. Potential opportunities largely consist of a BMP footprint area that appears to be unutilized or underutilized based on a review of current and historical satellite imagery in the right of way of a street segment identified in the "Street Improvements" heading of the Malibu CIP. Projects identified in the Malibu CIP falling under the "Drainage" heading were not evaluated in the integrated BMP identification approach as they have already been incorporated into the previous or revised EWMP. Potential integrated projects within the Legacy Park regional drainage area were also excluded as the area is deemed to be in compliance.

An overview of potential integrated stormwater BMP projects is presented in **Table 14**. The EWMP Implementation Plan ultimately did not include any of these projects but they may be considered over the course of adaptive management.

Table 14. Potential CIP Integration Opportunities within City Portion of NSMBCW Area

Project Name	Project ID	Description of Potential City CIP Integration Opportunity
Broad Beach Rd. 1	BB_1	Integration of stormwater control measures into CIP Annual Street Maintenance project 9002 in the southern right of way Broad Beach Rd. west of the eastern intersection with Seaford Dr. Stormwater control measures are expected to treat 0.11 acres of single-family residential land use.
Broad Beach Rd. 2	BB_2	Integration of stormwater control measures into CIP Annual Street Maintenance project 9002 in the northern right of way Broad Beach Rd. east of the intersection with Bunnie Ln. Stormwater control measures are expected to treat 0.03 acres of single-family residential land use.
Broad Beach Rd. 3	BB_3	Integration of stormwater control measures into CIP Annual Street Maintenance project 9002 in the southern right of way Broad Beach Rd. west of the intersection with E. Sea Level Dr. Stormwater control measures are expected to treat 0.06 acres of single-family residential land use.
Kanan Dume Rd. 1	KD_1	Integration of stormwater control measures into CIP Kanan Dume Road Widening project 9076 on the east side of the north bound lane of Kanan Dume Rd. just north of the intersection with Pacific Coast Highway. Stormwater control measures are expected to treat 0.59 acres of low density single-family residential land use.
Kanan Dume Rd. 2	KD_2	Integration of stormwater control measures into CIP Annual Street Maintenance project 9002 on the east side of the north bound lane of Kanan Dume Rd. just north of Teal Terrace. Stormwater control measures are expected to treat 0.27 acres of single-family residential land use.

3.4 ADDITIONAL STRUCTURAL CONTROL MEASURES

This section describes the process for identifying and screening additional structural BMPs for their inclusion into the EWMP. The identification and sizing of these additional structural BMPs is the most involved element of the RAA and EWMP strategy development, as it involves a series of steps to identify potential locations, options for BMPs at those locations, unit costing to account for potential BMP sizes and finally a BMP optimization framework with WMMS2 to consider all the potential alternatives and



select the cost optimal strategy. In other words, the EWMP strategy was not developed with traditional scenario modeling – instead, an array of options evaluated within an optimization framework using WMMS2 to select the combination of BMPs for the EWMP. A detailed BMP menu formulation and opportunity screening process was used to identify the various structural BMP alternatives that were evaluated prior to selection of the EWMP strategy. The BMP menu and opportunity screening process included the following:

- **BMP Menu and Model Parameter Development:** With guidance and feedback from the City and County, a suite of BMP types and configurations were developed for potential implementation.
- **Opportunity Area Identification:** Opportunity areas are locations (i.e., parcels and roadways) where proposed BMPs could be implemented. For example, a BMP could be implemented in a public park or a publicly owned right of way. The identification process utilized publicly available datasets for characterizing individual area attributes (e.g., Los Angeles County Assessor’s Parcel Database).
- **BMP Screening:** Not all portions of an opportunity area are feasible for BMP implementation. For example, the presence of high slopes, buildings, and other constraints may eliminate large areas within an opportunity area. In this analysis, these “no go” zones were screened out and removed from the opportunity area boundary. The remaining areas are predominantly flat, open spaces where BMPs could be sited (i.e., potential BMP footprints).
- **Cost estimates.** A key component of the cost-benefit curve in **Figure 7** an accurate assessment of costs needed to construct and maintain the identified BMPs. Life-cycle costs have been summarized from WMMS2 and applied to the identified projects.

Figure 9 provides a conceptual illustration of the process described above. Here, a park is identified, screening criteria are applied, and open space and parking lots are identified as potential BMP implementation areas. The follow subsections describe this process and describe this process and its data sources in detail.

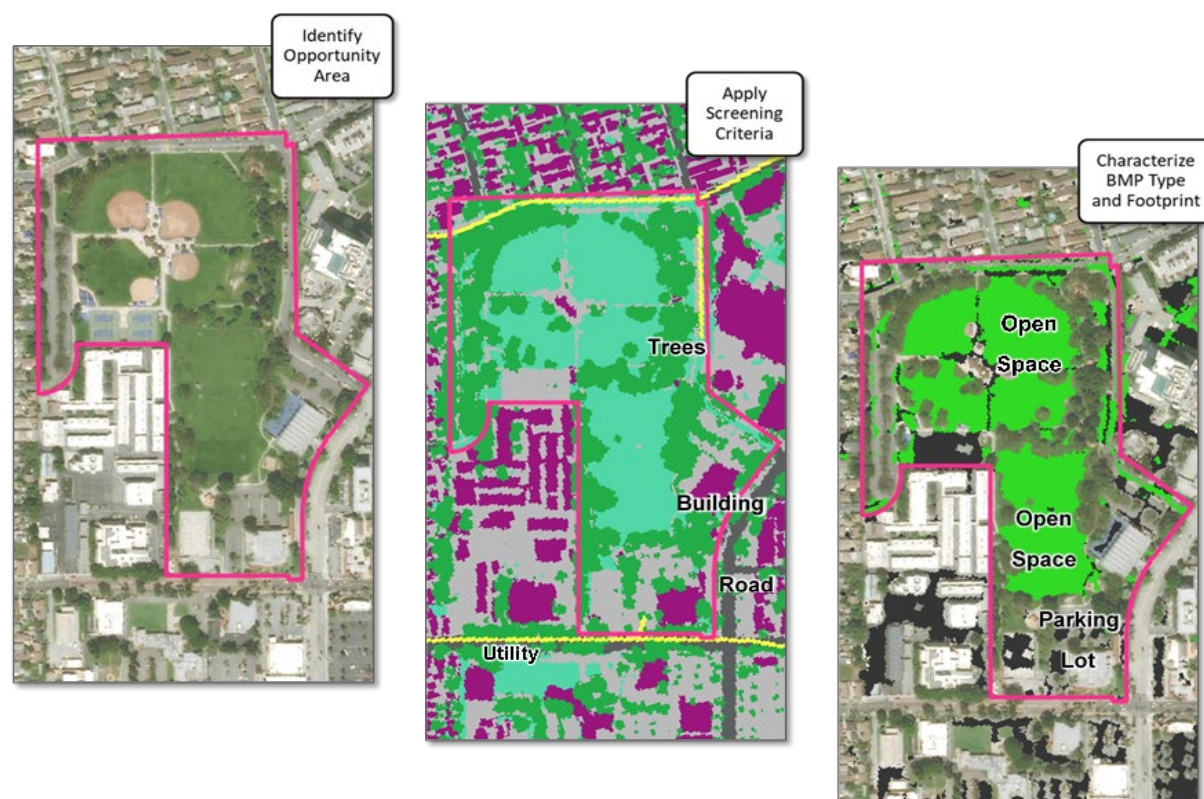


Figure 9. Conceptual Illustration of the Process for Identifying, and Screening Additional BMPs

3.4.1 BMP MENU FOR EWMP IMPLEMENTATION PLAN

The EWMP includes a targeted BMP menu to address water quality priorities and the unique conditions of the NSMBCW. The BMP menu includes regional BMPs to capture and treat runoff from the coastal areas. **Table 15** lists these BMP types and configurations, while **Figure 10** presents example images of select BMPs from the BMP menu.

Appropriately and accurately representing these BMPs for the EWMP and RAA relies on several considerations, including typical facility dimensions, infiltration rates, treatment processes present, among others. To accomplish this, a standard set of design values and parameters (e.g., ponding height, media percolation rate, underdrain depth) were developed for each BMP. Sources for these values originated from predominantly local projects and/or guidelines. **Figure 11** through **Figure 13** provide factsheets for three example BMPs: surface infiltration, surface biofiltration and subsurface filtration.



Table 15. BMP Menu for NSMBCW EWMP and Typical BMP Types

BMP Category	Type	Description	Typical BMP Types	Runoff Management Mechanism
Regional Infiltration or Treatment	Roadway Capture	Road right-of-way represents a majority of the available public land in the EWMP area. The BMP screening process identified roadways near overland flow paths could be used as sites for regional BMPs either underneath or adjacent to the road. With this approach, the roadway is used as a footprint for regional BMPs that treat relatively large areas, rather than the typical “green street” configuration that only managed runoff from the road and nearby parcels.	Surface Infiltration Subsurface Infiltration Subsurface Treatment	Infiltration to native soils Filtration through modular cartridge units.
	Planned Green Streets	Several green street projects including projects in Marie Canyon and Viewridge Road (Topanga Canyon) have been previously identified by the Group. These projects are carried forward in the EWMP. The projects capture runoff from a moderate sized tributary area, not only the runoff from the road.	Bioretention/ filtration	Infiltration to native soils or filtration through media
	Canyon Projects	For a few Priority Areas, siting opportunities near the outlet (but not under the roadway) were identified that may be suitable for capture runoff prior to discharge to the beach.	Surface or subsurface treatment	Filtration through modular cartridge units.

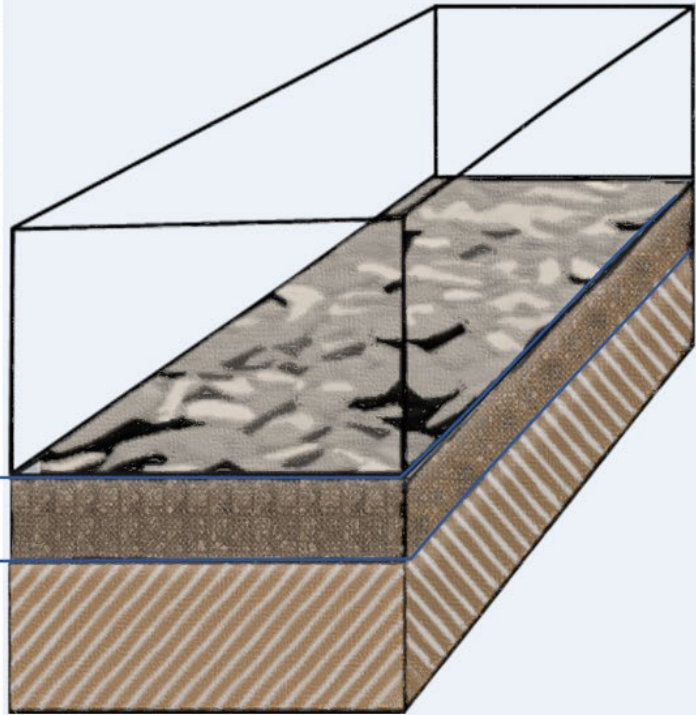


Figure 10. Example BMPs within the Menu used for the EWMP

Subsurface infiltration (top left), modular filtration (top right), surface bioretention (bottom)



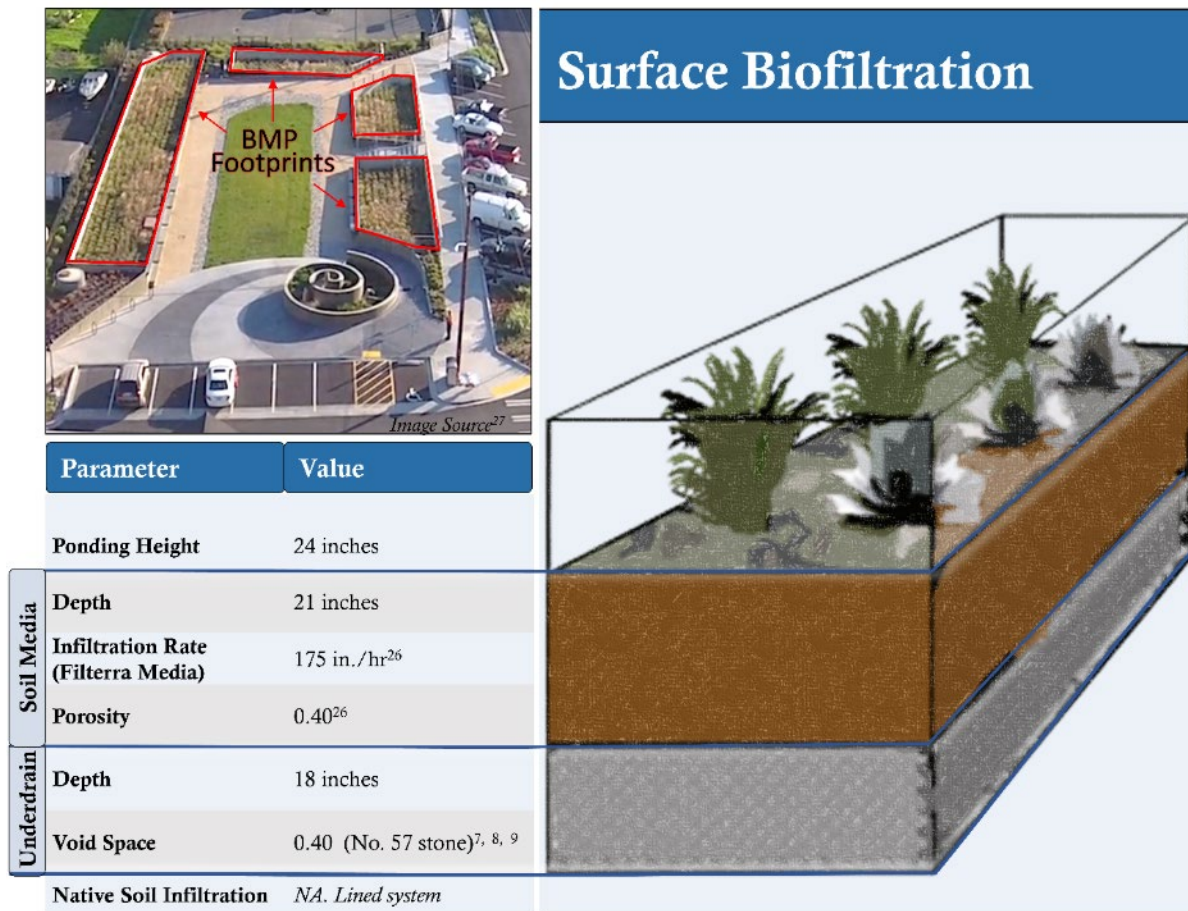
Surface Infiltration



Parameter	Value
Ponding Height	3.5 feet ²⁸
Depth	4 inches ²
Void Space	0.38 ¹⁸
Native Soil Infiltration	Site Specific

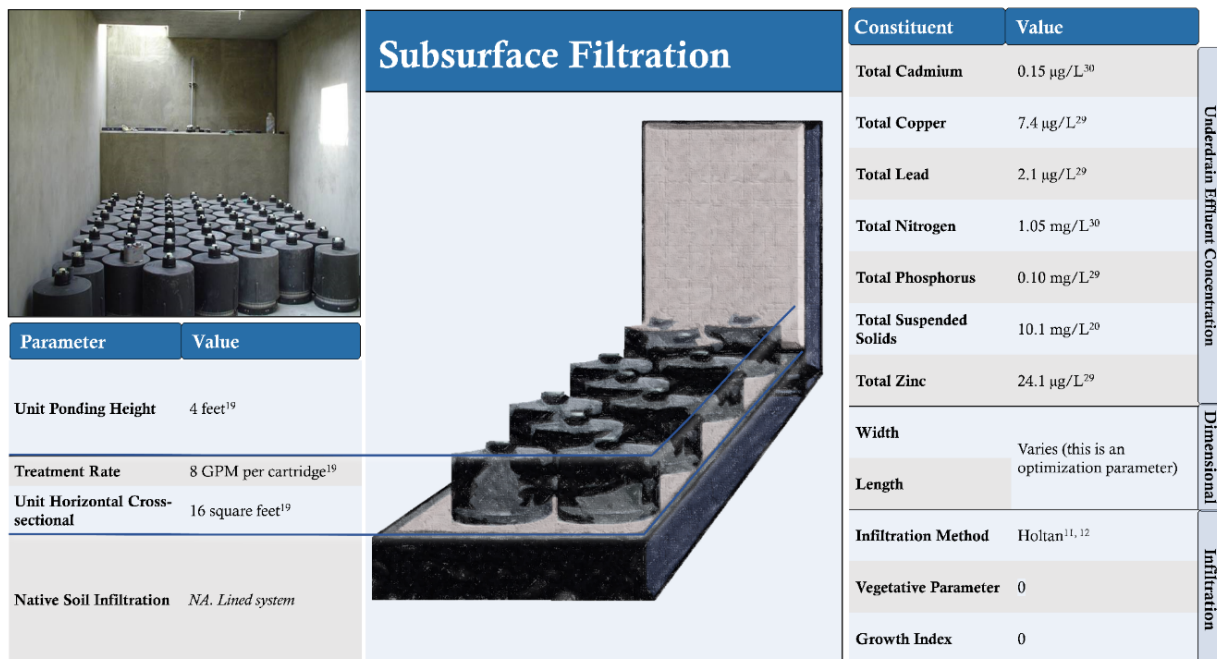
2 LACPW 2014 11 Holtan *et al.* 1967 12 Frere *et al.* 1975 18 Allen 1985 28 SMC Water Pollution Prevention Program 2020

Figure 11. Design and Modeling Parameters for Regional Surface Infiltration



7 OCPDW 2011 8 Riverside 2018 9 City of LA 2018 11 Holtan *et al.* 1967 12 Frere *et al.* 1975 26 Contech ES 27 Northwest Cascade 2016 28 State of WA 2019a

Figure 12. Design and Modeling Parameters for Regional Surface Biofiltration



¹¹ Holtan *et al.* 1967 ¹² Frere *et al.* 1975 ¹⁹ Bio Clean Environmental 2018b ²⁰ State of WA 2019b ²⁹ SCCWRP 2019 ³⁰ WERF 2017

Figure 13. Design and Modeling Parameters for Regional Subsurface Filtration

3.4.2 OPPORTUNITY AREA IDENTIFICATION

Opportunity areas are the locations (e.g., parcels) where BMPs from the BMP menu could potentially be implemented. Ideal locations are generally characterized as those with open spaces large enough for a BMP footprint to be sited (e.g., a baseball field in a park or a large right of way along a road). The identified opportunity area types and their specific reasoning for inclusion are listed in **Table 16**.

Table 16. Opportunity Areas Considered in the NSMBCW EWMP

Opportunity Area	BMP Types that Could be Sited on Opportunity Area	Reasoning for Inclusion
Roadways	Regional Infiltration and Treatment	The area beneath and adjacent to roads provide some of the most ubiquitous opportunity sites in the area.
Municipal parcels	Regional Infiltration and Treatment	Municipally owned parcels provide an excellent opportunity and generally considered to have relatively fewer implementation challenges.

The following subsections provide descriptions of the data sources and processes used to characterize the opportunity areas and develop projects for the EWMP Implementation Plan.

3.4.3 BMP SCREENING

Some portions of an opportunity area will not be feasible for BMP implementation (e.g., areas with high slopes). To characterize “no go” zones within each of the identified opportunity areas, or other limiting factors, three sets of screening criteria were developed and used to pare down the identified opportunity areas into actual available footprints for regional BMPs:



- Setbacks
- Proximity
- Soil/geologic

3.4.3.1 SETBACK CRITERIA

A minimum setback distance from buildings, trees, steep slopes, utilities, groundwater contamination, and waterbodies has been developed. These are listed and described in **Table 17**, and illustrated in **Figure 14**.

Table 17. Setback Criteria, Description, and Sources

Setback	Description and Source
Building	Building footprints were characterized from land cover imagery from the Los Angeles Region Imagery Acquisition Consortium (LARIAC 2014). According to LACDPW (2017a), setbacks from buildings for infiltration facilities should be at least 15-feet. As a conservative assumption, this setback is applied for all BMP types in the menu.
Tree Canopy	Tree canopy was characterized from land cover imagery from LARIAC (2014). To protect existing trees, a setback of 10-feet (i.e., tree protection zone) provided from the Los Angeles County Department of Parks and Recreation (LACDPR, 2011) is applied to tree canopy for all BMP types in the menu.
Steep Slope	Slopes were characterized from a digital elevation model (DEM) from LARIAC (2014). Setbacks are 50-feet from slopes greater than 20% for all surface BMPs in the menu.
Groundwater Contamination	Groundwater contamination sites are characterized by the California State Water Resources Control Board's (SWRCB, 2020) GeoTracker system. All active sites within this database had a 500-foot setback applied. This was a conservative assumption applied to all infiltrating BMP types.

3.4.3.2 PROXIMITY CRITERIA

The proximity criteria consist of a maximum distance from the opportunity area to the storm drain network and/or nearby overland flow paths. These criteria are imposed to limit the potentially high costs associated with implementing long stretches of pipe to convey water to/from the site. The proximity criteria are listed and described in **Table 18**.



Table 18. Proximity Criteria, Description, and Sources

Criteria	Description and Source
Storm Drain Network	Regional BMP opportunity areas not within 300-feet of a storm drain network gravity main, or similar, were screened out (LACDPW 2019a), unless they were adjacent to an overland flow path (below).
Overland Flow Paths	Regional BMP opportunity areas not within 200-feet of an overland flow path were screened out. Overland flow paths were determined for the EWMP area through a geoprocessing routine that estimated flow accumulation and direction.

3.4.3.2.1 Soil/Geologic Criteria

The soil/geologic criteria consist of a minimum infiltration rate for infiltrating projects and average slope for all projects. Additionally, a proximity criterion was applied to the shoreline to reflect likelihood of shallow groundwater preventing infiltration BMPs from being effective – see an example screened area in **Figure 14**. These constraints are listed and described in **Table 19**.

Table 19. Soil/Geologic Criteria, Description, and Sources

Criteria	Description and Source
Infiltration Rate	For infiltrating BMPs, infiltration rates of 0.3 in/hr or greater are necessary (LACDPW 2014). Soil infiltration rates are provided from the Natural Resources Conservation Service (NRCS 2019).
Slope	Surface facilities are not considered feasible on slopes greater than 20% (LADBS 2017). A conservative value of 15% was used in this screening analysis for surface regional facilities.
Shoreline	Due to the likely challenges associated with infiltration devices near-shore (i.e., high groundwater) any facility proposed within a 1,000 ft buffer of the shoreline was designated as a 120" per hr filtration device.

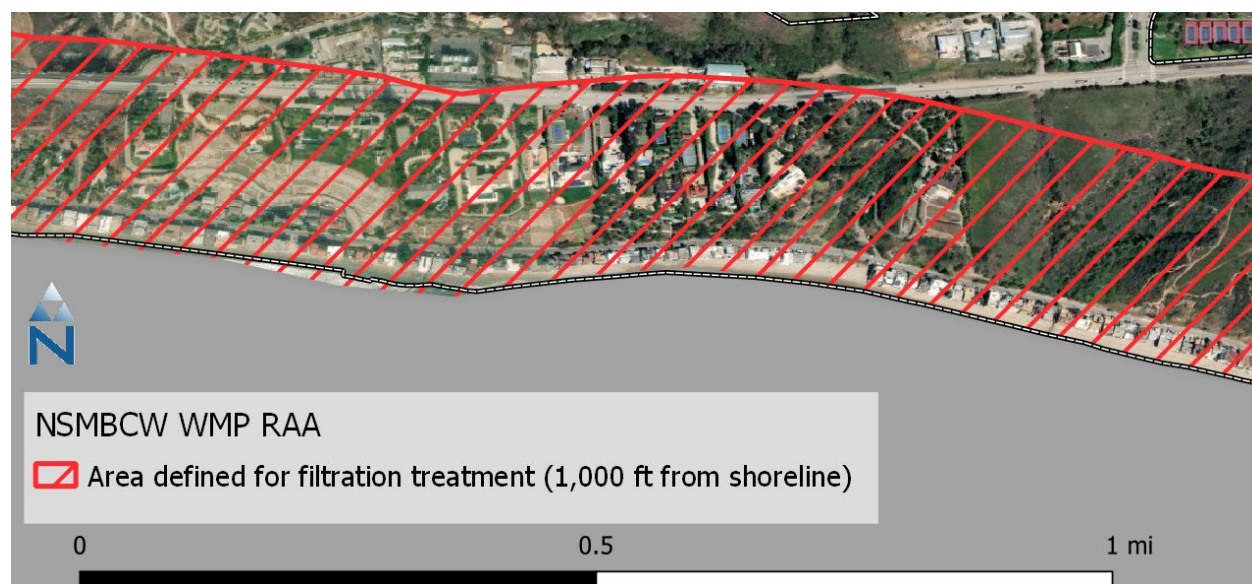


Figure 14. Shoreline buffer where potential opportunities for regional devices were limited to filtration

3.4.4 SUMMARY OF ADDITIONAL REGIONAL CONTROL MEASURES EVALUATED FOR THE EWMP IMPLEMENTATION PLAN

A total of 33 opportunities passed the identification and screening process described above and were added to three projects identified by the City and County during previous planning efforts and two existing regional projects (**Table 20**). These 38 projects are limited to the “Priority Areas” identified for the EWMP which are described in **Section 4.3**. The opportunities were used to evaluate BMP options for the EWMP Implementation Plan and to select projects that could address water quality priorities for the NSMBCW. The RAA determines the number of potential project opportunities needed to address the water quality priorities, using watershed and BMP modeling. **Figure 15** shows a map of the 38 opportunities carried forward for consideration during the RAA.

Table 20. Project Types and Opportunity Areas Evaluated for the EWMP Implementation Plan

Source of Identified Opportunity	Regional Treatment	Regional Infiltration ²
Identified Through Screening Process	11	22
Previously Planned Projects	3	-
Existing Projects	1	1
Total ¹	15	23

1. The projects within the EWMP Priority Areas (see Section 4.3), as those areas were the focus of screening.

2. In some areas within the NSMBCW, groundwater levels may inhibit the implementation of BMPs that solely rely on infiltration. In these areas, advanced filtration BMPs may be implemented in lieu of retention BMPs. During implementation, the decision to use treatment or infiltration will be determined on a site-by-site basis.

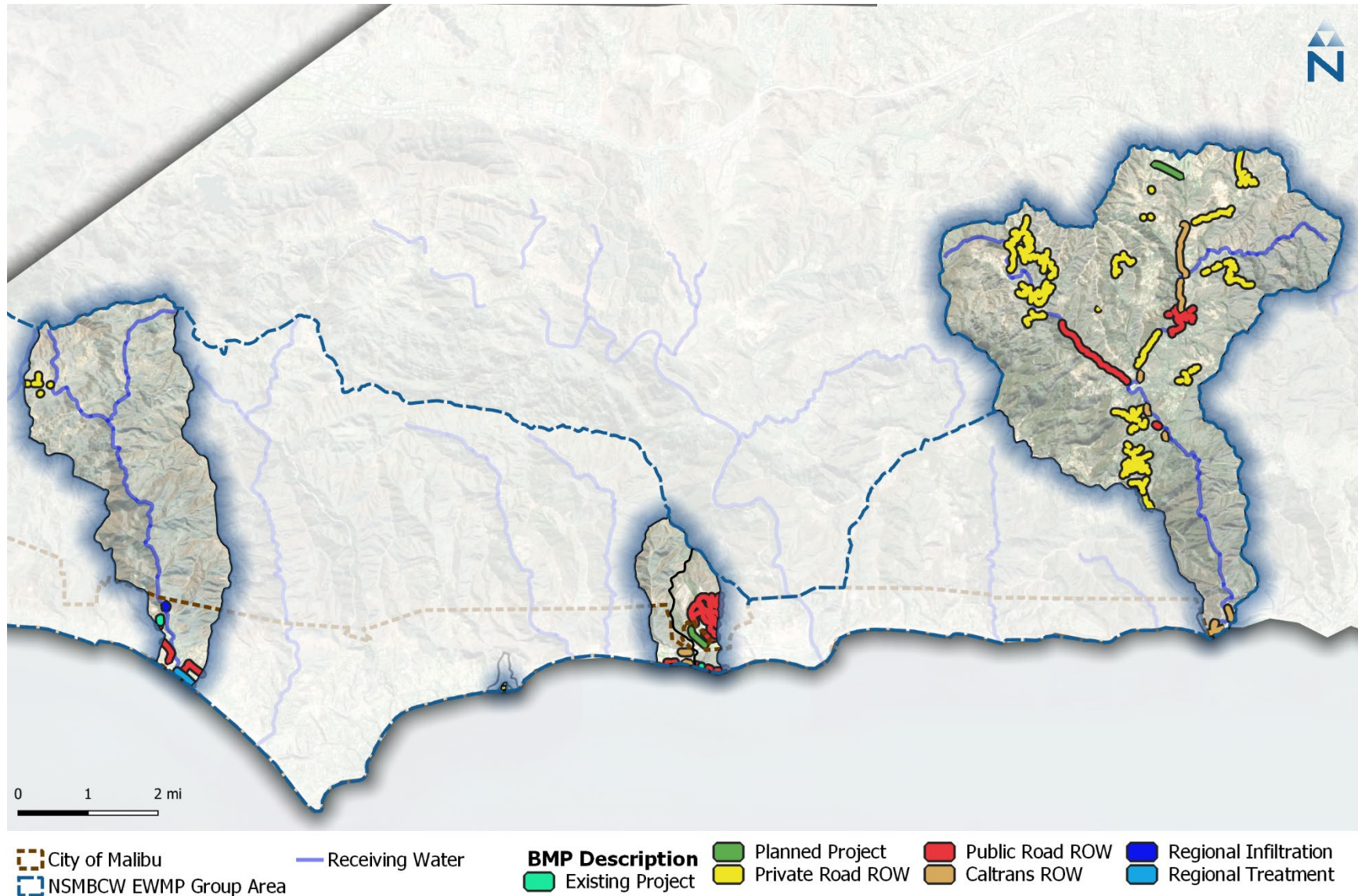


Figure 15. Identified BMP Opportunity Areas Considered for Inclusion in the EWMP Implementation Plan

3.5 BMP SELECTION & SIZING

Not all of the projects listed in **Table 20** and shown in **Figure 15** necessarily need to be implemented to address Water Quality Priorities. To assess which projects and sizing should be proposed for the most-cost effective implementation, the WMMS2 Optimization Framework ([LINK](#)) evaluates the BMP opportunities and their cost-effectiveness in combination with the existing and planned BMPs.¹⁰ **Figure 16** illustrates that WMMS2 optimization workflow, with each element representing a utility and step within the modeling workflow. **Section 4** describes the RAA which drives the structural control measures that are selected for the EWMP strategy for the NSMBCW.

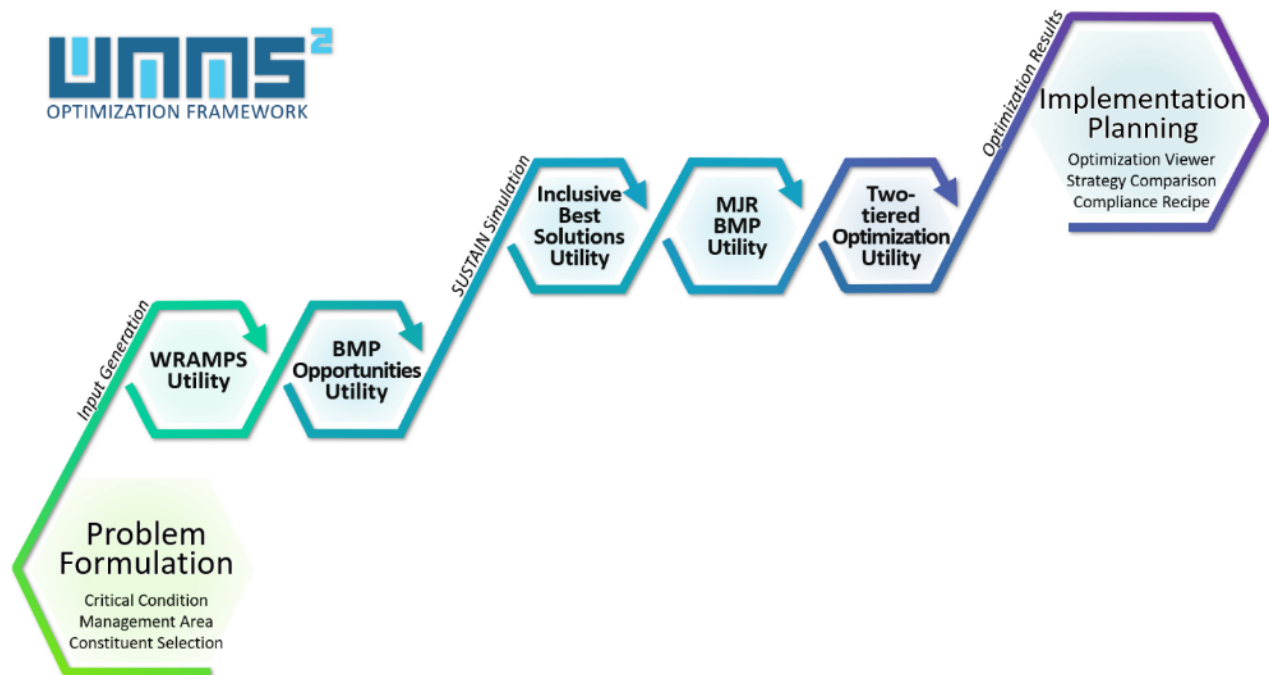


Figure 16. Conceptual Process Map of the WMMS2 Optimization Framework Utilities and Viewer

¹⁰ <https://portal.safecleanwaterla.org/wmms/utilities>



4. Reasonable Assurance Analysis

A key element of the EWMP is the RAA, which is prescribed by the Permit as a process to demonstrate “that the activities and control measures...will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term” (Permit section C.5.b.iv.(5)). While the Permit prescribes the RAA as a quantitative demonstration that control measures will be effective, the RAA also promotes a modeling process to support the EWMP Group with selection of control measures. The RAA is based upon the BMP opportunities identified in **Section 3**, in order to find the cost-optimal combination of BMPs to achieve the WQBELs/RWLs of the Permit. The RAA was used to evaluate the many different scenarios/combinations of distributed and regional control measures (described in **Section 3**) that could potentially be used to comply with the RWLs and WQBELs of the Permit and was then used to select the control measures specified in the EWMP Implementation Plan (described in **Section 5**).

It is acknowledged that while the RAA is a critical element of the EWMP, the content can be rather technical and some readers may wish to skip to **Section 5**, which describes the EWMP Implementation Plan (i.e., the outcome of the RAA, including the selection of the BMPs).

In 2021, the original RAA was updated through comprehensive enhancements to approaches for BMP screening, BMP optimization, identification of critical conditions and limiting pollutant analyses. The updated RAA incorporates both water quality data and control measure performance data gathered through December 31, 2020.

This section describes key elements of the RAA, including the following:

- Modeling system used for the RAA (4.1)
- Baseline model calibration (4.2)
- Water quality targets and required reductions (4.3)
- Critical conditions (4.4)
- Limiting pollutant analysis for non-modeled pollutants (4.5)
- Representation of control measures in RAA (4.6)
- Approach for selecting control measures for the EWMP Implementation Plan (4.7)
- Dry Weather RAA Approach (4.8)

In 2014, the Regional Board issued RAA Guidelines (RWQCB, 2014), which outline expectations for developing RAAs, and those guidelines were followed closely during development of this RAA.

4.1 MODELING SYSTEM USED FOR THE RAA – WATERSHED MANAGEMENT MODELING SYSTEM 2.0

The WMMS is the modeling system used to conduct the RAA for the NSMBCW EWMP. The 2016 EWMP used the Structural BMP Prioritization and Analysis Tool (SBPAT) for the RAA, but in 2021 the RAA modeling system was converted to WMMS to take advantage of the advanced computing capabilities that became available with recent WMMS updates (WMMS2), described further below.



WMMS is specified in the Permit as an approved tool to conduct the RAA. The LACFCD, through a joint effort with USEPA, developed WMMS specifically to support informed decisions for managing stormwater. WMMS is a comprehensive watershed model of the entire Los Angeles County area that includes the unique hydrology and hydraulics features and characterizes pollutant loading and downstream transport for all the key TMDL constituents (LACDPW 2010a, 2010b). Since its original release by the LACFCD and LACDPW in 2009, WMMS has played an important supporting role in watershed planning, BMP implementation and conceptual design, and climate change analysis for the Los Angeles Region. At the time of its original release, WMMS was a state-of-the-art planning tool based on the best available data and models.

In 2020, LACFD completed a major update to WMMS, called WMMS2, that incorporated recent advancements in the state-of-the-science including computational efficiency, data storage, public domain libraries and tools for modeling and data visualization, CIMP data collection, remote sensing (e.g., Light Detection and Ranging [LiDAR]), datasets characterizing the land surface and meteorological conditions, and understanding of BMP costs, designs, and effectiveness. The goals of the development of WMMS2 were to reflect the latest technological advancements in the overall model framework, incorporate the latest available data representing land characteristics and hydrologic and water quality conditions throughout Los Angeles County coastal watersheds, provide improvements and greater flexibility to represent various BMPs, and develop new tools and utilities to assist future model users in performing typical model simulations supporting watershed and BMP implementation planning efforts. Another goal for the project was to promote transparency throughout the process for model development, and actively engage key stakeholders and future model users to help them understand the capabilities of the modeling system, obtain buy-in on modeling assumptions and methodologies, and release all the tools, documentation, and resources in the public domain to provide anyone access and encourage future model applications.

The WMMS2 website contains documentation and utilities that serve as the basis for this RAA (<http://www.lacountywmms.com/> www.LACountyWMMS.com; also see **Figure 17**). The entire WMMS2 domain encompasses approximately 3,100 square miles of Los Angeles County’s coastal watersheds of, representing 2,566 subwatersheds. The NSMBCW EWMP area includes 180 subwatersheds¹¹ (**Figure 18**).

WMMS2 is a suite of three modeling tools to support BMP planning:

1. A watershed model for prediction of baseline hydrology and pollutant loading (Loading Simulation Program – C+ [LSPC]);
2. A model for simulating the performance of control measures in terms of flow, concentration and load reduction (System for Urban Stormwater Treatment Analysis and Integration [SUSTAIN]); and
3. A tool for running millions of potential scenarios and optimizing/selecting control measures based on cost-effectiveness (also within SUSTAIN).

The LSPC and SUSTAIN models within WMMS2 are described in more detail in the following subsections.

¹¹ To support evaluation of regional BMPs, some of these subwatersheds were further grouped by “pour point” to receiving waters.

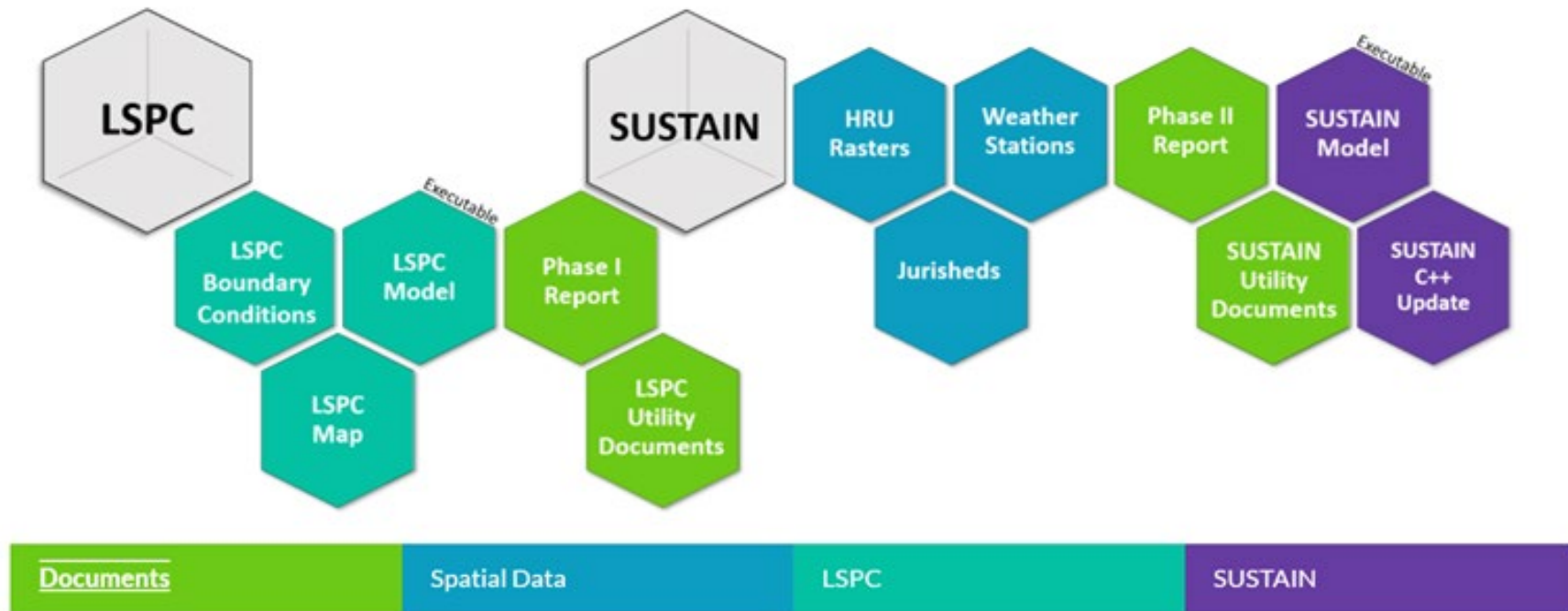


Figure 17. Screenshot of WMMS2 Website Showing Repository of Documentation and Modeling Files for LSPC and SUSTAIN

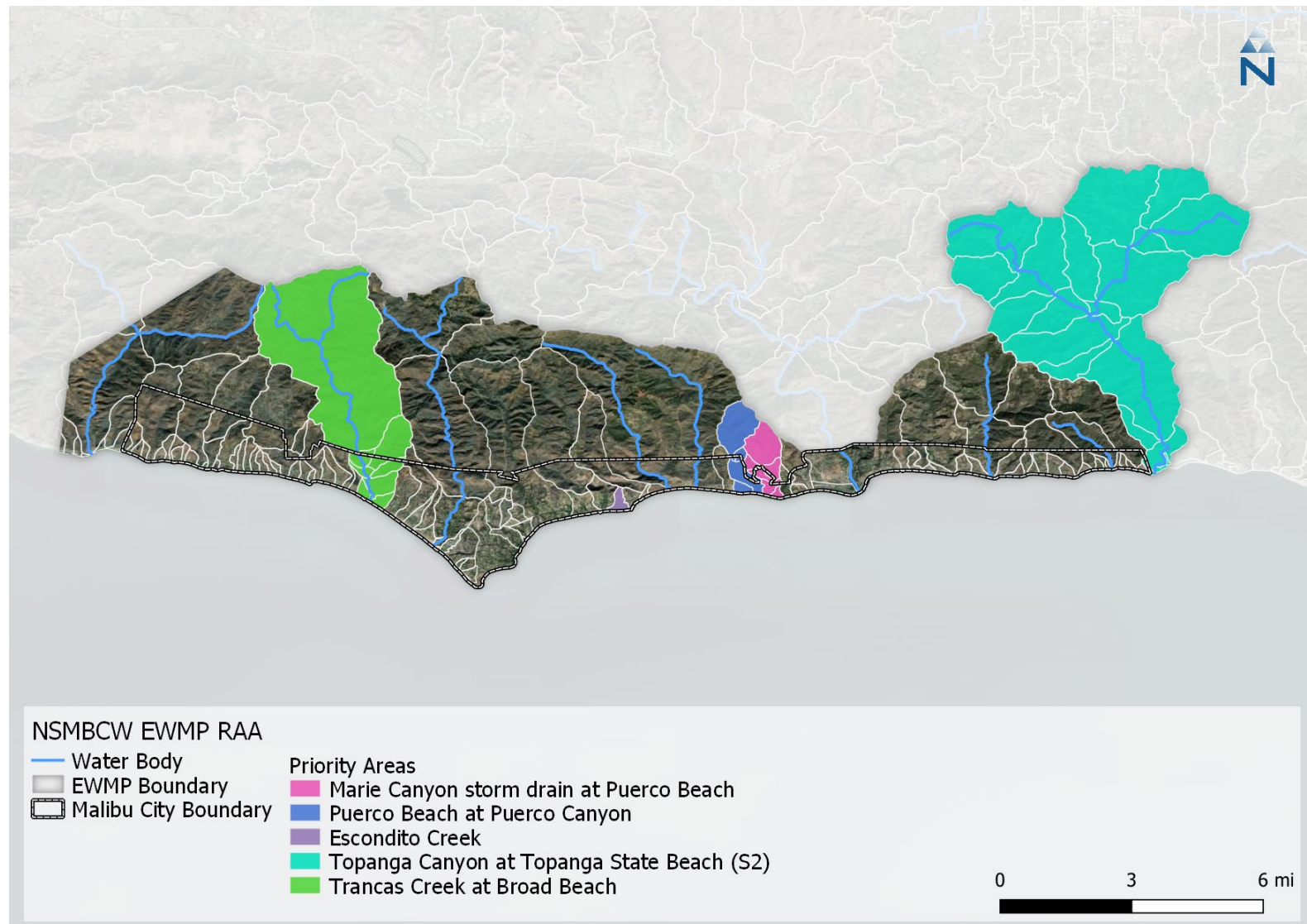
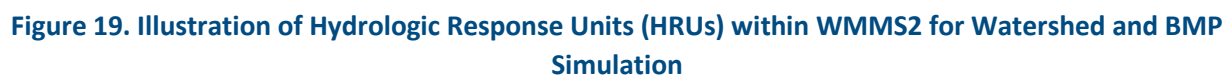


Figure 18. NSMBCW EWMP Group Area and 180 Subwatersheds Represented by WMMS2 with Key Assessment Areas

The LSPC model within WMMS2 is built upon hydrologic response units (HRUs) and the WMMS2 update involved development of HRUs at a much higher resolution than the original WMMS – an illustration of HRUs within WMMS2 is shown in **Figure 19**.



4.1.2 BMP PERFORMANCE AND SELECTION MODEL – SUSTAIN

SUSTAIN is the BMP simulation model within WMMS2 and was developed by the USEPA to support practitioners in developing cost-effective management plans for municipal stormwater programs and evaluating and selecting BMPs to achieve water quality goals (USEPA, 2009; <http://www2.epa.gov/water-research/system-urban-stormwater-treatment-and-analysis-integration-sustain>). SUSTAIN was specifically developed as a decision-support system for selection and placement of BMPs at strategic locations in urban watersheds. It includes a process-based continuous simulation BMP module for representing flow and pollutant transport routing through various types of structural BMPs. This simulation provides the primary application of SUSTAIN – simulating the performance of selected stormwater control measures.

The secondary application of SUSTAIN is BMP selection, which is based on cost-benefit of different BMP alternatives. The SUSTAIN model in WMMS2 includes a cost database comprised of typical BMP cost data from published sources including BMPs constructed and maintained in Los Angeles County (see WMMS2 documentation at link above). SUSTAIN considers certain BMP properties as “decision variables,” meaning they can vary within a given range during model simulation to support BMP selection and placement optimization. As BMP sizes and locations change, so do cost and performance. SUSTAIN runs iteratively to generate a cost-effectiveness curve comprised of millions of BMP scenarios (e.g., the model was used for the EWMP to evaluate the different combinations of green infrastructure as compared to regional BMPs and provides a recommendation on the most cost-effective scenario).

WMMS2 includes a series of utilities to support users with using SUSTAIN to simulate BMPs and leverage optimization to select the BMPs that provide cost-optimal pollutant reductions. An illustration of the cost optimization output functionality in WMMS2 is shown in **Figure 20**.

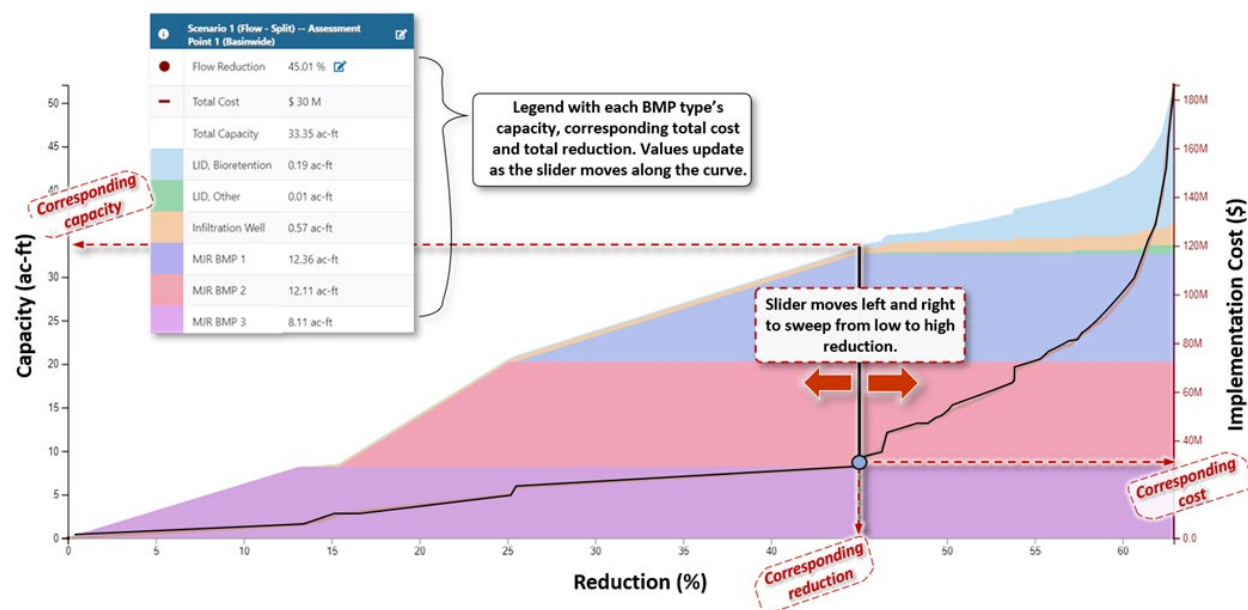


Figure 20. Screenshot of the Example SUSTAIN Utility in WMMS2 that Supports Users with Developing Optimization Curves for Implementation Strategy Development



4.2 BASELINE CALIBRATION

A fundamental element of the RAA is simulating baseline / existing conditions in the watershed prior to implementation of control measures. For the NSMBCW RAA, baseline conditions were simulated using the LSPC watershed model in WMMS2, including predictions of flow rate and pollutant concentrations over a 10-year period, as follows:

- The simulation period is July 1, 2010 to June 30, 2020.
- Simulated pollutants in WMMS2 include total suspended solids, total copper, total zinc, total lead, total nitrogen and total phosphorous. These are the six pollutants that are directly represented by WMMS2. For the NSMBCW RAA, the emphasis is on runoff as a surrogate for bacteria management.
- An hourly time step was used to simulate the flow rate and pollutant concentration at each of the 180 subwatershed outlets and the resultant downstream receiving water conditions.
- The model explicitly accounts for effects of major hydraulic structures in the watershed including debris basins.

Updates to the default WMMS2 model for NSMBCW during calibration emphasized improved representation of watershed characteristics, mostly updates to “physical” boundary condition characteristics rather than parameter adjustments, including:

- Extended climate inputs through June 30, 2020
- Increased soil moisture storage in the upper and lower soil storage zones to improve model representation of peak flow during wet weather events

To encourage accurate representation of existing/baseline conditions, the RAA Guidelines provide “model calibration criteria” for demonstrating the baseline predictions are accurate and to ensure the “calibrated model properly assesses all the variables and conditions in a watershed system” (Regional Board, 2014).

Detailed hydrology and water quality calibrations were performed for the RAA building upon the “default” WMMS2 parameters. For the NSMBCW RAA, the analysis is driven primarily to address the SMBB Bacteria TMDL, and bacteria is the priority pollutant. The approach to the bacteria RAA and bacteria management in general is based on runoff management (as opposed to reduction in bacteria concentrations). Therefore, the RAA baseline model performance demonstration is based on hydrology – a detailed hydrologic calibration was performed based on Topanga Canyon continuous flow data. Topanga Canyon is the largest drainage in the area and the only location with a continuous flow gage in the NSMBCW, and therefore it was the focus of the hydrologic calibration. The improved soil storage parameters from the Topanga Canyon calibration exercise were expanded to the entire NSMBCW LSPC model to enhance performance across the EWMP area and model domain.

The comparison of the calibrated hydrology model to the RAA Guidelines performance metrics is shown in **Table 21**. The baseline WMMS2 (LSPC) with updated calibration performs quite well for representing existing hydrologic conditions in NSMBCW. A series of model calibration panels are shown in **Appendix 4** for hydrology and water quality stations across NSMBCW. The WMMS2 model performed Good or Very

Good for all evaluated metrics according to the RAA guidelines. Over time, through each RAA update as required by the Permit, the NSMBCW RAA model can continue to be incrementally improved.

The updated calibration incorporates hydrology data gathered through December 31, 2020. The data in 2020, the last date when hydrologic data were available for the hydrologic model calibration, includes hydrologic data not fully validated by LACFCD staff, to ensure data as recent as possible could be incorporated into the RAA.

Table 21. Summary of Hydrology Calibration Performance by Calibrated NSMBCW Baseline Model

Location	Model Period	Hydrology Parameter	Modeled vs. Observed	RAA Guidelines Performance Assessment
Topanga Creek Above Mouth of Canyon (LA DPW F54C)	7/1/2010 – 6/30/2020	Annual Volume	+13.7%	Good
		Top 10% Flows	+3.4%	Very Good
		Storm Volume	-8.0%	Very Good

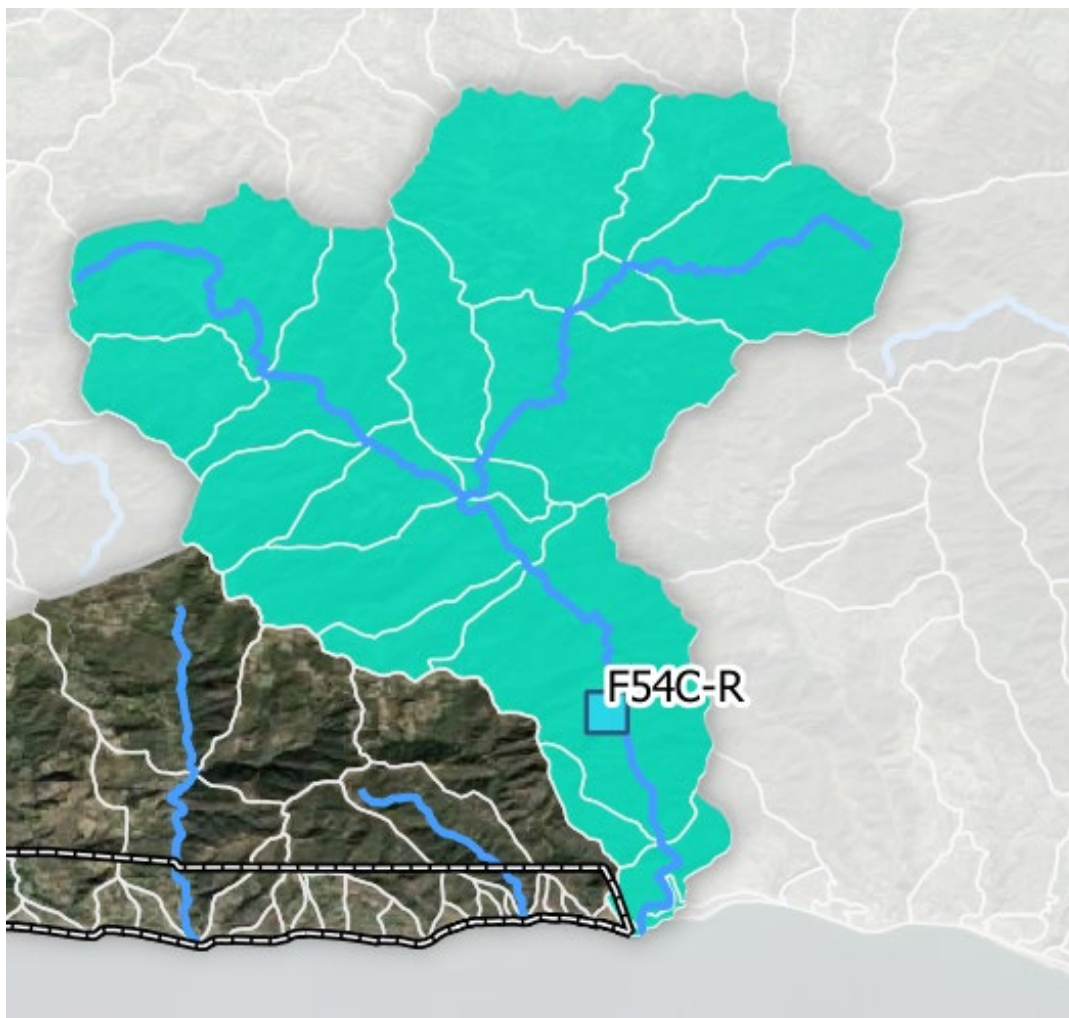


Figure 21. Hydrology Calibration Station for NSMBCW RAA in Topanga Canyon.



4.3 WATER QUALITY TARGETS AND REQUIRED REDUCTIONS

The RAA is designed to address the water quality priorities identified in **Section 2**, and to achieve the RWLs and WQBELs identified in the MS4 Permit, which are derived from applicable TMDLs (see Attachment P of the Permit) and the Basin Plan (see Receiving Water Limitations, Section V of the Permit). The RWLs and WQBELs are used to formulate RAA Targets or loads or concentrations to be achieved through implementation of the control measures specified by the EWMP. For NSMBCW, the analysis of targets and reductions to meet TMDL and ASBS provisions was organized into two components:

- Attainment of the SMBB Bacteria TMDL
- Attainment of ASBS Special Provisions

The following subsections describe the evaluation of required reductions and critical conditions.

4.3.1 SANTA MONICA BAY BEACHES TMDLs

The SMBB Bacteria TMDL express the requirements into terms of Allowable Exceedance Days (AEDs), and a beach monitoring program throughout SMB collects samples from the beaches and determines if beaches exceed the allowed number of days each year. The AEDs are based on three types of conditions:

- **Wet Weather** (days with 0.1" rainfall plus the 3 following days): most beaches are allowed 17 Exceedance Days each year
- **Summer Dry Weather** (May 1 to Oct 31): beaches are allowed zero Exceedance Days on summer dry days
- **Winter Dry Weather** (Nov 1 to Apr 30): most beaches are allowed three Exceedance Days on winter dry days

The analysis in **Table 22** details each beach monitoring station in the NSMBCW and the reported number of Exceedance Days between the 2013/14 and 2019/20 reporting years (note that the 2019/20 reporting year is the last complete year of record). The focus of the analysis is for wet weather conditions, as dry weather contributions are addressed through the non-stormwater screening and abatement program and MCMs. The analysis in **Table 22** is foundational to the NSMBCW RAA and EWMP Implementation Plan. Areas upstream of beaches with more than the allowable exceedances are targeted in the RAA and EWMP.

Drainages upstream of beach monitoring stations were categorized as Wet Weather Priority Areas if the 2013-2020 monitoring exhibited two or more years with the numbers of wet weather exceedances greater than allowable and greater than the reference beach site at Leo Carrillo (Station SMB 1-1). A total of three drainages met the threshold for Wet Weather Priority Areas:

- Puerco Beach at Marie Canyon (1-12)
- Puerco Beach at Puerco Canyon (O-2)
- Topanga Beach at Topanga Canyon (SMB 1-18)

These areas are shown in **Figure 22**, and they are the focus of the EWMP Implementation for control measures to address the SMBB Bacteria TMDL. Other areas consistently attain the SMBB Bacteria TMDL requirements and have reasonable assurance of achieving RWLs/WQBELs with existing BMPs and are



labeled as “Existing BMPs and MCMs” in **Table 22**. Finally, the beaches around Malibu Lagoon, including Surfrider beach, are categorized as “Legacy Park (85th %ile)” in **Table 22** as they are already managed by Legacy Park which is a BMP that manages the 85th percentile, 24-hour storm from the Civic Center area and therefore addresses the contribution from NSMBCW area – the exceedances at those sites are assumed to be caused or contributed by inflow from the upstream Malibu Creek Watershed drainage.

4.3.2 AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

ASBS drainages within the NSMBCW area have distinct requirements and the RAA achieves reductions based on ASBS monitoring data (see **Figure 22** for the ASBS drainages). The results of the discharge and receiving water monitoring conducted by the City and County indicated that concentrations of certain constituents were altered relative to natural conditions, and that stormwater runoff was contributing to the alterations of natural water quality. These constituents are classified as Category 3 WBPCs as follows:

- Selenium for ASBS sites S-02 and 24-BB-03R
- Total PAHs for ASBS site S-02
- Ammonia for ASBS site 24-BB-03R

Table 23 shows the analysis of ASBS monitoring data for these pollutants on an event-by-event basis, and **Table 24** shows the summary of percent reductions to achieve the 85% Threshold Concentration. The RAA is based on flow management, and the % flow management target was **70 percent reduction**¹² which was the greatest of the three average reductions for selenium (70%), total PAHs (68%) and ammonia (39%; **Table 24**). Note that based on the source assessment selenium is believed to be coming from natural sources in the watershed and PAHs may be a result of runoff from areas affected by wildfire.

¹² The EWMP Implementation Plan includes both infiltration and advanced treatment BMPs, and the 70% reduction target requires that 70% of the runoff under the ASBS critical condition be managed by either infiltration or advanced treatment (not necessarily retention).



Table 22. Determination of Priority Drainage Areas based on Wet Weather Beach Monitoring Data (Single Sample Maximum Exceedance Days, 2013-2020)

Station ID	SMB 1-1	SMB 1-2	SMB 1-3	SMB 1-5	SMB 1-13	SMB 1-16	SMB 1-17	SMB 4-1	SMB MC-1	SMB MC-2	SMB MC-3
Station Name	Leo Carrillo Beach at Arroyo Sequit Crk	El Pescador State Beach	El Matador State Beach	Zuma Beach at Zuma Crk	Carbon Beach at Sweetwater Cyn	Las Tunas Beach at Pena Cyn	Las Tunas Beach at Tuna Cyn	Nicholas Beach	Malibu Point at west end of Surfrider Beach	Surfrider Beach at Malibu Lagoon breach	Malibu Pier at Surfrider Beach
Reporting Year											
Upstream Drainage >>> Classification	Reference Site	Existing BMPs and MCMs	Existing BMPs and MCMs	Existing BMPs and MCMs	Existing BMPs and MCMs	Existing BMPs and MCMs	Existing BMPs and MCMs	Existing BMPs and MCMs	Legacy Park (85 th %ile)	Legacy Park (85 th %ile)	Legacy Park (85 th %ile)
2013-14	0	0	0	1	0	0	0	0	1	11	0
2014-15	1	0	0	0	2	3	0	0	2	19	5
2015-16	1	0	0	0	1	0	0	1	0	13	1
2016-17	2	0	0	1	3	1	0	0	0	25	3
2017-18	0	0	0	0	1	0	0	0	0	8	0
2018-19	5	0	1	4	2	0	0	2	1	28	3
2019-20	4	0	1	2	4	1	0	0	1	18	5
Allowed Days*	3	1	1	3	3	2	2	2	3	17	3



Table (continued). Determination of Priority Drainage Areas based on Wet Weather Beach Monitoring Data (Single Sample Max Exceedance Days, 2013-2020)

Station ID	SMB 1-4	SMB 1-6	SMB 1-7	SMB 1-8	SMB 1-9	SMB 1-10	SMB 1-11	SMB 1-12	SMB 1-14	SMB 1-15	SMB 1-18	SMB O-1	SMB O-2
Station Name	Zuma Beach at Trancas Crk	Walnut Canyon on Point Dume at Zumirez Drive	Paradise Cove Beach at Ramirez Crk	Escondido Beach at Escondido Crk	Latigo Beach at Tivoli Cove Condos	Corral Beach at Solstice Canyon Crk	Corral Beach at Corral Canyon Crk	Puerco Beach at Marie Cyn	Las Flores Beach at Las Flores Crk	Big Rock Beach at Piedra Gorda Cyn	Topanga Beach at Topanga Cyn	Unnamed gully between Point Dume and Paradise Cove	Puerco Beach at Puerco Cyn
Reporting Year													
Upstream Drainage >>> Classification	ASBS	Existing BMPs and MCMs	Existing BMPs and MCMs	ASBS	Existing BMPs and MCMs	Existing BMPs and MCMs	Existing BMPs and MCMs	WET	Existing BMPs and MCMs	Existing BMPs and MCMs	WET	Existing BMPs and MCMs	WET
2013-14	1	0	1	0	1	1	0	1	1	1	6	1	0
2014-15	0	3	1	1	1	3	2	4	2	2	13	2	3
2015-16	0	2	2	0	1	3	1	3	2	1	9	1	0
2016-17	3	2	2	1	2	0	3	4	0	2	17	0	1
2017-18	0	1	0	0	0	0	0	1	0	0	4	1	0
2018-19	3	4	4	1	5	4	4	2	3	1	27	1	4
2019-20	2	2	3	2	4	2	4	4	1	3	23	0	1
Allowed Days*	3	3	3	3	3	3	3	3	3	3	17	3	1



Table 23. ASBS Threshold Exceedances based on ASBS Monitoring Data

Site	Date	Constituent	85% Threshold Concentration ¹ (ug/L)	Receiving Water Sample Concentration ¹ (ug/L)	Percent Reduction to Meet 85% Threshold Concentration ¹
S-02	Feb-13	Selenium	0.017	0.031	45.2%
		Total PAHs	0.0125	0.0411	69.6%
	Mar-13	Selenium	0.017	0.052	67.3%
		Total PAHs	0.0125	0.0255	51.0%
	Feb-14	Selenium	0.017	0.155	89.0%
		Total PAHs	0.0125	0.0841	85.1%
	Jan-16	Selenium	0.017	0.076	77.6%
		Total PAHs	0.0125	0.0352	64.5%
24-BB-03R	Feb-14	Ammonia	15	ND	0.0%
		Selenium	0.017	0.026	34.6%
	Dec-14	Ammonia	15	190	92.1%
		Selenium	0.017	0.01	0.0%
	Jan-16	Ammonia	15	40	62.5%
		Selenium	0.017	0.015	0.0%
	Mar-16	Ammonia	15	ND	0.0%
		Selenium	0.017	0.021	19.0%

1. City of Malibu and LACDPW 2015, City of Malibu 2016; LACDPW 2016

Table 24. ASBS Percent Reductions to Achieve 85% Threshold Concentration¹

Site	Selenium		Total PAHs		Ammonia	
	Average	Maximum	Average	Maximum	Average	Maximum
S-02	70%	89%	68%	85%	N/A	N/A
24-BB-03R	13%	35%	N/A	N/A	39%	92%

1. Concentration reductions are calculated based on the monitoring events detailed in **Table 23**.

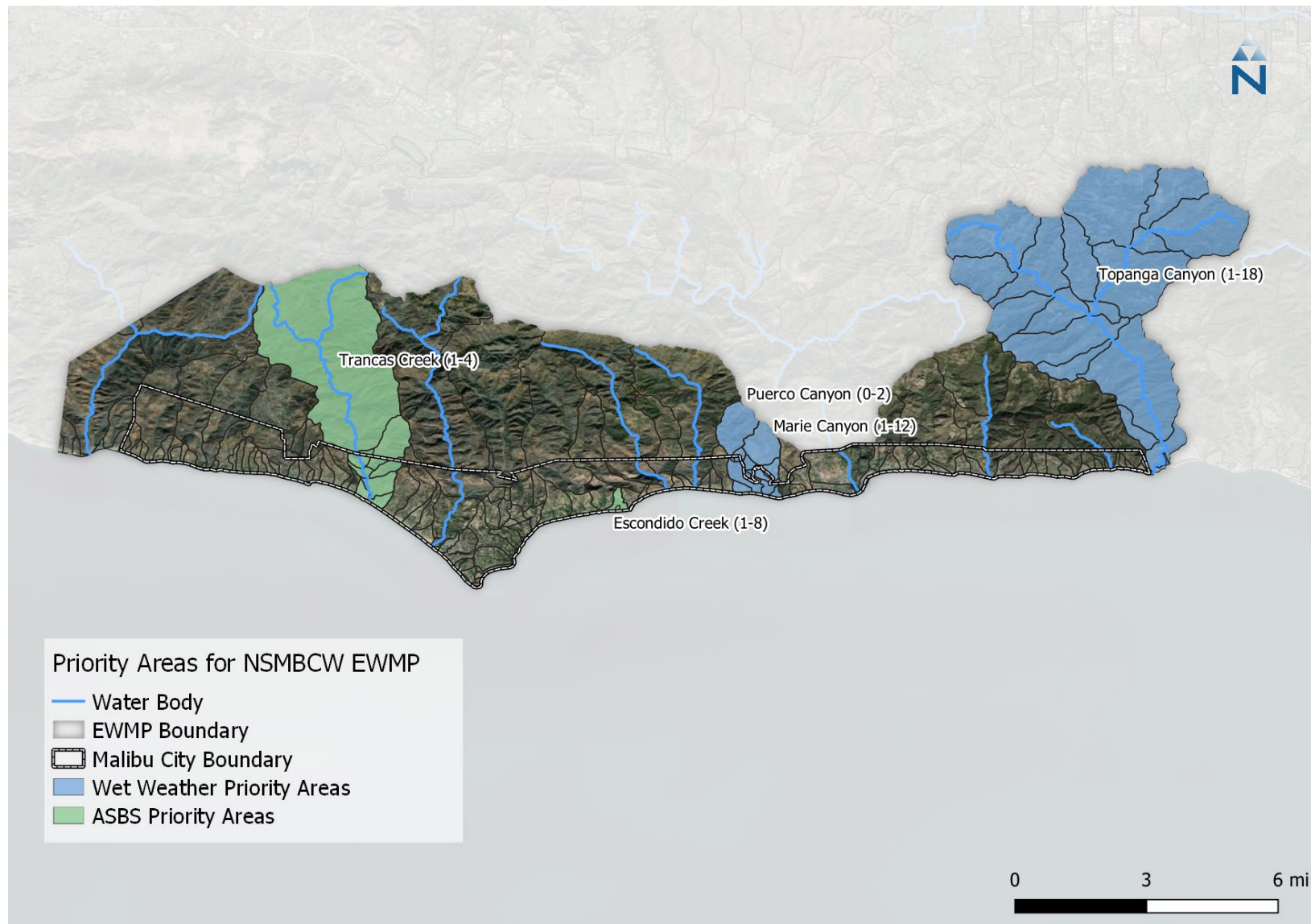


Figure 22. Priority Areas for Wet Weather and ASBS for the NSMBCW EWMP



4.4 CRITICAL CONDITIONS

A key consideration of the RAA is the “critical condition” under which water quality targets must be achieved. Stormwater management for different size storms generally requires different size BMPs. For example, for most pollutants, the management of a 90th percentile storm requires larger BMPs than management of a median (50th percentile) storm. The RAA Guidelines specify the RAA for attainment of final TMDL WQBELs and/or RWLs should be based on critical conditions, for example, the 90th percentile flow rates and/or the critical conditions specified by applicable TMDLs (Regional Board, 2014). With WMMS2, the continuous time series from 2010 to 2020 can be used to identify critical conditions for the BMP simulations. Previous RAAs used “design storms” and annual average years to size BMPs and represent the critical conditions – those design storms and annual average years were used partially due to limitations in computing power (run times and memory limitations) which prevented long-term simulations for BMPs. Advancements made in the development of WMMS2 allow the utilization of cloud-based approaches for identifying critical conditions and including them “intrinsically” in the BMP simulations/optimization outputs.

Leveraging computing advancements, the critical condition approach for the RAA has been improved to calculate the bacteria “Exceedance Volumes” that correspond to attainment of the SMBB Bacteria TMDL and ASBS provisions. For the NSMBCW RAA, two primary critical condition were considered:

1. **Wet Weather Priority Area Critical Condition:** for addressing bacteria impairments in Wet Weather Priority Areas (**Figure 22**), the critical condition is based on managing the runoff from the MS4 area on critical condition days¹³. The Exceedance Volume flagging identifies the “Top 5” days in terms of rainfall following the 17th highest rainfall days, because those are the days with highest rainfall that occur after accounting for the 17 wet weather AEDs. The Top 5 days for the wet weather critical condition correspond to the 18th thru 22nd highest ranked rainfall days in the time series. The EWMP retains the runoff from the flagged days to manage runoff prior to discharge from the outlet of each assessment area/receiving water to provide reasonable assurance of achieving bacteria WQBELs. An example output from the Exceedance Volume flagging exercise for bacteria is shown in **Table 25**, which summarizes the rainfall depths for the NSMBCW areas on the Top 5 days after the 17 are accommodated. For this analysis, the period between June 1, 2016, and June 30, 2017 was used, which is wettest year in the 2010-2020 record, to ensure the wet weather critical conditions rainfall analysis is conservatively protective.
2. **ASBS Priority Area Critical Condition:** for addressing the ASBS Priority Areas (**Figure 22**), rainfall conditions that approximate the 85th percentile, 24-hour storm were identified to address the “design storm” condition of the ASBS provisions. The selected 24-hour design storm depth was 0.67”, which was based on reviewing 85th percentile, 24-hour storm isohyets in the ASBS areas, which range from approximately 0.6” at the beach to ~0.9” in the higher elevation portion of Trancas Canyon. Thus, the RAA is driven to reduce 70 percent of the runoff (based on the targets in **Section 4.3.2**) from a 0.67” daily storm. Rather than use a synthetic design storm hyetograph, the rainfall time series was analyzed, and actual days were used for the WMMS2 simulation. The

¹³ There are small areas along the coastline in the Priority Areas that do not necessarily drain through a watercourse to Santa Monica Bay, instead they discharge through diffuse overland flow paths. The RAA is configured to manage the discrete drainages/discharges from the Priority Areas which is over 95% of the land area in the Priority Areas. “Manage” means capture and retain or treat the runoff from the bacteria critical condition with either advanced treatment or infiltration.



date selected was the day between June 1, 2016, and June 30, 2017 that had the daily rainfall amount most proximal to 0.67", which was December 15, 2016 (0.67" daily rainfall).

Together, the critical conditions used for the NSMBCW EWMP RAA are highly protecting and therefore control measures that are able to manage these conditions have reasonable assurance of achieving RWLs in receiving waters.

Table 25. Summary of Critical Conditions for Wet Weather Priority Areas to address the SMBB Bacteria TMDL¹

Rainfall Gage	Maximum Flagged Daily Rainfall		Minimum Flagged Daily Rainfall	
	Depth (in.)	Date	Depth (in.)	Date
D-435	0.261	10/17/2016	0.213	2/10/2017
P-352B	0.354	10/17/2016	0.275	12/21/2016
D-6	0.246	12/30/2016	0.206	3/21/2017
P-447C	0.275	12/30/2016	0.235	11/26/2016
P-1239	0.315	10/17/2016	0.235	1/4/2017

1. These are the daily rainfall depths for the Top 5 wettest days for the Priority Areas based on the proximal rain gages. For Wet Weather Priority Areas, the Top 5 wettest days are those after 17 Allowable Exceedance Days are accounted for (i.e., the 18th through 22nd wettest days). The analysis period is 7/1/16 to 6/30/17, which is the wettest year between 2010-2020, and is therefore conservatively protective.

4.5 LIMITING POLLUTANT ANALYSIS FOR NON-MODELED POLLUTANTS

The limiting pollutant analysis for the NSMBCW EWMP is based on analyzing the freshwater monitoring data from the CIMP and quantifying the runoff volumes and sediment loads from the upstream watersheds on days when RWL exceedances were reported. The analysis of runoff volumes and sediment loads on "exceeding days" provides a quantitative linkage between the modeled limiting pollutant (bacteria, or flow as its surrogate) and the non-modeled pollutants. The runoff volumes and sediment loads on exceeding days provide a metric for determination of the amount of runoff management (infiltration or treatment) that would be needed to address the RWL exceedances for each non-modeled pollutant (i.e., non-modeled water quality priorities). As long as the runoff management required to address bacteria is greater than the runoff management needed to address non-modeled pollutants, then the BMPs in the NSMBCW EWMP have reasonable assurance to address both modeled and non-modeled pollutants. **Table 26** provides the limiting pollutant analysis and linkage between bacteria management (modeled) and other water quality priority pollutants (non-modeled). For all non-modeled pollutants, the volume of runoff and sediment loading on exceeding days is far less than those same metrics for bacteria. Note that the limiting pollutant analysis quantifies both runoff *volume* and *sediment* loading, which provides direct linkages to both dissolved and particulate-associated pollutants, respectively. The results in **Table 26** demonstrate that by managing bacteria, the BMPs in the NSMBCW EWMP also have reasonable assurance of managing other water quality priority pollutants.

The defensibility of this linkage also relies on the type of BMPs included in the EWMP, namely assuring the BMPs have equivalent or higher efficacy for the modeled pollutant as the non-modeled pollutants (e.g., the percent reduction of both modeled and non-modeled pollutants is sufficient to achieve RWLs). In the case of bacteria management, it is clear that non-modeled pollutants will be addressed with



sufficient efficacy because the bacteria BMP configuration is largely based on full treatment or retention of the runoff, meaning high levels of pollutant reduction for all pollutants in the managed runoff¹⁴.

In some areas within the NSMBCW, groundwater levels may inhibit the implementation of BMPs that solely rely on infiltration. In these areas, advanced treatment BMPs (e.g., filtration) may be implemented in lieu of retention BMPs. Horizontal and vertical filtration BMPs have very high pollutant removal rates and have been demonstrated to be able to achieve RWL concentrations for bacteria in effluent (e.g., Mohanty et al., 2014; Boehm et al, 2020; Lau et al, 2017; Ghavanloughajar et al, 2020). These peer-reviewed references provide reasonable assurance that bacteria and non-modeled water quality priority pollutant RWLs can be achieved with treatment control measures. The selection of specific media and filtration methods will occur over the course of EWMP implementation, and approaches to bacteria filtration are considered a regional priority within LA County. Pilot studies and research are actively being pursued to ensure that stormwater programs in LA County have options for treating bacteria in areas where retention is infeasible. During EWMP implementation, in cases where filtration BMPs are implemented, the NSMBCW Group will ensure that filtration technologies are carefully selected to assure that concentrations of bacteria and non-modeled water quality priority concentrations are substantially reduced, using defensible treatment approaches. These same filtration approaches also have reasonable assurance of addressing other water quality priority pollutants because they are typically less challenging to remove than bacteria – the contact times/filtration surface area used to remove bacteria will also be sufficient to remove other pollutants. Literature that provides reasonable assurance includes the following:

- Diblasi et al, 2009 provides experimental documentation of the high potential for PAH removal by stormwater treatment with biofiltration.
- For legacy organic pesticides (4,4'-DDD 4,4'-DDE and 4,4'-DDT), the Chesapeake Stormwater Network Toxics Workgroup (2015) concluded “it can be safely assumed that organochlorine (OC) pesticides behave in the same manner as a sediment particle and should have a similar BMP removal rate to the suspended sediment benchmark. This conclusion is also supported by the chemical characteristics of legacy OC pesticides”.

Overall, the limiting pollutant analysis demonstrates that by managing bacteria, the BMPs in the NSMBCW EWMP also have reasonable assurance of managing other water quality priority pollutants.

¹⁴ In some areas within the NSMBCW, groundwater levels may inhibit the implementation of BMPs that solely rely on infiltration. In these areas, advanced filtration BMPs may be implemented in lieu of retention BMPs. Horizontal and vertical filtration BMPs have very high pollutant removal rates and have been demonstrated to be able to achieve RWL concentrations for bacteria in effluent (Mohanty et al., 2014; Boehm et al, 2020; Lau et al, 2017; Ghavanloughajar et al, 2020). The selection of specific media and filtration methods will occur over the course of EWMP implementation, and approaches to bacteria filtration are considered a regional priority for LA County. Pilot studies and research are actively being pursued to ensure that stormwater programs in LA County have options for treating bacteria in areas where retention is infeasible. During EWMP implementation, in cases where filtration BMPs are implemented, the NSMBCW Group will ensure that filtration technologies are carefully selected to assure that bacteria concentrations are substantially reduced, using defensible treatment approaches. These same filtration approaches also have reasonable assurance of addressing other Water Quality Priority pollutants because they are typically less challenging to remove than bacteria – the contact times/filtration surface area used to remove bacteria will also be sufficient to remove other pollutants.



Table 26. Limiting Pollutant Analysis and Demonstration that Bacteria Management has Reasonable Assurance of Addressing Non-Modeled Pollutants and All other Water Quality Priorities

Trancas Canyon Creek – All Weather Conditions ¹	Limiting Pollutant Metric (Volume)		Limiting Pollutant Metric (Sediment)	
	Total Daily Discharge (ac-ft)		Total Sediment Load (tons)	
Constituent	On Exceeding Days	On All Monitored Days	On Exceeding Days	On All Monitored Days
4,4'-DDD	13.48	226.48	2.20	67.60
4,4'-DDE	14.87	226.48	2.27	67.60
4,4'-DDT	14.87	226.48	2.27	67.60
Chlordane	14.87	25.89	2.27	3.34
Copper, Dissolved	28.03	73.28	5.55	10.45
<i>E. coli</i>	243.72	254.80	70.56	72.54
Total PCBs	52.34	74.73	8.26	10.64

= Modeled limiting pollutant metric – the sediment load and runoff volume on exceeding days is greater for bacteria than all other (non-modeled) pollutants and thus management of bacteria has reasonable assurance of addressing all other Water Quality Priorities.

Topanga Canyon Creek – All Weather Conditions ¹	Limiting Pollutant Metric (Volume)		Limiting Pollutant Metric (Sediment)	
	Total Daily Discharge (ac-ft)		Total Sediment Load (tons)	
Constituent	On Exceeding Days	On All Monitored Days	On Exceeding Days	On All Monitored Days
<i>E. coli</i>	1206.11	2539.50	684.63	1246.74

1. There were no exceedances for non-modeled pollutants reported by CIMP monitoring for dry weather, and therefore these analyses are representative of both 'Wet Weather' and 'All Weather'



4.6 RAA WORKFLOW AND BMP SIMULATION FOR REASONABLE ASSURANCE

The RAA workflow and BMP simulation for Priority Areas provides reasonable assurance that RWLs will be attained in the NSMBCW. As shown in **Figure 23**, the RAA sequentially addresses the modeled water quality priority pollutants for dry and wet weather and then demonstrates that non-modeled pollutants will be sufficiently managed. The Exceedance Load approach intrinsically addresses both dry and wet conditions within the same analyses/simulations, and the modeled pollutants are each simulated individually to ensure that BMPs will achieve the regulatory deadlines (which avoids the need for an analysis to demonstrate that one modeled pollutant will address the other modeled pollutants).

This subsection describes key elements of the BMP simulation for the RAA which was used to identify the EWMP Implementation Plan detailed in **Section 5**.

4.6.1 KEY ELEMENTS OF RAA SIMULATION CONFIGURATION

The RAA simulation with WMMS2 is designed to reflect the EWMP Group's contribution to watershed's attainment of the Water Quality Priorities. For the simulation, several key elements of the configuration are highlighted as follows:

- **Model domain:** the simulation of BMPs for management of stormwater and non-stormwater runoff is limited to the EWMP area. The areas outside of the EWMP boundary are excluded and the runoff from those areas does not affect the sizing or number of BMPs needed to address water quality priorities. Additional control measures for the EWMP Implementation Plan are focused on Wet Weather Priority Areas and ASBS Priority Areas based on the required reductions analysis presented in **Section 4.3**.
- **BMP simulation period:** the BMP simulation period was constrained to July 1, 2016, to June 30, 2017. Within the 10-year baseline simulation, this year is the wettest year within the decade and was conservatively used to calculate Exceedance Volumes during critical conditions and identify the BMPs needed to manage bacteria and non-modeled pollutants. By selecting 2016-17 as the BMP simulation period, the volumes of runoff to be managed by the BMPs are conservatively larger, providing additional reasonable assurance that water quality priorities will be addressed.
- **Configuration of land uses and point sources:** the BMP simulation included several configuration steps to focus BMP implementation on MS4 areas as follows:
 - The BMP simulation excludes the impact of natural open space on BMPs to achieve the SMBB Bacteria TMDL requirements, because the SMBB Bacteria TMDL includes a Reference Watershed Approach to avoid requirements for MS4s Permittees to manage natural lands. In WMMS2 there are a large number of HRUs for open space and the excluded categories are generally those HRUs that reflect open/natural lands, open space with dense canopy cover, etc. The excluded open space did not include predominantly urbanized categories such as parks, lawns, or other urban pervious land types.
 - The BMP simulation is driven by the surface runoff simulated in WMMS2 (known as 'SURO' in LSPC and SUSTAIN), and baseflow is excluded from the BMP simulation (known as 'IFWO' and 'AGWO' in LSPC and SUSTAIN). This approach focuses the RAA on stormwater and non-stormwater from the MS4 area, rather than deep baseflow sources that are generally not controllable by MS4s. Note that SURO does include non-stormwater runoff such as irrigation overspray, meaning that non-stormwater is intrinsic to the RAA.

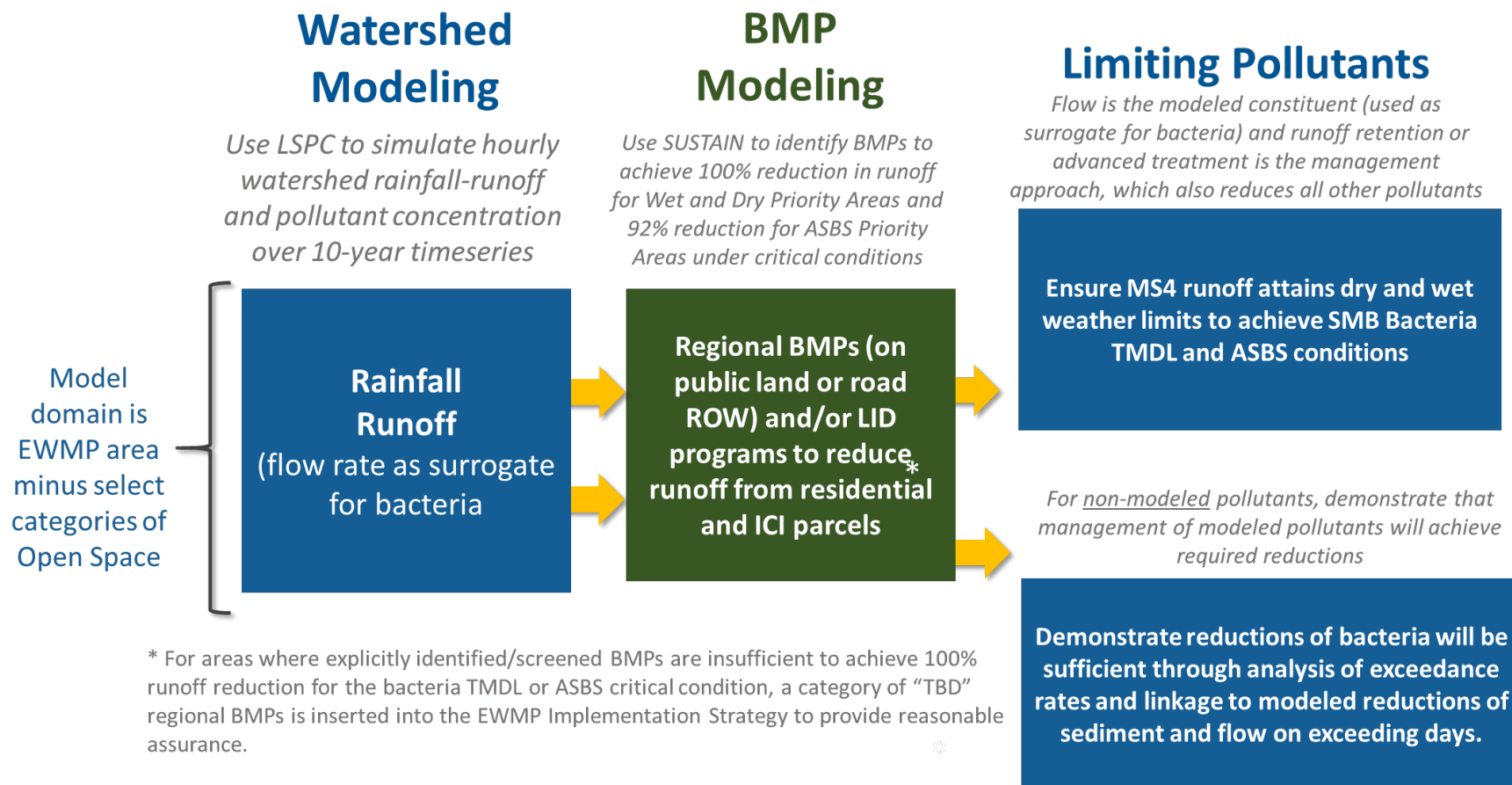


Figure 23. RAA Process for Simulating Critical Conditions and Determining the Extent of Control Measures to Address Water Quality Priorities



4.6.2 REPRESENTATION OF EWMP CONTROL MEASURES

The BMP simulation determines the optimal combination of BMP types to address Water Quality Priorities. This step requires a robust set of assumptions to define the watershed-wide extent and configuration of each of the types of control measures.

The representation of control measures in the model is an important element of the RAA, as it provides the link between future watershed activities, model-predicted water quality improvement, and, ultimately, attainment of water quality targets. Since the BMP modeling parameters will greatly influence the outcome of the RAA, it is imperative that the suite of BMP assumptions is based on the best available data and represent the opportunity and limitations that will be faced by designers, contractors, and maintenance crews in the field as these BMPs are implemented over time. Further, the technical rigor of the analysis must be appropriately balanced with the resolution of the modeling system and the accuracy of the key datasets.

This section will present and review the three primary elements for representing BMPs in the RAA model, as follows:

- **Opportunity** – Where can these BMPs be located and how many can be accommodated?
- **System Configuration** – How is the runoff routed to and through the BMP and what is the maximum BMP size?
- **Cost Functions** – What is the relationship between BMP volume/footprint/design elements and costs?

The following sections provide an overview of methods, summarize key assumptions, and highlight potential data limitations. In **Section 3**, details were presented regarding the “menu” of control measures that were included in the EWMP Implementation Plan, including details on the typical “profile” for each type of LID, regional infiltration and regional treatment control measure in the BMP menu.

4.6.3 BMP OPPORTUNITIES

BMPs can only feasibly be implemented at certain locations in the watershed and foremost, BMPs may only be implemented within certain practical bounds throughout the watershed. While physical constraints may limit implementation in some areas (e.g., high slopes, high groundwater table, insufficient space, poor infiltration rates, etc.), practical or preferential constraints are also an important consideration for each jurisdiction (e.g., parcel ownership, proximity to contaminated sites, etc.). To ensure that the spatial and temporal extent of BMP opportunities were accurately accounted for in the model, a BMP opportunity assessment was customized for each individual BMP category and type. The best available data and GIS layers were specifically selected to screen out inappropriate opportunities and/or identify high priority project opportunities (e.g., regional projects on public parcels). A summary of these methods was provided in **Section 3**. In addition to the spatial opportunity screening process that highlighted potential roadblocks to BMP implementation, the preferences of the Group were incorporated into the RAA to allow the EWMP Implementation Plan to be customized to City and County preferences.

4.6.4 SYSTEM CONFIGURATION



BMP configuration is determined by a combination of [1] physical watershed properties that are generally unchangeable (e.g., location of parcels or streets, soil types, drainage areas, space available for BMPs) and [2] BMP design assumptions that are at the discretion of the responsible agency (e.g., standard BMP profiles, underdrain configurations, soil media mixes). Details regarding BMP configuration for the BMP simulation include the following (see **Table 27** for a summary of BMP simulation assumptions):

- **BMP Profile** – For optimization with WMMS2, a typical profile is assumed for each BMP type and then optimization increases and decreases the *footprint area* over which that profile spans to identify the most cost-effective solutions. The BMP profiles are presented in in **Section 3**.
- **Drainage Area** – Determined by the topography of the watershed and the placement of the BMP, drainage area ultimately defines how much water and pollutant load could possibly arrive at the site. Drainage areas to nearly all BMPs in the EWMP Implementation Strategy were delineated explicitly to fully reflect the land uses in the upstream areas and the “nestedness” of BMPs. This element of the configuration represents a significant advancement over the original RAA, which required coarse assumptions on typical drainages for many BMP types. The one exception for drainage area delineation were the existing LID BMPs for the County and City of Malibu (see **Section 3** for maps of these BMP locations) – a set of assumptions were used to estimate the drainage areas for those BMPs (rather than explicit delineation).
- **Infiltration and Treatment Rate** – Determined by the soil types in the area, infiltration rate defines the rate at which water exits the BMP into the soil (and drives the simulated fill-up and draw-down of the BMP). The infiltration rate for each BMP type was driven by the estimated infiltration rate for the footprint where the BMP is located, using NRCS (2019) and estimated seepage rates, which is the same data source used by WMMS2. This approach is an advancement over the original RAA that used subwatershed-wide infiltration rates for BMP configuration. For the treatment BMPs, the filtration rate was assumed to be 120” per hour, which is typical of vertical flow biofilters (State of WA, 2019; Ghavanloughajar et al, 2020).
- **Routing** – Determined by the drainage network in the local area, the runoff conveyance method is critical to determining how much of the runoff and associated pollutants are accessible to the BMP. The BMP routing network was determined explicitly to ensure nestedness of BMPs is accounted for in the BMP simulation. Most of the drainage in the NSMBCW area is natural, without extensive curb and gutter, and a majority of BMPs were assumed be ‘inline’ without diversion structures or pumps.
- **BMP Efficacy** – Determined by the BMP type selected, BMP efficacy defines the pollutant removal rates for overflow or underdrain effluent from the BMP. For the NSMBCW RAA, runoff is simulated as a surrogate for bacteria, and 100% of surface runoff is either retained or treated with advanced treatment/filtration during the RAA simulation, which ensures that RWLs will be attained for bacteria and non-modeled pollutants. During EWMP implementation, in cases where filtration BMPs are implemented, the NSMBCW Group will ensure that filtration technologies are carefully selected to assure that bacteria and non-modeled pollutant concentrations are substantially reduced, using defensible treatment approaches.

Careful analyses were performed to specifically tailor each of the above variables for every individual BMP category and type. This required a thorough understanding of the watershed setting (to determine common available BMP footprints, typical drainage areas, and conditions that warranted pumping); innovative use of existing datasets to estimate spatially varied infiltration rates; and familiarity with



standard BMP design practices to set design profiles. The results of these analyses have yielded a robust and defensible suite of BMP configuration assumptions that reasonably represent future BMP implementation in the watershed.

Table 27. Summary of BMP Configuration for NSMBCW RAA

BMP Category	Type	Key Design Parameters
Institutional	MCMs and/or Enhanced MCMs	None, not modeled. No implicit reductions due to source control are included in this RAA considering the 2020 State Board Order that only accepted source control BMPs that are modeled explicitly.
Low Impact Development	Existing LID (New/Re-development)	Existing BMPs as inventoried in WRAMPS, and City of Malibu tracking database were incorporated into the RAA. For the County, the BMP types from WRAMPS along with sizing and drainage area were used in the simulation. For the City of Malibu, detailed sizing information was not available, and coarse sizing was assumed and incorporated into RAA. Most of these BMPs are bioretention or biofiltration.
Regional Infiltration or Treatment <i>(Infiltration is assumed unless the footprint is within 1000' of the shoreline, then treatment is assumed necessary due to shallow groundwater. During implementation, the decision to use treatment or infiltration will be determined on a site-by-site basis)</i>	Roadway Capture	Road right-of-way represents a majority of the available public land in the EWMP area. The BMP screening process identified roadways near overland flow paths could be used as sites for regional BMPs either underneath or adjacent to the road. With this approach, the roadway is used as a footprint for regional BMPs that treat relatively large areas, rather than the typical "green street" configuration that only managed runoff from the road and nearby parcels. The road types are tracked explicitly in the RAA, either public local, private local, or Caltrans roads. The Caltrans opportunities may not be feasible and will require close coordination with Caltrans, but in several priority drainages the Caltrans right-of-way represents some of the only accessible public land that is well-sited for capturing canyon discharges prior to the beach outlet.
	Planned Green Streets	Several green street projects including projects in Marie Canyon and Viewridge have been previously identified by the Group. These projects are carried forward in the EWMP. The projects capture runoff from a moderate sized tributary area, not only the runoff from the road.
	Canyon Projects	For a few Priority Areas, siting opportunities near the outlet (but not under the roadway) were identified that may be suitable for capture runoff prior to discharge to the beach. These projects are labeled as Canyon BMPs and include a site at the outlet of Trancas Canyon underneath a County beach parking lot, and a site upstream in Trancas Canyon within a LACFCD parcel. The feasibility of these sites it not established and will be evaluated over the course of implementation.

4.6.5 COST FUNCTIONS

The RAA uses the optimization routines in WMMS2 to select a cost-effective combination of BMPs by weighing implementation costs versus the attained pollutant reduction benefits. Because the assumed BMP unit costs can greatly impact the spatial and temporal implementation strategy, the cost functions must be robust and based on local efforts rather than national cost functions. The WMMS2 development effort involved a major update to the cost functions in WMMS and in general the capital cost functions from WMMS2 were used for the NSMBCW RAA. Details on the cost functions are provided in the documentation for the WMMS2 model. **Table 28** details the cost functions used for the RAA and estimation of costs in **Section 6**. The cost functions include base costs to reflect the capital expense associated with individual sites – they are included to account for the fact that many of the projects in the NSMBCW EWMP are dry weather projects which have relatively small sizes and therefore typical cost functions likely underestimate the cost of the project. The base costs ensure that cost estimates for small



regional projects account for the design, planning and permitting for individual project sites (even small capacity BMPs). For Canyon BMPs, the base costs were higher because those projects are downstream near beach outlets and may require unique environmental permitting efforts. For Planned projects, the costs provided by the jurisdictions with the concept were used directly (rather than cost functions).

Table 28. Cost Functions used for WMMS Optimization and EWMP Implementation Plan Cost Estimates

BMP Type	Subtype	Base Cost	Capital Cost
Regional Treatment	Modular Filtration	\$1,000,000	\$323 / sq. ft.
Regional Infiltration	Bioretention (adjacent to roadways)	\$500,000	\$207 / sq. ft.
Regional Infiltration	Infiltration Gallery (underneath roadways)	\$1,000,000	\$13 / cu. ft.
Regional Infiltration	Canyon Project (infiltration)	\$2,000,000	\$207 / sq. ft.
Regional Treatment	Canyon Project (modular filtration)	\$2,000,000	\$323 / sq. ft.

4.7 SELECTION OF CONTROL MEASURES FOR EWMP IMPLEMENTATION PLAN

The RAA process is an important tool for assisting EWMP agencies with selection of control measures for EWMP implementation (known as the EWMP Implementation Plan). A major challenge associated with stormwater planning is the multitude of potential types and locations of control measures and the varying performance and cost of each scenario. This subsection describes the process for selecting the control measures for the EWMP Implementation Plan by each jurisdiction.

As described in **Section 3**, over 33 regional BMP opportunities were identified through the screening process, and the modeling workflow within WMMS2 ([LINK](#)) provides a powerful tool for considering millions of scenarios of control measures and recommending a solution based on cost-effectiveness (see **Figure 24**). The cost from project concepts and WMMS2 cost functions are used to weigh the cost of different BMP scenarios with benefits in terms of pollutant reduction. The optimization modeling is conducted stepwise to determine the control measures for attainment of final RWLs and WQBELs that are selected for the EWMP Implementation Plan, as follows:

- 1. Determine the cost-effective BMP solutions for each subwatershed in the EWMP area:** an example set of “BMP solutions” is shown in **Figure 24**, which shows thousands of scenarios considered for an individual subwatershed in the EWMP area (**Figure 18** shows the 180 subwatersheds). The scenarios are based on the available opportunity (e.g., the available footprints for regional infiltration and treatment BMPs) and predicted performance for eliminated Exceedance Volume if those BMPs were implemented at those opportunities with varying sizes. The most cost-effective BMP solutions for each of the 180 subwatersheds in the EWMP area, known as “Tier 1” in WMMS2 workflow, provide the basis for cost optimization. Following this step, the “Multi-jurisdictional Regional BMP Utility” in



WMMS2 is used to explicitly account for the potential combinations of regional BMPs that manage multiple subwatersheds.¹⁵

2. **Determine the cost-effective scenarios for each Priority Area in the EWMP area:** by rolling up the BMP solutions at the subwatershed level, the most cost-effective scenarios for each assessment area can be determined for a wide range of reductions. These “cost optimization curves,” which are generated by the Tier 2 Optimization Utility in WMMS2, provide a potential EWMP Implementation Plan for a range of required reductions. Each Priority Area potentially has its own optimization curve, or the highest-level organization is for all the Wet Weather Priority Areas and ASBS Priority Areas rolled up into three curves (**Figure 22** shows the Priority Areas). The County and City are organized within “jurisdictions” in the assessment areas, and the extracted solutions from the optimization curve account for jurisdiction-by-jurisdiction requirements.
3. **Extract the cost-effective scenarios for the required reduction per schedule deadlines:** for the NSMBCW EWMP, the RAA schedule is based on final wet weather SMBB Bacteria TMDL deadline. The selected “slices” from the optimization curves become the EWMP Implementation Plan. The extracted control measures comprise a detailed recipe for implementation to achieve RWLs in the EWMP area. The limiting pollutant analysis for non-modeled water quality priorities demonstrated that bacteria BMPs have reasonable assurance of addressing non-modeled pollutants as well.

The network of control measures was extracted and used for scheduling of the EWMP Implementation Plan, as presented in the next section. The extracted recipes for each jurisdiction are based primarily upon the schedule for the SMBB Bacteria TMDL, as follows:

- Achieve the bacteria reduction for wet weather critical condition in Wet Weather Priority Areas.
- Achieve runoff reduction for the ASBS critical condition in ASBS Priority Areas.

The final product, as presented in the next section, is the network of structural BMPs in NSMBCW area that are forecast to achieve the RWLs and WQBELs of the MS4 Permit while also providing multiple benefits to the communities and stakeholders in the NSMBCW.

¹⁵ The WMMS2 MJR BMP utility allows for detailed representation of regional BMPs, so that hundreds of BMPs can potentially be handled rather than only a handful of regional BMPs.

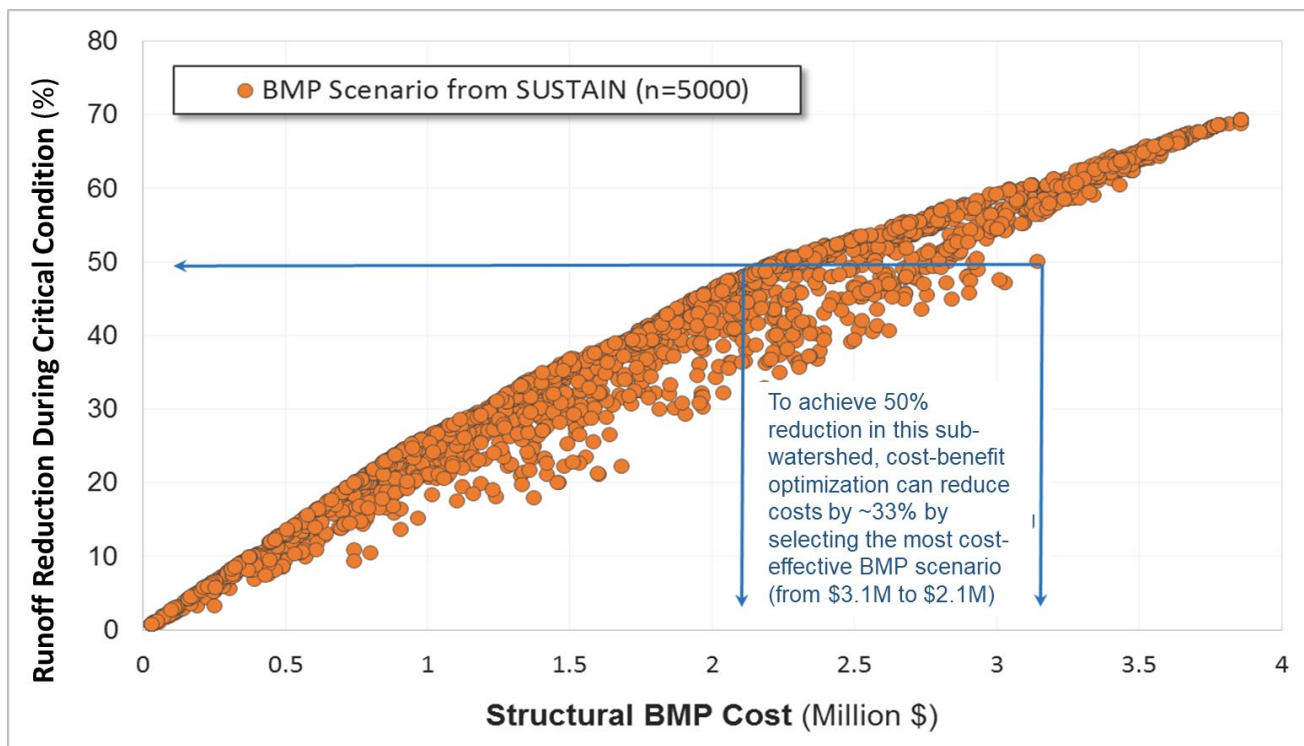


Figure 24. Example BMP Solutions for a Selected Subwatershed and Advantage of Cost-Benefit Optimization

4.8 RAA APPROACH - DRY WEATHER

Demonstrating reasonable assurance of meeting the applicable dry weather Permit requirements necessitates a methodology that accounts for many factors which cannot be accurately modeled based on dry weather runoff processes alone (Thoe et al, 2015), despite the existence of somewhat extensive dry weather beach-specific monitoring datasets that are available. Therefore, to perform the RAA for dry weather for the NSMBCW EWMP area, a semi-quantitative conceptual model (methodology) has been developed following the Permit structure. This approach applies independent lines of evidence for demonstrating that MS4 discharges are not causing or contributing to receiving water exceedances. The following series of criteria form the dry weather RAA methodology. If one criterion is met for each CSMP monitoring location, then “reasonable assurance” is considered to be demonstrated. This methodology was presented to Regional Board staff on April 9, 2014, and verbal feedback received at the time was supportive.

1. If a dry weather diversion, infiltration, or disinfection system is located at the downstream end of the analysis region, reasonable assurance is considered to be demonstrated. To meet this criterion, any such system must have records to show that it is consistently operational, well maintained, and effectively removing bacteria in the treated effluent (in the case of disinfection facilities). Diversion or infiltration systems must demonstrate consistent operation and maintenance so that all freshwater surface discharges to the receiving water are effectively eliminated during year-round dry weather days.



2. If there are no MS4 outfalls (major or minor) owned by the NSMBCW Agencies within the analysis region, MS4 discharges are considered to not be contributing to pollutant concentrations in the receiving water. Therefore, reasonable assurance is demonstrated.
3. For the SMBB Bacteria TMDL monitoring locations, if the allowed summer-dry and winter-dry single sample exceedance days have been achieved for four out of the past five years and the last two years, then the existing water quality conditions at the monitoring location are acceptable, and reasonable assurance is demonstrated.
4. If non-stormwater MS4 outfall discharges have been eliminated within the analysis region, reasonable assurance is demonstrated. For this criterion to be met, supporting records from the non-stormwater outfall screening program should be supplied.

4.8.1 NON-STORMWATER DISCHARGE SCREENING

Since the NSMBCW EWMP Group's dry weather approach is consistent with the Permit requirement to eliminate 100 percent of non-exempt dry weather MS4 discharges, the Group's non-stormwater screening process plays an important role in demonstrating reasonable assurance for dry weather.

The non-stormwater screening process, that was used to identify if there are outfalls with significant non-stormwater discharge, consists of the steps outlined in **Table 29** and shown in **Figure 25**. Further details on the NSMBCW EWMP Group's approach to meet this requirement are provided below and in Section 4 of the NSMBCW CIMP (NSMBCW EWMP Group, 2015c). The NSMBCW EWMP Group completed the initial screening in 2015 consistent with Permit requirements and no significant non-stormwater discharges were identified. Additionally, during subsequent screening events no significant non-stormwater discharges were observed at any of the City and County's outfalls.

Table 29. Non-Stormwater Outfall Screening and Monitoring Program Summary

Element	Description
Develop MS4 outfall database	Develop a database of all major outfalls with descriptive information, linked to GIS.
Outfall screening	A screening process will be implemented to collect data for determining which outfalls exhibit significant NSW discharges.
Identification of outfalls with NSW discharge	Based on data collected during the Outfall Screening process, identify outfalls with NSW discharges.
Inventory of outfalls with significant NSW discharge	Develop an inventory of major MS4 outfalls with known significant NSW discharges and those requiring no further assessment.
Prioritize source investigation	Use the data collected during the screening process to prioritize significant outfalls for source investigations.
Identify sources of significant discharges	For outfalls exhibiting significant NSW discharges, perform source investigations per the prioritization schedule. If not exempt or unknown, determine abatement process.
Monitor discharges exceeding criteria	Monitor outfalls that have been determined to convey significant NSW discharges comprised of either unknown or non-essential conditionally exempt discharges, or continuing discharges attributed to illicit discharges must be monitored.

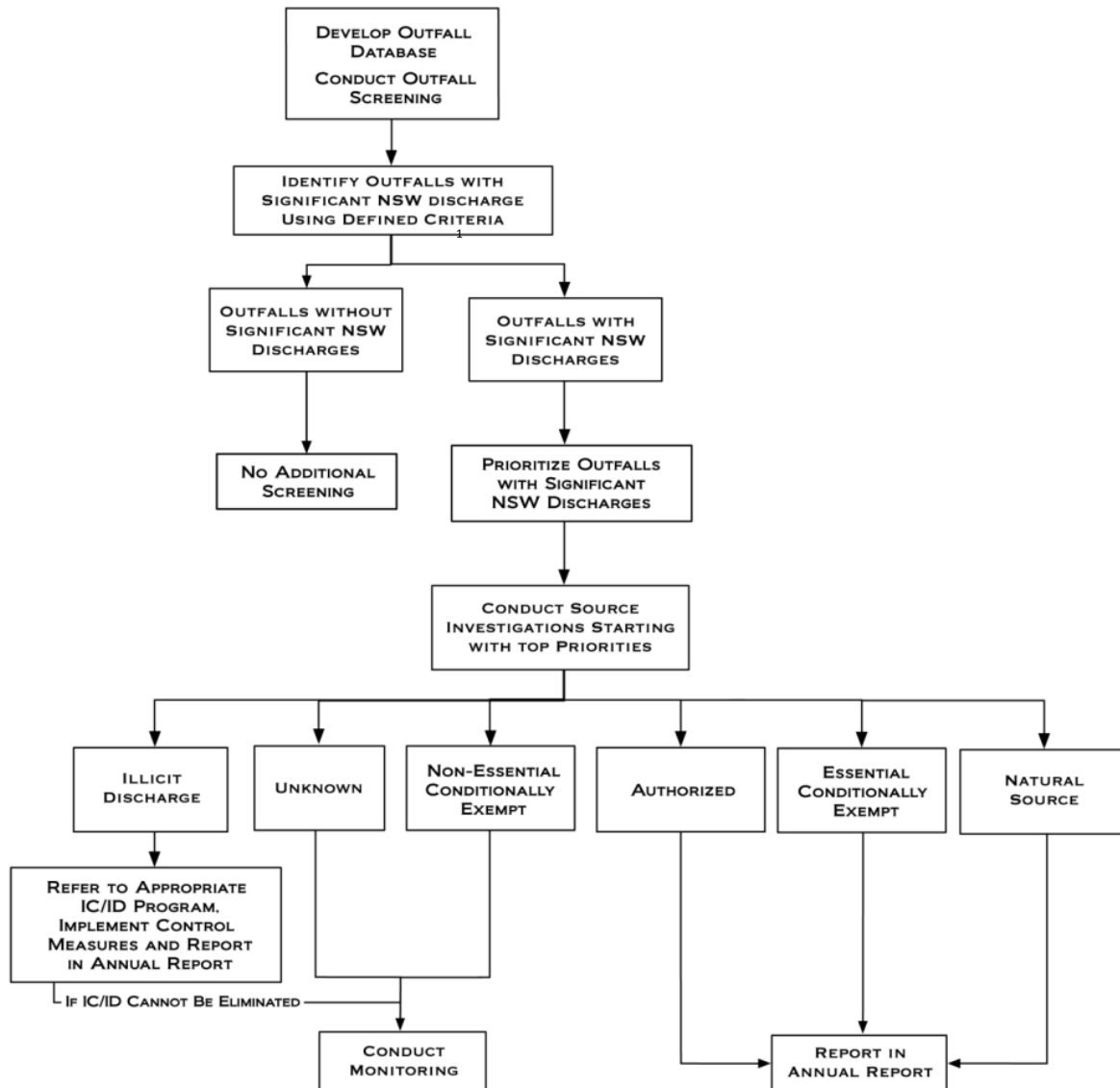


Figure 25. Non-Stormwater Outfall Screening Program

¹ Discharges are defined as “significant” based on a variety of factors, including, but not limited to: a) proximity of the outfall to receiving water bodies where TMDLs apply; b) presence of persistent flows at the outfall, meaning flow is observed on two or more of the three screenings at a rate “greater than a garden hose” (> 10 gallon per minutes); c) characteristics of the catchment area, including but not limited to, presence of permitted discharges in the area, land use characteristics, and previous IC/ID results.



4.8.2 INVENTORY OF MS4 OUTFALLS WITH SIGNIFICANT NON-STORMWATER DISCHARGES

An inventory of MS4 outfalls was developed and as no outfalls with significant non-stormwater discharges have been observed then no further assessment (Part IX.D of the Permit MRP) was required. The inventory was included in the outfall database. The inventory was updated to incorporate the most recent characterization information for outfalls and will be updated as ongoing visual inspections occur.

4.8.3 PRIORITIZED SOURCE IDENTIFICATION

In the future, if major outfalls exhibiting significant non-stormwater discharges are identified through the screening process and incorporated in the inventory, the NSMBCW EWMP Group will prioritize the outfalls for further source investigations. Once the prioritization is complete, a source identification schedule will be developed. The scheduling will focus on the outfalls with the highest priorities first.

4.8.4 SIGNIFICANT NON-STORMWATER DISCHARGE SOURCE IDENTIFICATION

Based on the prioritized list of major outfalls with significant non-stormwater discharges, investigations will be conducted to identify the source(s) or potential source(s) of non-stormwater flows. The source investigation results will then be classified into one of four endpoints outlined as follows:

- A. Illicit connections or illicit discharges (IC/IDs): If the source is determined to be an illicit discharge, the Permittee must implement procedures to eliminate the discharge consistent with IC/ID requirements (Permit Part VI.D.10) and document actions.
- B. Authorized or conditionally exempt NSW discharges: If the source is determined to be an NPDES permitted discharge, a discharge subject to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or a conditionally exempt essential discharge, the Group Member must document the source. For non-essential conditionally exempt discharges, the Group Member must conduct monitoring consistent with Part IX.G of the MRP to determine whether the discharge should remain conditionally exempt or be prohibited.
- C. Natural flows: If the source is determined to be natural flows, the Permittee must document the source.
- D. Unknown sources: If the source is unknown, the Permittee must conduct monitoring consistent with Part IX.G of the MRP.

Based on the results of the source assessment, outfalls may be reclassified as requiring no further assessment and the inventory will be updated to reflect the information and justification for the reclassification.

Where investigations determine the non-stormwater source to be authorized, natural, or essential conditionally exempt flows, the EWMP Group will conclude the investigation, categorize the outfall as requiring no further assessment in the inventory, and move to the next highest priority outfall for investigation. Where investigations determine that the source of the discharge is non-essential conditionally exempt, an illicit discharge, or is unknown – further investigation may be conducted to eliminate the discharge or demonstrate that it is not causing or contributing to receiving water problems. In some cases, source investigations may ultimately lead to prioritized programmatic or structural BMPs. Where Permittees determine that they will address the non-stormwater discharge through modifications to programs or by structural BMP implementation, the EWMP Group will incorporate the approach into the implementation schedule developed for the EWMP Group and the outfall can be lowered in priority for investigation, such that the next highest priority outfall can be addressed.



4.8.5 NON-STORMWATER DISCHARGE MONITORING

Outfalls with significant NSW discharges that remain unaddressed after source investigation will be monitored for water quality in accordance with the CIMP.

4.8.6 SIGNIFICANT NON-STORMWATER DISCHARGE ELIMINATION

The Group will strive to eliminate, divert, or treat significant non-stormwater discharges that are unauthorized and determined to be causing or contributing to RWL/WQBEL exceedances consistent with the requirements of the MS4 Permit.



5. EWMP Implementation Plan

The EWMP Implementation Plan is the recipe for implementation for the NSMBCW Group to address water quality priorities and the WQBELs and RWLs provisions of the MS4 Permit. Through the RAA, a series of quantitative analyses were used to identify the capacities and locations of LID, green streets and regional BMPs that comprise the EWMP Implementation Plan and assure those control measures will address the water quality priorities. Implementation of the EWMP Implementation Plan provides a BMP-based pathway for each jurisdiction under the MS4 Permit. The EWMP Implementation Plan includes individual recipes for the City and County organized by Priority Areas – see **Figure 22** for a map of the Priority Areas. The NSMBCW is unique compared to other EWMP areas in LA County for multiple reasons:

- Water quality in the area is generally good, with only a portion of the area not attaining RWLs. The receiving waters in NSMBCW area regularly attain bacteria RWLs even during storm events;
- The area is composed of numerous small coastal drainages with numerous outlets to Santa Monica Bay rather than draining toward a single large creek or river;
- A large portion of the area is natural open space characterized by steep slopes and drainage infrastructure such as ‘curb and gutter’ is not widespread;
- Public land is much less available than other areas, and in fact many roads and coastal access points are private land; and,
- A significant portion of the road right-of-way is Caltrans which is addressed through a separate MS4 permit and that establishes different TMDL implementation requirements and schedule creating potential challenges for coordination on BMP implementation, even though Pacific Coast Highway often crosses drainages near the outlet to the beach which would make for ideal BMP siting.

Based on these unique characteristics of the NSMBCW area, it is critical for the City and County to have flexibility during EWMP implementation, as described in the next subsections. This EWMP Implementation Plan described through the following subsections includes:

- Elements of the EWMP Implementation Plan (5.1)
- Stormwater control measures to meet 2024 deadline (5.2)
- Scheduling of stormwater control measures (5.3)
- Proposed near (3-Year) and long-term (13-Year) implementation schedules (5.4)

5.1 ELEMENTS OF THE EWMP IMPLEMENTATION PLAN

The EWMP Implementation Plan is expressed in terms of [1] the control measures that will be implemented by each jurisdiction based on the RAA outputs to address water quality priorities and [2] ‘Equivalency Metrics’ that provide equivalency to the RAA-generated control measures so that flexibility is provided over the course of EWMP implementation (e.g., to substitute alternative control measures if a regional project is found to be infeasible). The two primary elements of the EWMP Implementation Plan are as follows:



- **EWMP Implementation Plan:** the network of control measures that has reasonable assurance of achieving the TMDL and ASBS reductions is referred to as the EWMP Implementation Plan. The EWMP Implementation Plan is the output from the RAA and represents a “trajectory” toward long-term implementation of BMPs in the NSMBCW area. The Plan provides important context for understanding the forecasted number and size of BMPs that are required to meet the MS4 Permit requirements, the estimated economic impacts in terms of capital costs and operation and maintenance (O&M), and the benefits that can be provided to the community.
- **Equivalency Metrics:** given the vast extent of the BMP network that comprises the EWMP Implementation Plan, it is a given the BMPs implemented over time will differ from those forecasted by the RAA/EWMP Implementation Plan. As such, Equivalency Metrics are needed for the purpose of evaluating whether the EWMP is implemented rather than tracking a list of the projects that have been constructed. Several Equivalency Metrics are presented for tracking over time, and attainment of any of those targets is considered equivalent to the implementation of the EWMP Implementation Plan. As BMPs are substituted over the course of EWMP implementation (e.g., replace green street capacity in a subwatershed with additional regional BMP capacity), the Group will show equivalency based on the Equivalency Targets, which include:
 1. Total capacity implemented by each jurisdiction by Priority Area,
 2. The volume of stormwater managed¹⁶ by implemented control measures, and
 3. Impervious area managed by structural control measures.

These Equivalency Metrics are reported in the appendices to this section.

For the NSMBCW EWMP, the EWMP Implementation Plan is architected around Priority Areas (**Figure 26**; see **Section 4.3** for the methods for establishing Priority Areas). The Wet Weather and ASBS Priority Areas each have different critical conditions and therefore sizing of control measures to achieve the Permit requirements (see **Section 4.4**). For the other drainages in the NSMBCW area, existing BMPs and MCMs are adequate for water quality protection. The process for EWMP Implementation, based on Priority Areas and Equivalency Metrics, is shown in **Figure 27** and outlines approach to determining whether EWMP requirements have been achieved over time. **Section 7** describes the adaptive management and assessment process in more detail.

The following subsections lay out the ‘trajectory’ of the EWMP Implementation Plan over the coming years.

¹⁶ The volume is determined by reporting the amount of water that would be retained (infiltrated) and/or treated by BMPs over the course of a year, in this case 2016-17 is used as the example year. The use of a year-long period for reporting aligns with MS4 annual reporting which tracks the estimated runoff captured each fiscal year.

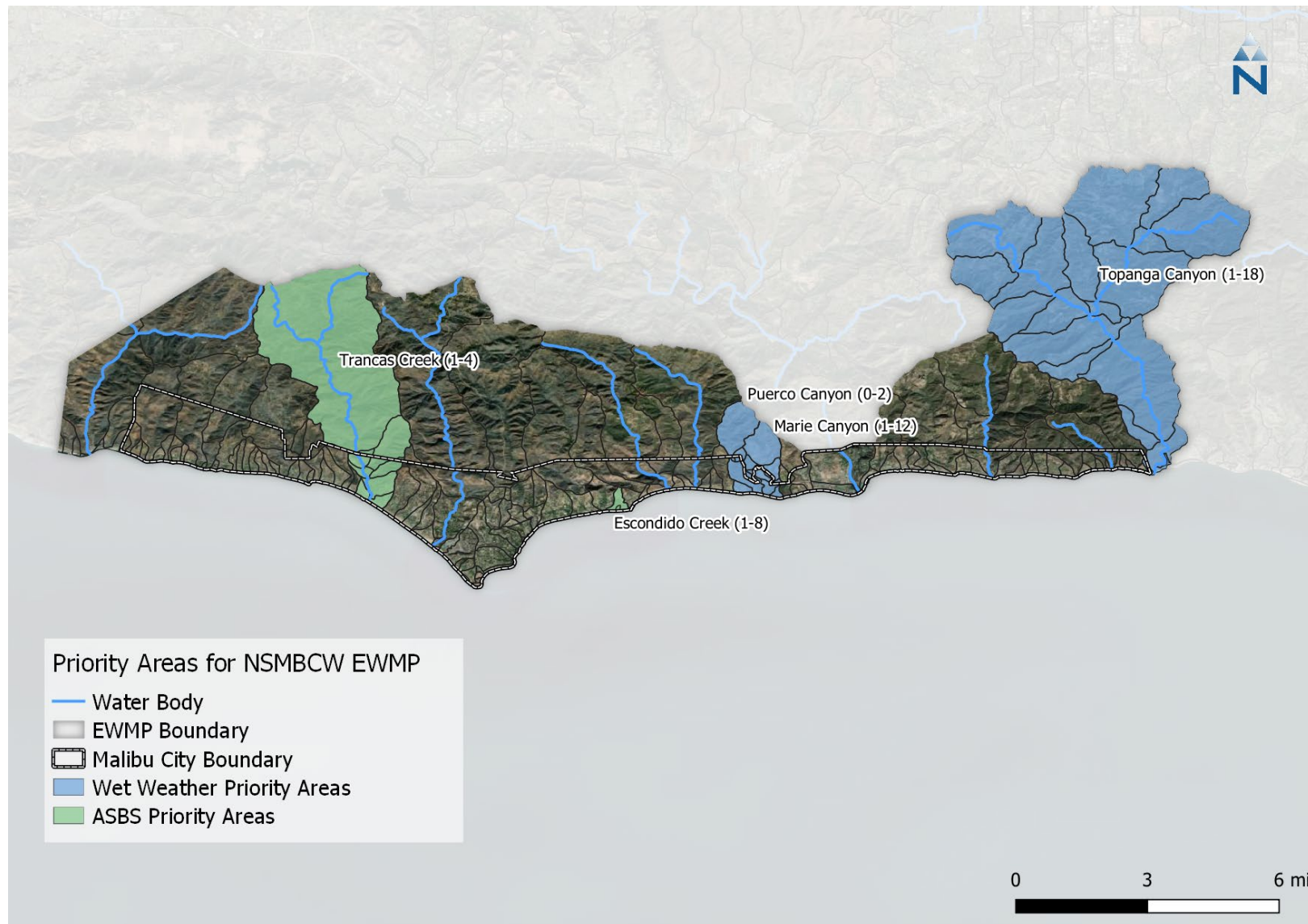


Figure 26. NSMBCW Priority Areas for EWMP Implementation

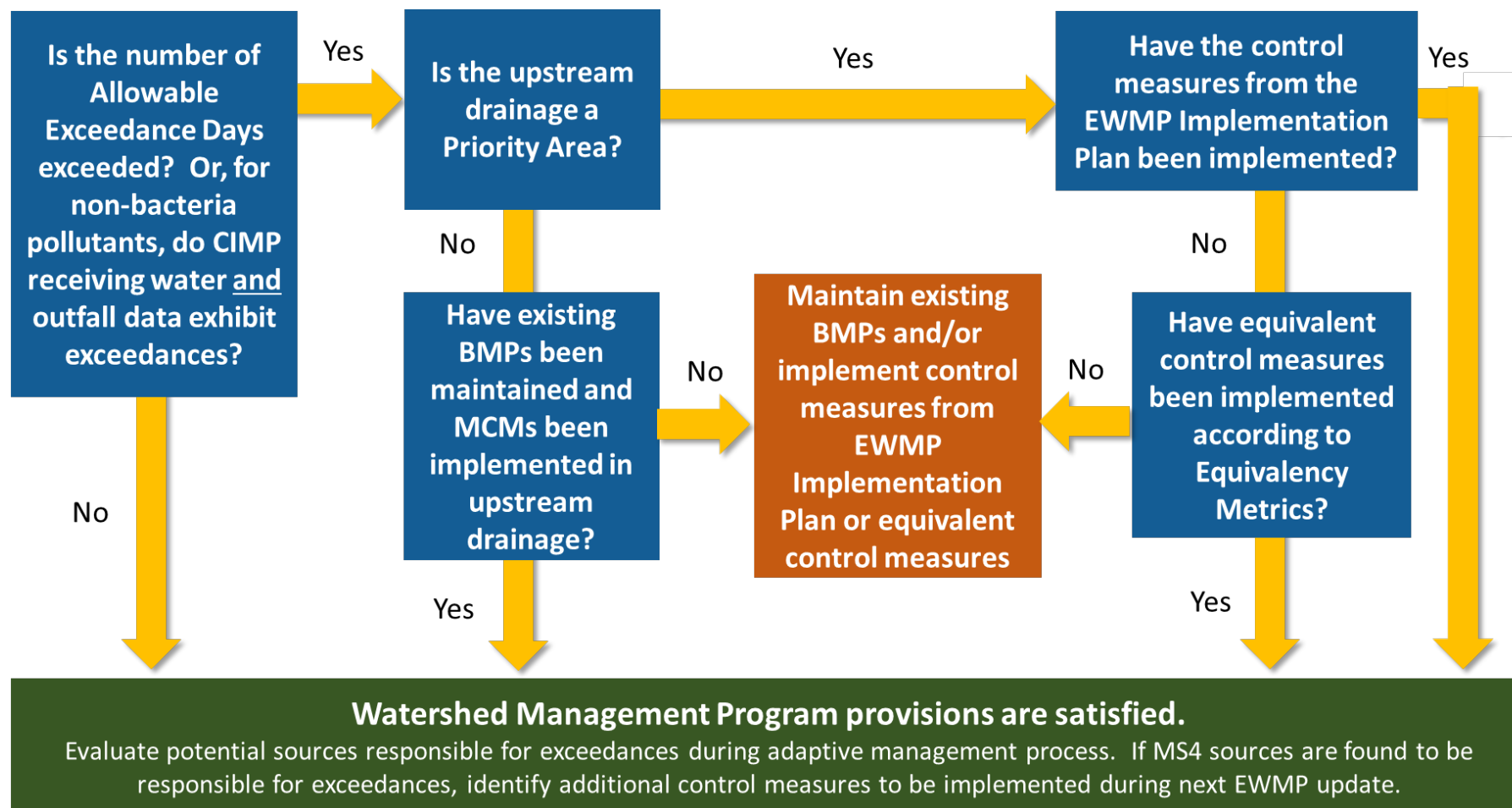


Figure 27. EWMP Implementation Process and Role of Equivalency Metrics and Priority Areas



5.2 STORMWATER CONTROL MEASURES

The EWMP will guide stormwater management in NSMBCW for the coming years, and the control measures to be implemented will provide widespread community benefits. The EWMP Implementation Plan identifies the location and type of control measures that would be required by the City and County to meet applicable WQBELs and RWLs by 2024; however, an alternate schedule that considers the utilization of two time schedule order (TSOs) with a 10-year extension and a final deadline of 2034 is proposed in **Section 5.4**. These control measures are forecasted to attain the SMBB Bacteria TMDL and ASBS provisions while also addressing other water quality priorities. The EWMP Implementation Plan is presented as the following components:

- **Summary of total capacity¹⁷ of control measures to be implemented in each type of Priority Area:** bar graphs are used to summarize the control measure capacities that comprise the EWMP Implementation Plan. Shown in **Figure 28** are the bar graphs that detail the various sub-categories of control measures to be implemented across the entire EWMP area. **Figure 29** provides the detailed breakdown by City and County.
- **Summary of total capacity of control measures to be implemented in each Priority Area:** the recipe of control measures to be implemented within each Priority Area (by drainage/creek/canyon) is shown in **Figure 30**. The breakdown by City and County is shown in **Figure 31** and **Figure 32**. Additional graphics with further breakdown by jurisdiction and drainages are provided in **Appendix 5A**.
- **Maps of regional BMPs that comprise the EWMP Implementation Plan:** the regional BMPs that are included in the EWMP Implementation Plan have specific locations and simulated sizing via the RAA. Key regional projects within the EWMP Implementation Plan are shown in **Figure 33**. A series of maps showing all the identified opportunities and the projects selected by the RAA are shown in **Appendix 5B**. These maps provide a visual representation of BMP locations and sizing. Example maps for distinct Priority Areas are shown in **Figure 34** (Topanga Canyon), **Figure 35** and **Figure 36** (Marie Canyon), **Figure 37** (Puerco Canyon), and **Figure 38** (Trancas Creek). Then the “treatment depths” by those same BMPs are displayed in **Figure 39** and **Figure 40**, which illustrate the managed areas and the cumulative BMP sizing for all the BMPs that treat the upstream areas. Additional maps with zoomed in panels by jurisdiction and canyon are provided in **Appendix 5B**.
- **Detailed recipe for implementation including volumes of stormwater to be managed and control measure capacities:** the EWMP Implementation Plan is detailed for each subwatershed in the EWMP area (generally 1 to 2 square mile drainages). The graphical outputs are also tabulated into detailed “recipes for implementation” that are presented in detailed tables in **Appendix 5C**. These recipes are presented for each jurisdiction including the Equivalency Metrics for volumes of stormwater to be managed and impervious area to be managed.

¹⁷ Capacity is the storage volume within the control measures and does not include infiltration/drawdown. For the NSMBCW EWMP Implementation Plan, a significant portion of the BMP capacity is attributed to regional treatment BMPs. Treatment control measures are not storage-based instead they are flow-thru and therefore their cost is typically not proportional to the relative capacity when compared to regional infiltration BMPs. In other words, capacities of regional treatment BMPs appear relatively small relative to their performance and cost when compared to infiltration projects. During implementation, the decision to use treatment or infiltration will be determined on a site-by-site basis.



Shown in **Table 30** is a summary of the number of regional BMPs identified for the NSMBCW EWMP – a total of 11 specifically identified BMPs were selected by the cost optimization to achieve the TMDL and ASBS requirements. The network of control measures in the EWMP Implementation Plan is extensive and its implementation would represent a significant change in how stormwater will be managed in the North Santa Monica Bay. The next subsection describes the timeline/sequencing for implementing the EWMP Implementation Plan. The costs and financial strategy for the EWMP are presented in **Section 6**.

Table 30. Summary of Identified Regional BMPs for the NSMBCW EWMP Implementation Plan¹

Priority Area	Jurisdiction	Caltrans ROW	Canyon Project	Existing Project	Planned Green Street	Private Road ROW	Public Road ROW	Total
Marie Canyon (1-12)	Malibu	-	-	-	1	-	-	1
	Uninc. County	-	-	1	1	-	-	2
Puerco Canyon (O-2)	Malibu	1	-	-	-	-	1	2
	Uninc. County	-	-	-	-	-	-	-
Topanga Canyon (1-18)	Uninc. County	1	-	-	1	-	-	2
Trancas Creek (1-4)	Malibu	-	2	1	-	-	-	3
	Uninc. County	-	-	-	-	-	-	-
Escondido Creek	Malibu	-	-	-	-	1	-	1
Total		2	2	2	3	1	1	11

1. Many projects are multi-jurisdictional, jurisdiction locations in this table are based on the jurisdiction with the majority of the drainage area. Maps of these projects can be found in **Appendix 5B** and details on capacity and cost can be found in **Appendix 5C**. During implementation, the decision to use treatment or infiltration will be determined on a site-by-site basis.



These two panels show the total structural BMP capacity required for North Santa Monica Bay Priority Areas to attain RWLs. The top panel groups the BMP types into LID, regional infiltration and regional treatment BMPs, while the bottom panel provides more resolution for the BMP subcategories. See footnote 17 regarding relative capacities for treatment versus infiltration projects.

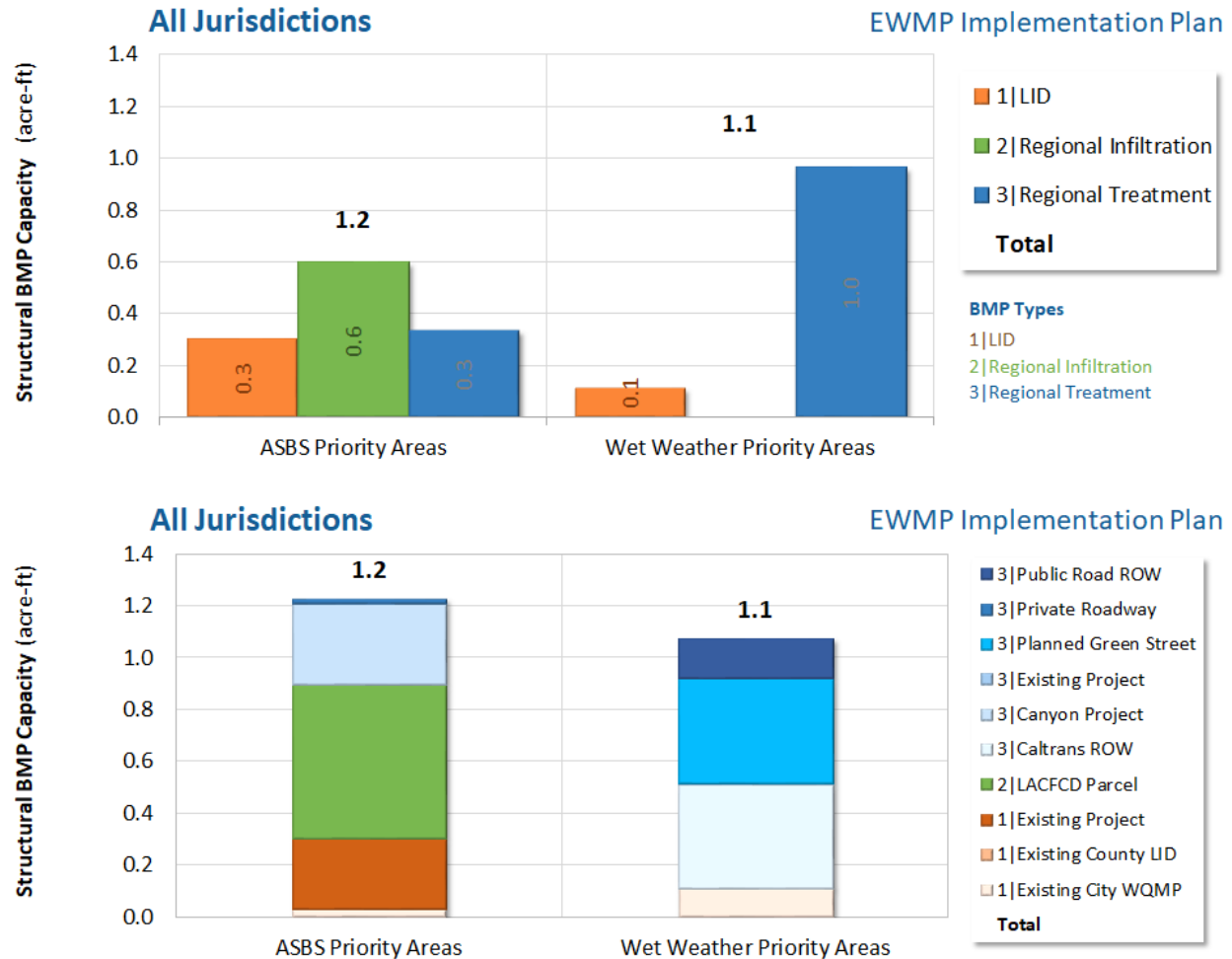


Figure 28. NSMBCW EWMP Implementation Plan by Priority Area Type



This figure shows the same control measure capacities as the previous figure, except organized by jurisdiction.

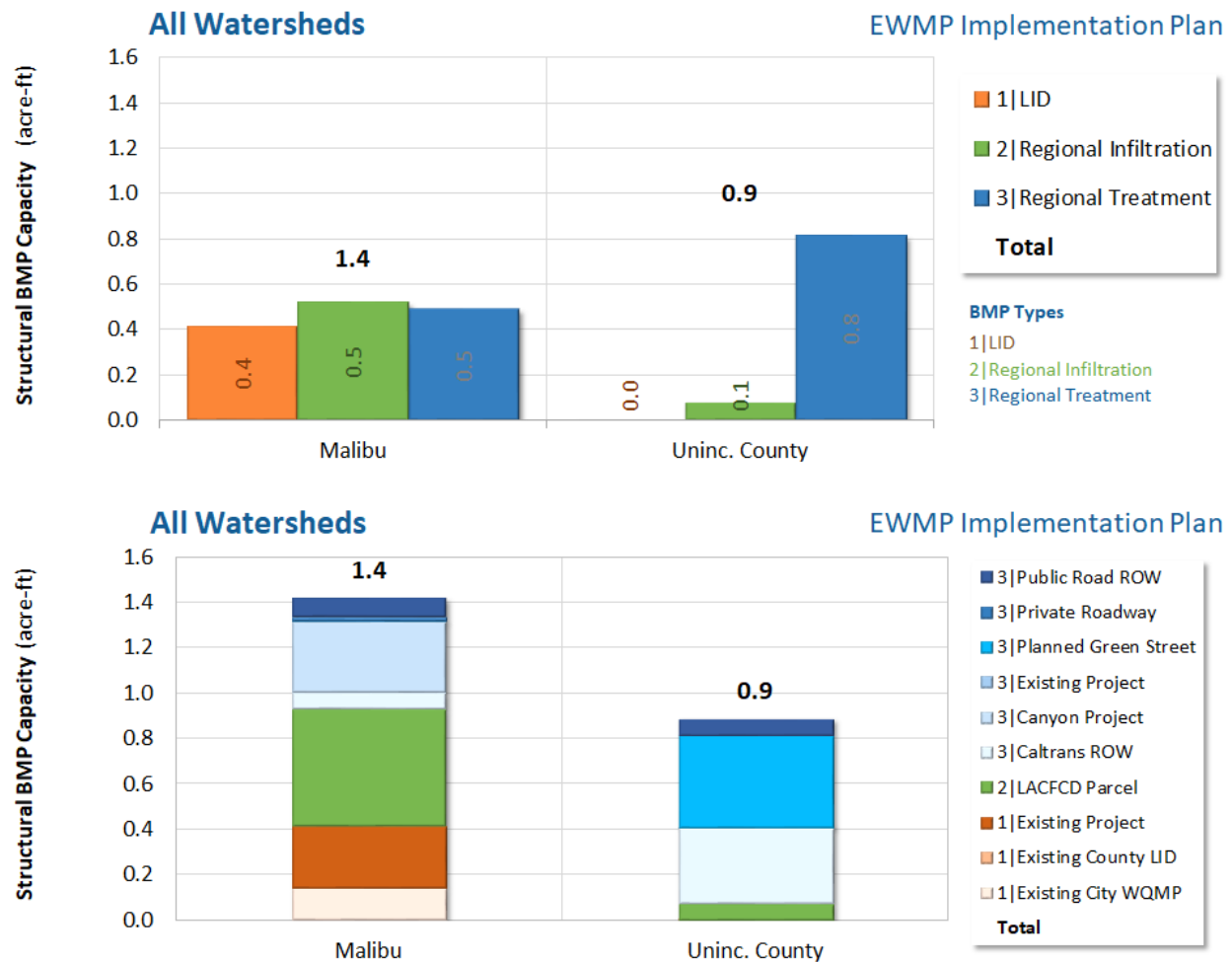


Figure 29. NSMBCW EWMP Implementation Plan by Jurisdiction



This figure shows the same control measure capacities as the previous figure, except organized by distinct Priority Areas. **Appendix 5A** presents many example panels organized by Priority Area, jurisdiction and drainage/canyon. See footnote 17 regarding relative capacities for treatment versus infiltration projects.

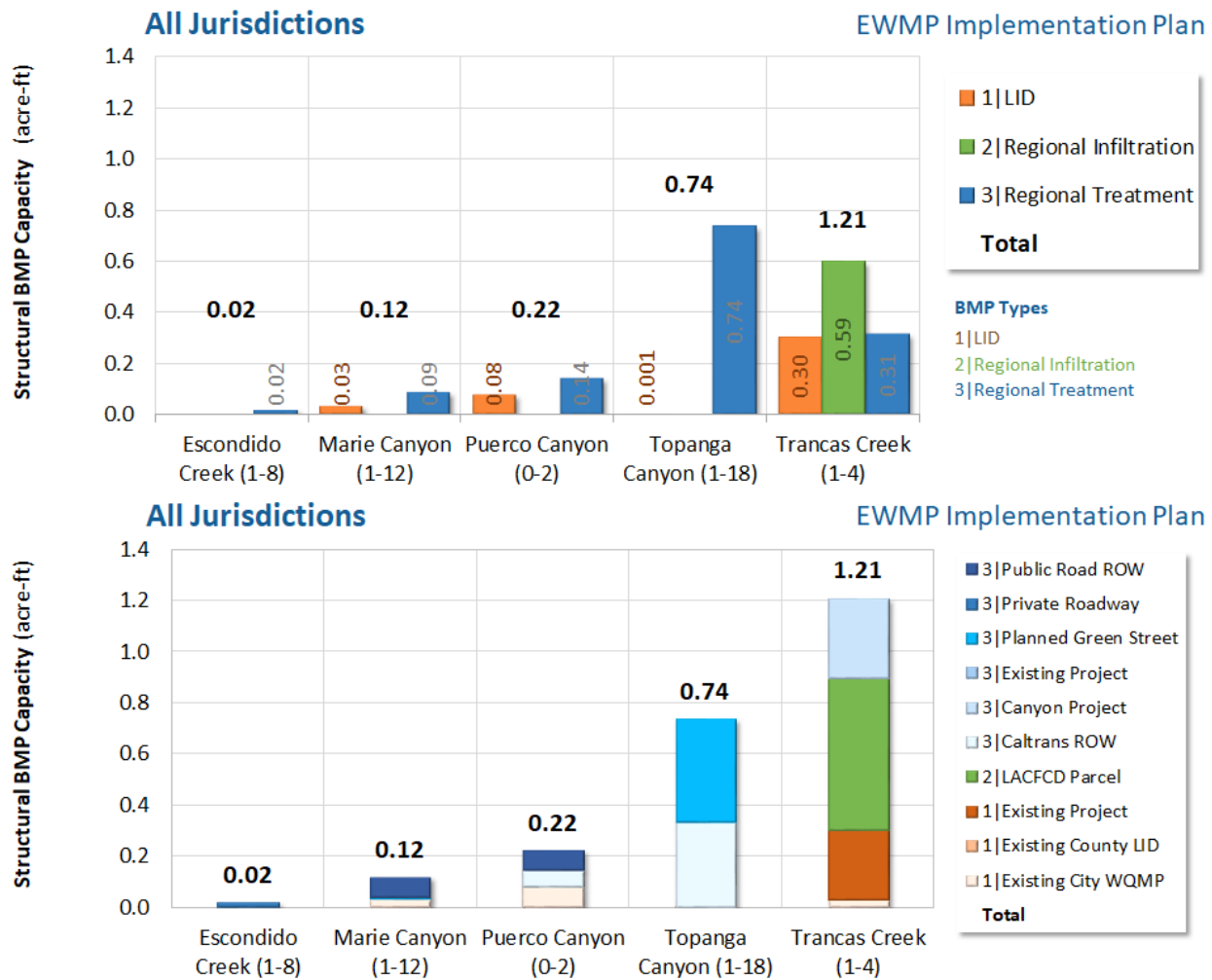


Figure 30. NSMBCW EWMP Implementation Plan by Priority Area



This figure shows the same control measure capacities as the previous figure, except for the City of Malibu portion only. **Appendix 5A** presents additional example panels organized by Priority Area, jurisdiction and drainage/canyon.

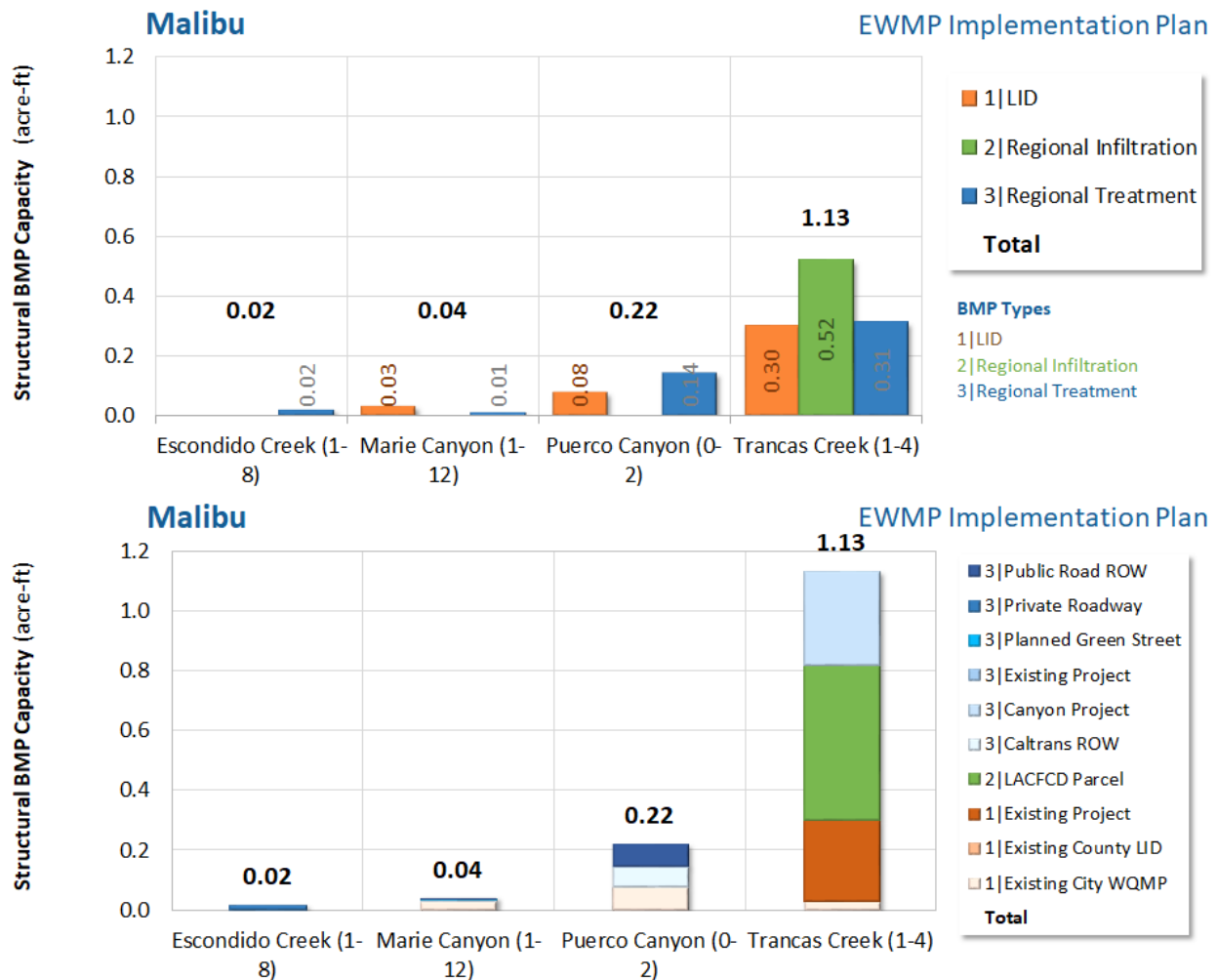


Figure 31. Malibu Portion of the NSMBCW EWMP Implementation Plan by Priority Area



This figure shows the same control measure capacities as the previous figure, except for the Unincorporated County portion only. **Appendix 5A** presents additional example panels organized by Priority Area, jurisdiction and drainage/ canyon.

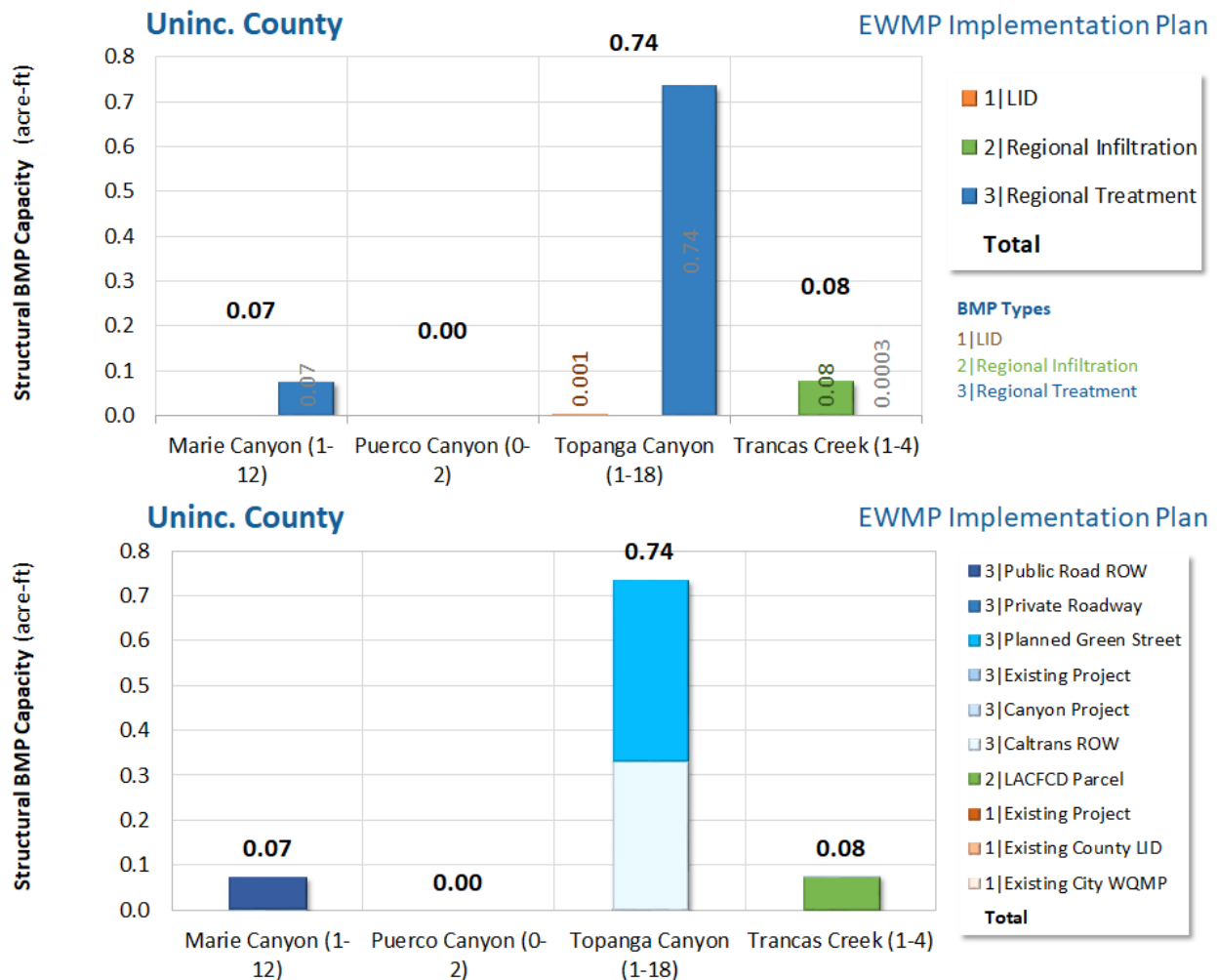


Figure 32. Unincorporated County Portion of the NSMBCW EWMP Implementation Plan by Priority Area

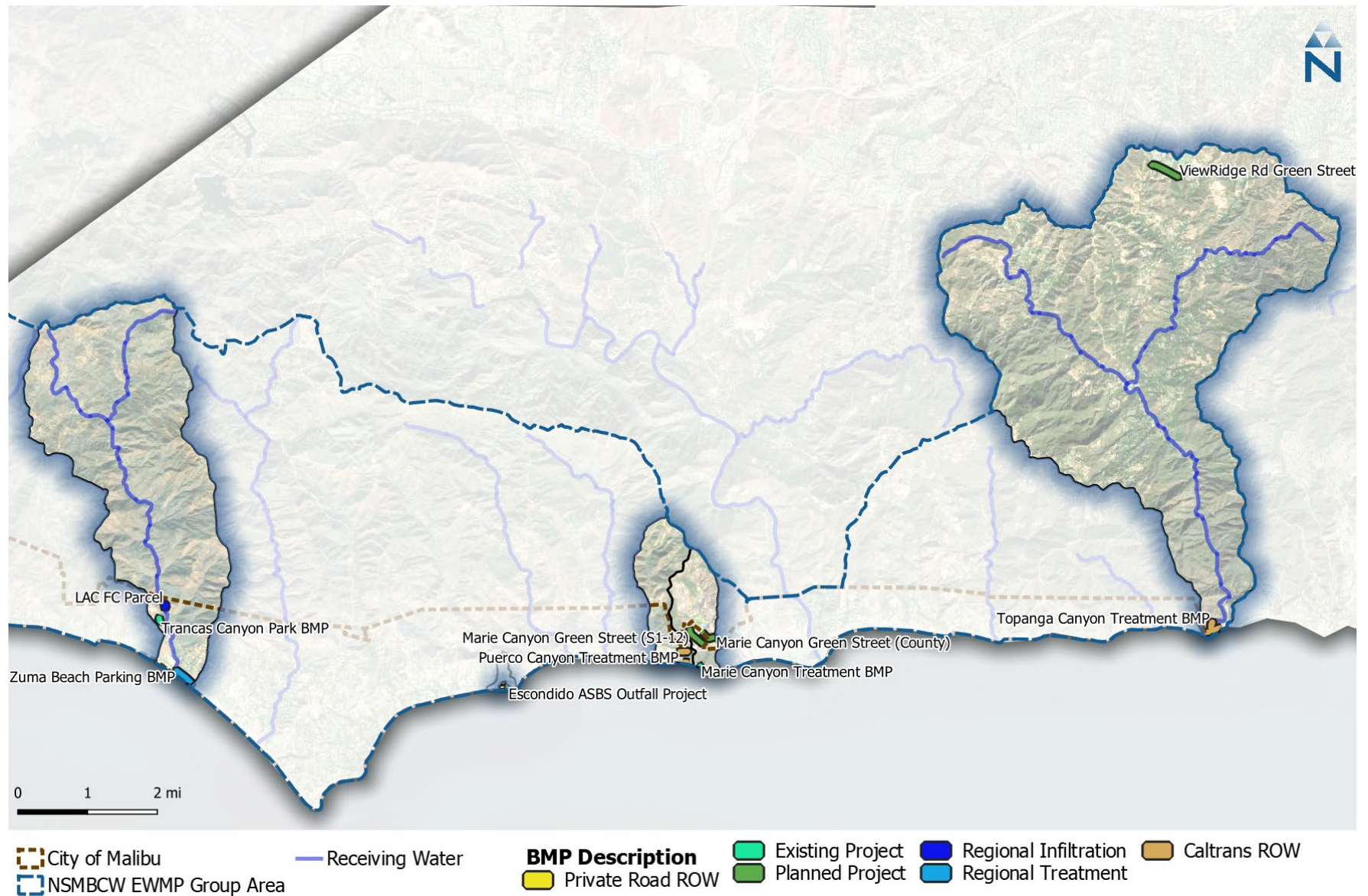


Figure 33. Key Existing, Planned and Proposed Regional Projects within the EWMP Implementation Plan



This map presents an example mapping output for EWMP Implementation Plan, showing the regional BMPs in Topanga Canyon, a Wet Weather Priority Area. The sizes of the circles indicate the size of the BMPs, and coloration reflects the BMP type (using same categories as the previous bar charts). **Appendix 5B** has these maps for all Priority Areas. The tabular version of this map is presented as a series of tables in **Appendix 5C** including jurisdictional breakdowns. See footnote 17 regarding relative capacities for treatment versus infiltration projects.

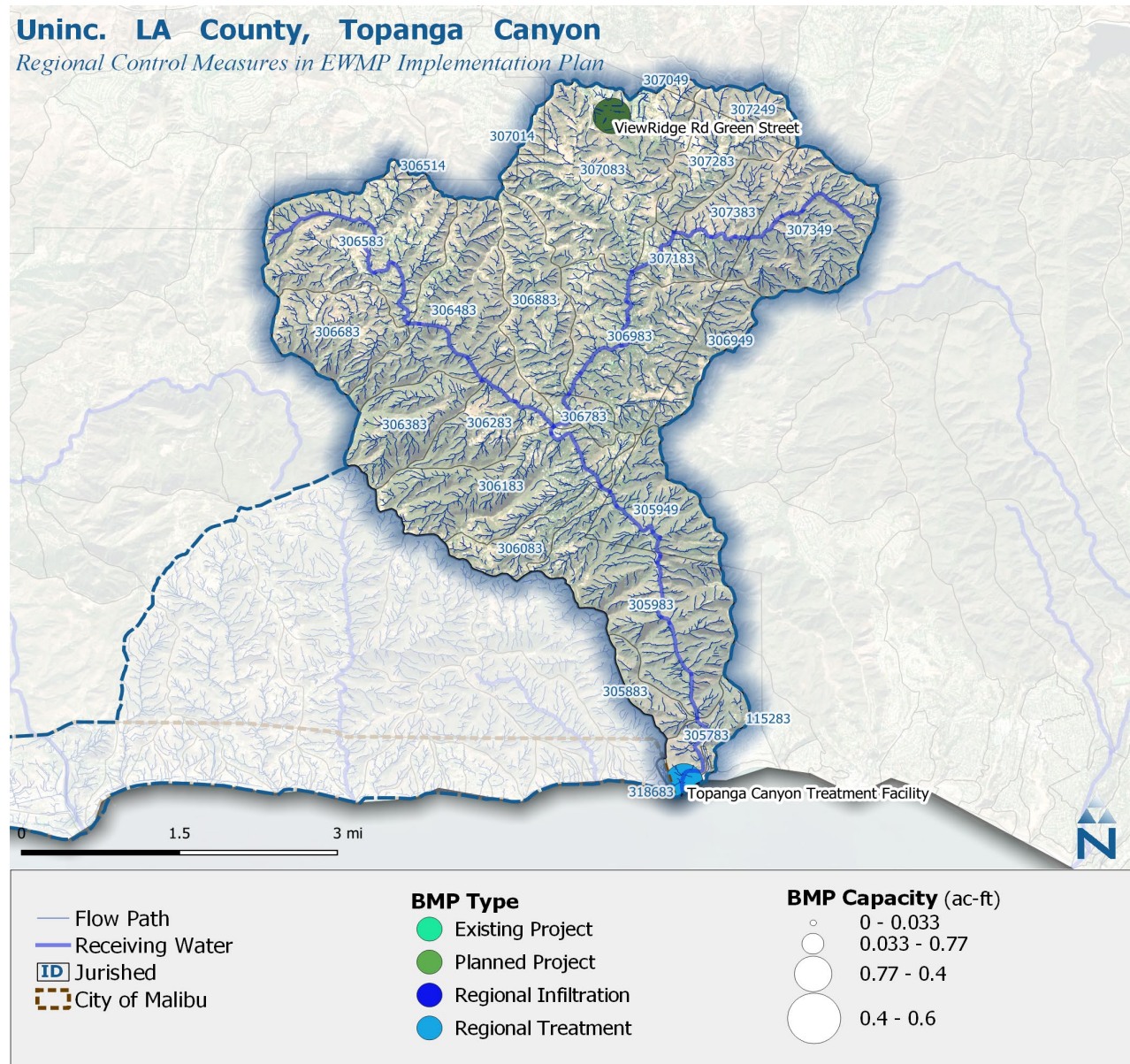


Figure 34. Example Map of Regional BMPs within the EWMP Implementation Plan in Topanga Canyon

This map presents an example mapping output for EWMP Implementation Plan, showing the regional BMPs in City portion of Marie Canyon, a Wet Weather Priority Area. The sizes of the circles indicate the size of the BMPs, and coloration reflects the BMP type (using same categories as the previous bar charts). **Appendix 5B** has these maps for all Priority Areas. The tabular version of this map is presented as a series of tables in in **Appendix 5C** including jurisdictional breakdowns.

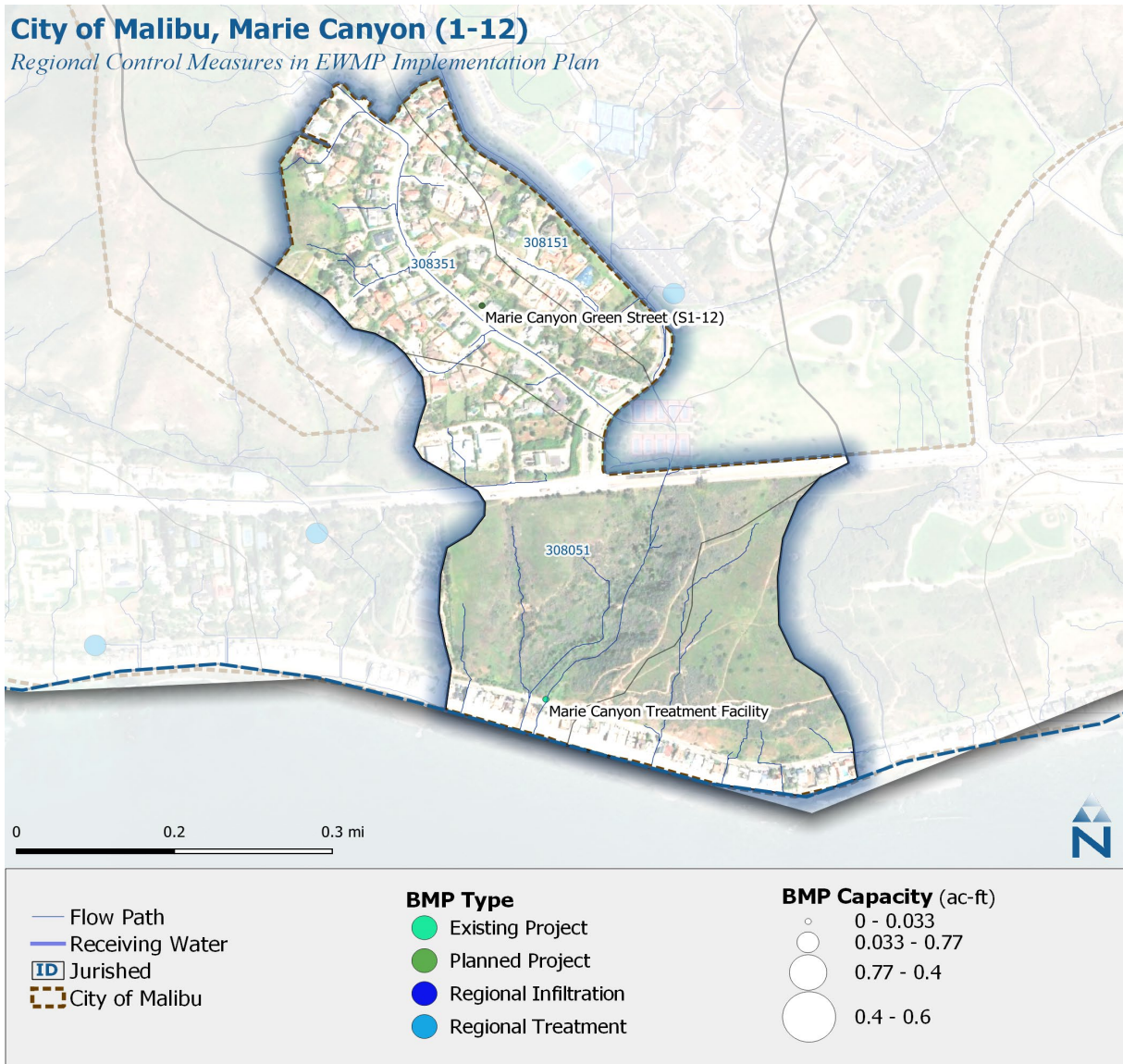


Figure 35. Example Map of Regional BMPs within the EWMP Implementation Plan in City portion of Marie Canyon

This map presents an example mapping output for EWMP Implementation Plan, showing the regional BMPs in County portion of Marie Canyon, a Wet Weather Priority Area. The sizes of the circles indicate the size of the BMPs, and coloration reflects the BMP type (using same categories as the previous bar charts). **Appendix 5B** has these maps for all Priority Areas. The tabular version of this map is presented as a series of tables in **Appendix 5C** including jurisdictional breakdowns.

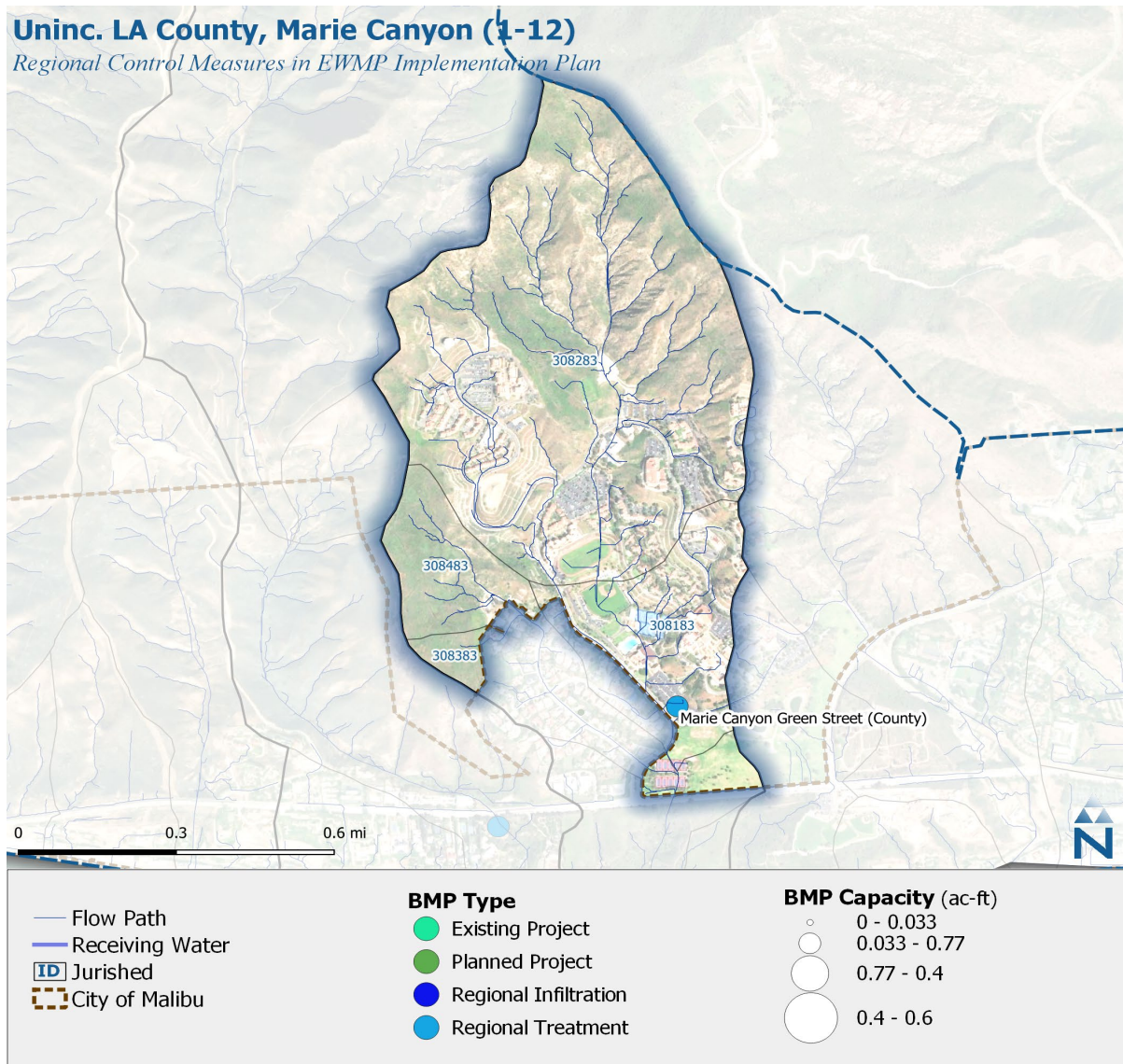


Figure 36. Example Map of Regional BMPs within the EWMP Implementation Plan in County portion Marie Canyon

This map presents an example mapping output for EWMP Implementation Plan, showing the regional BMPs in Puerco Canyon, a Wet Weather Priority Area. The sizes of the circles indicate the size of the BMPs, and coloration reflects the BMP type (using same categories as the previous bar charts). **Appendix 5B** has these maps for all Priority Areas. The tabular version of this map is presented as a series of tables in in **Appendix 5C** including jurisdictional breakdowns.

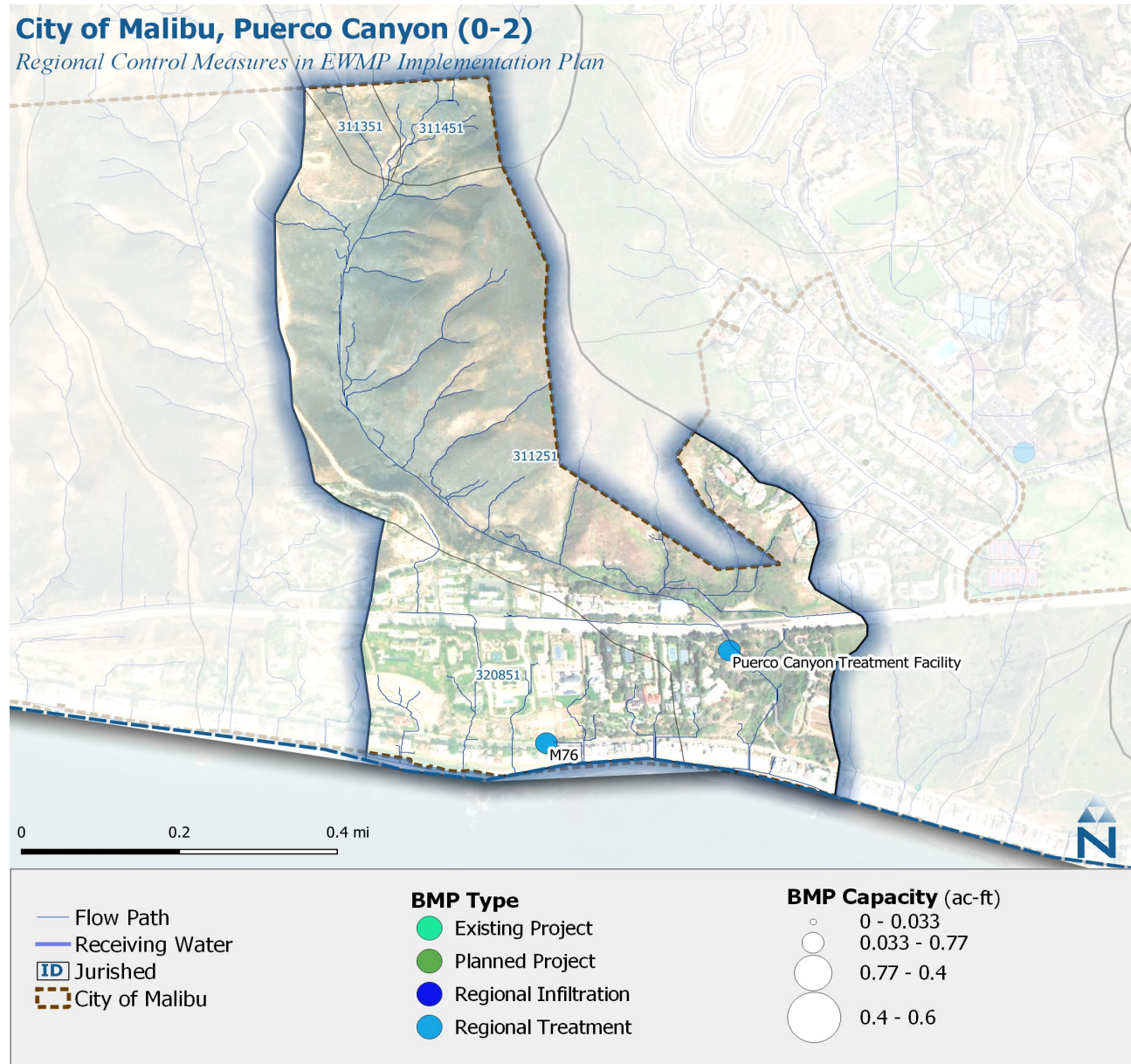


Figure 37. Example Map of Regional BMPs within the EWMP Implementation Plan in Puerco Canyon

This map presents an example mapping output for EWMP Implementation Plan, showing the regional BMPs in Trancas Creek, an ASBS Priority Area. The sizes of the circles indicate the size of the BMPs, and coloration reflects the BMP type (using same categories as the previous bar charts). **Appendix 5B** has these maps for all Priority Areas. The tabular version of this map is presented as a series of tables in **Appendix 5C** including jurisdictional breakdowns.

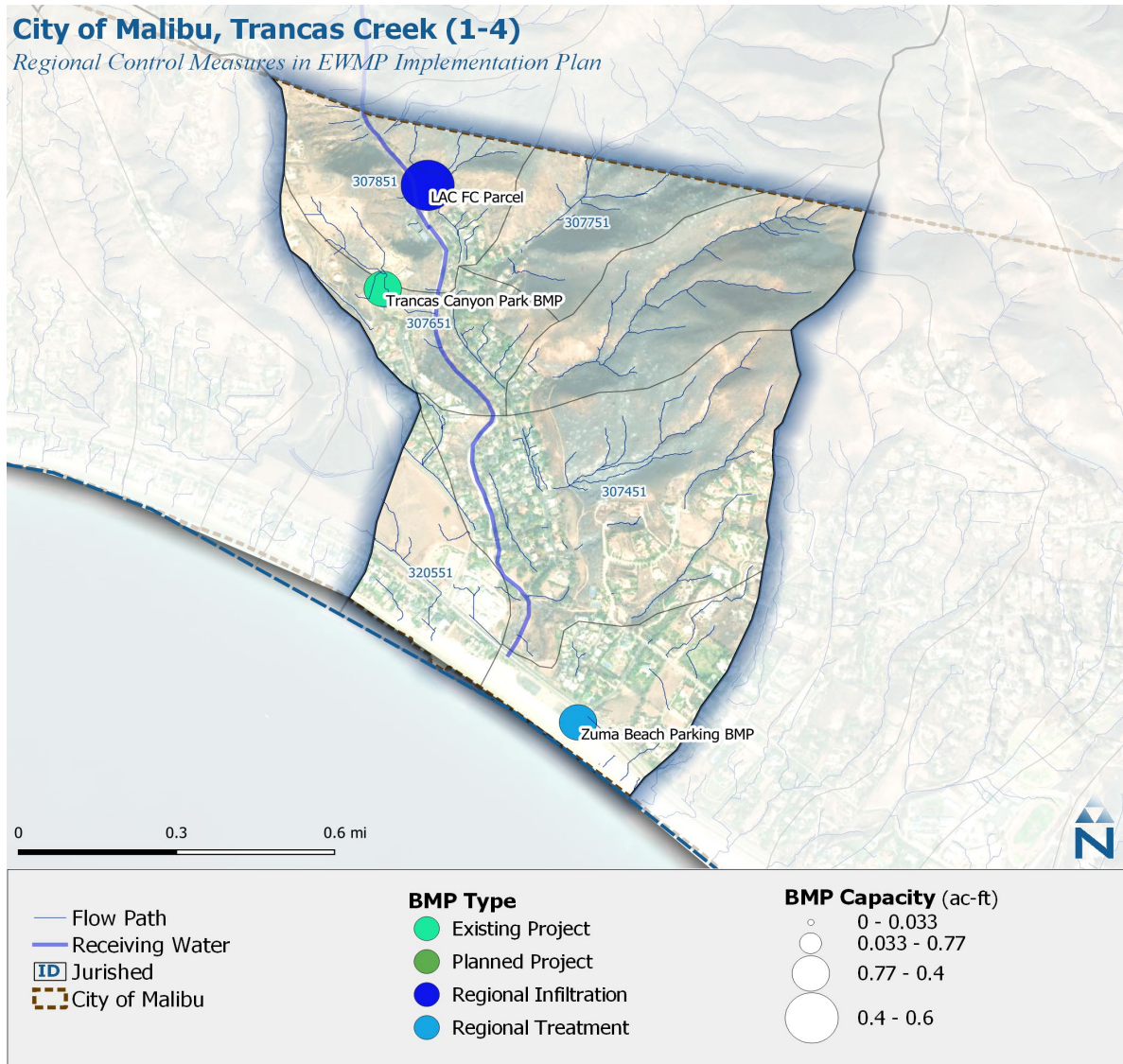


Figure 38. Example Map of Regional BMPs within the EWMP Implementation Plan in Trancas Creek

This map presents the managed areas by regional BMPs in the EWMP Implementation Plan for Topanga Canyon, a Wet Weather Priority Area. The coloration of the areas reflects the cumulative sizing of the BMPs downstream of those areas. The red labels show the IDs of the regional projects in the EWMP Implementation Plan. The varying treatment depths in different areas are driven by the extent of identified opportunities and optimization preferring BMPs in certain areas to cost effectively manage runoff. Panels for all Priority Areas are shown in **Appendix 5B**. Details on the BMP capacities and costs are presented as a series of tables in **Appendix 5C**. See footnote 17 regarding relative capacities for treatment versus infiltration projects.

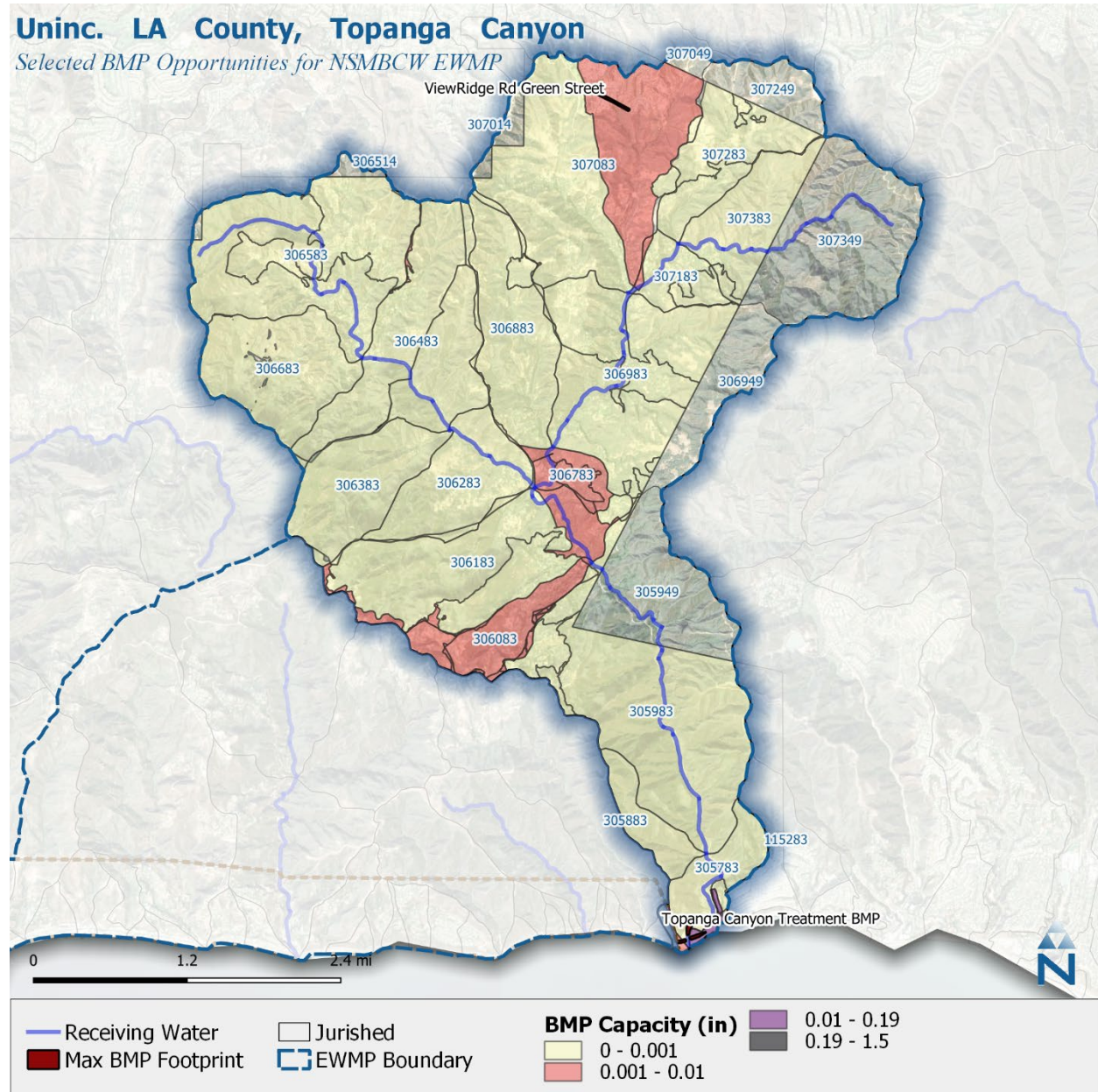


Figure 39. Example Map of Regional BMP Treatment in Topanga Canyon by EWMP Implementation

This map presents the managed areas by regional BMPs in the EWMP Implementation Plan for the Trancas Creek, an ASBS Priority Area. The coloration of the areas reflects the cumulative sizing of the BMPs downstream of those areas. The red labels show the IDs of the regional projects in the EWMP Implementation Plan. The varying treatment depths in different areas are driven by the extent of identified opportunities and optimization preferring BMPs in certain areas to cost effectively manage runoff. Panels for all Priority Areas are shown in **Appendix 5B**. Details on the BMP capacities and costs are presented as a series of tables in **Appendix 5C**.

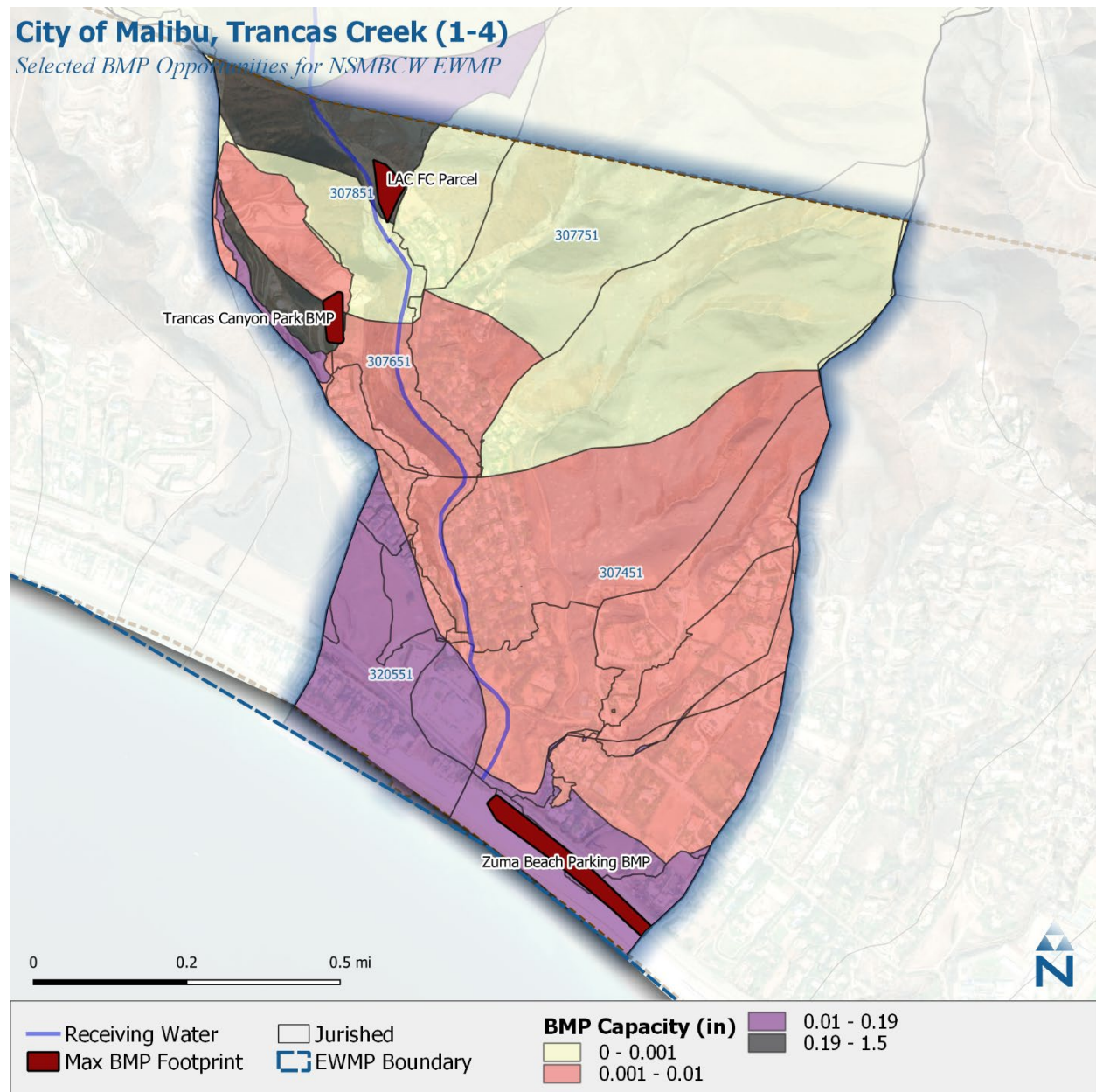


Figure 40. Example Map of Regional BMP Treatment in Trancas Creek by EWMP Implementation



5.3 SCHEDULING OF STORMWATER CONTROL MEASURES

The following sets forth the scheduling of control measure implementation that would be required to meet the SMBB Bacteria TMDL requirements. It addresses water quality priorities as follows¹⁸:

- Achieve the bacteria reduction for final SMBB Bacteria TMDL Wet Weather Priority Areas.
- Achieve reductions for the ASBS critical condition in ASBS Priority Areas.

The scheduling of the control measures that would be required is presented as the following components:

- **Summary of control measure capacities to be implemented by Priority Area:** the LID, regional infiltration and regional treatment BMP capacities that would need to be implemented are shown in **Figure 41**. Separate panels are shown for the City and County areas in **Figure 42** through **Figure 43**, and additional panels are provided in **Appendix 5A**.
- **Detailed scheduling for each jurisdiction including volumes of stormwater to be managed and control measure capacities:** detailed tables that present the scheduling by assessment area and jurisdiction including volumes of stormwater and impervious area targets (Equivalency Metrics) to be managed are presented in **Appendix 5C**. The City and County have a standalone recipe for each Priority Area.

The pace of implementation for the EWMP Implementation Plan is rapid due to the SMBB Bacteria TMDL schedule. The pace of implementation is directly proportional to required internal and financial resources, and the additional required resource to implement the EWMP will be significant. The next subsection evaluates the available resources and potential alternative implementation scheduling. The costs and financial strategy for the EWMP are presented in **Section 6**.

¹⁸ Section 5.4 proposes an alternative schedule with a 10-year extension and a deadline of 2034.



This panel presents the scheduling of LID, regional infiltration and regional treatment BMPs to be implemented across the EWMP area for a 2024 deadline (or 2034 with a 10-year extension, as shown in parentheses and discussed in **Section 5.4**). The pie charts show a breakdown of the BMP types for capacity, footprint, and capital cost for all Priority Areas (corresponding to the 'Total' bar in the lower part of the panel). See footnote 17 regarding relative capacities for treatment versus infiltration projects.

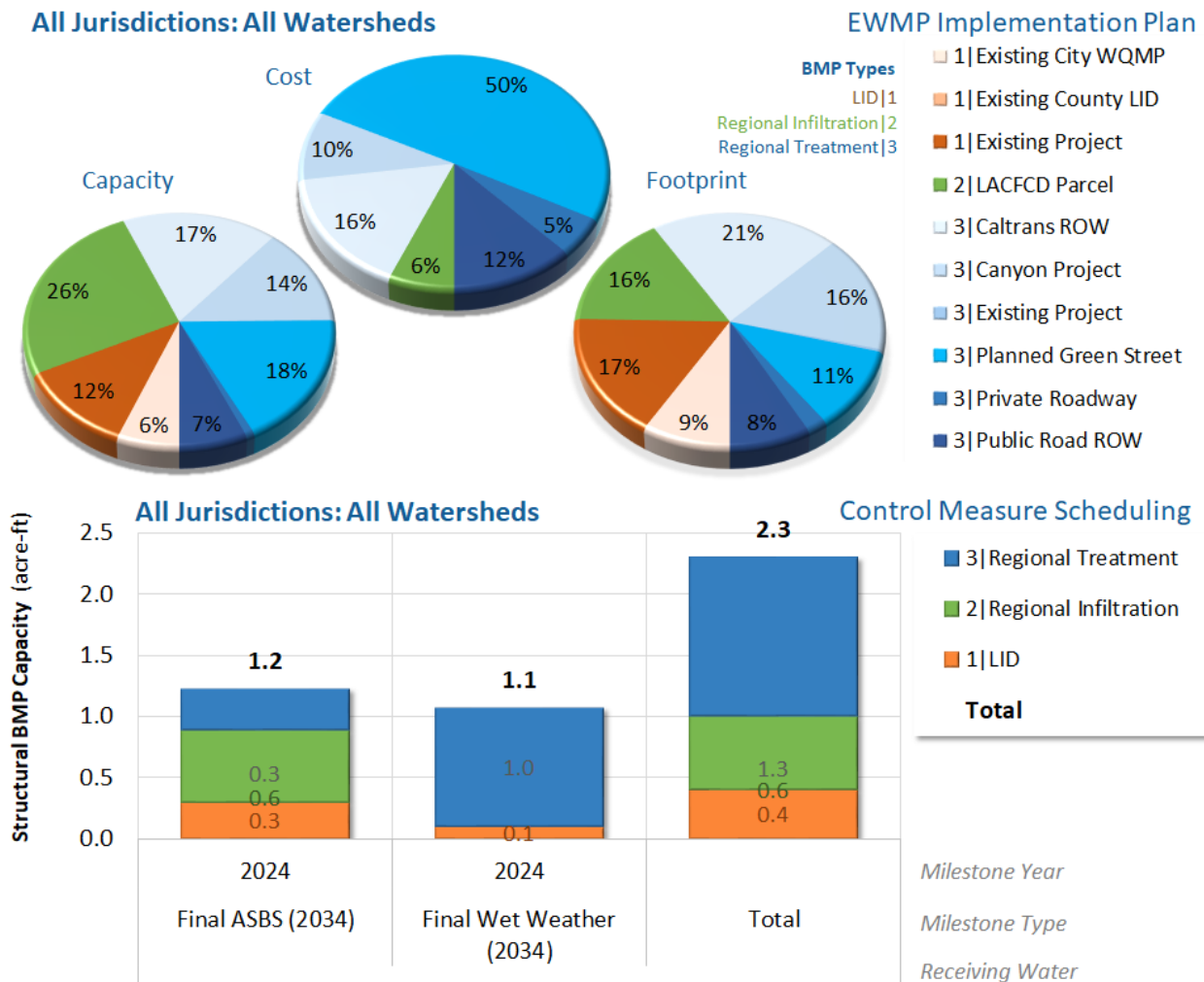


Figure 41. Scheduling of EWMP Implementation Plan to Address TMDL and ASBS Provisions



This panel presents the same results as the previous figure, except for the Malibu portion only. The bars show scheduling of LID, regional infiltration and regional treatment BMPs to be implemented across the EWMP area for a 2024 deadline (or 2034 with a 10-year extension, as shown in parentheses and discussed in **Section 5.4**). The pie charts show a breakdown of the BMP types for capacity, footprint, and capital cost for all Priority Areas (corresponding to the 'Total' bar in the lower part of the panel).

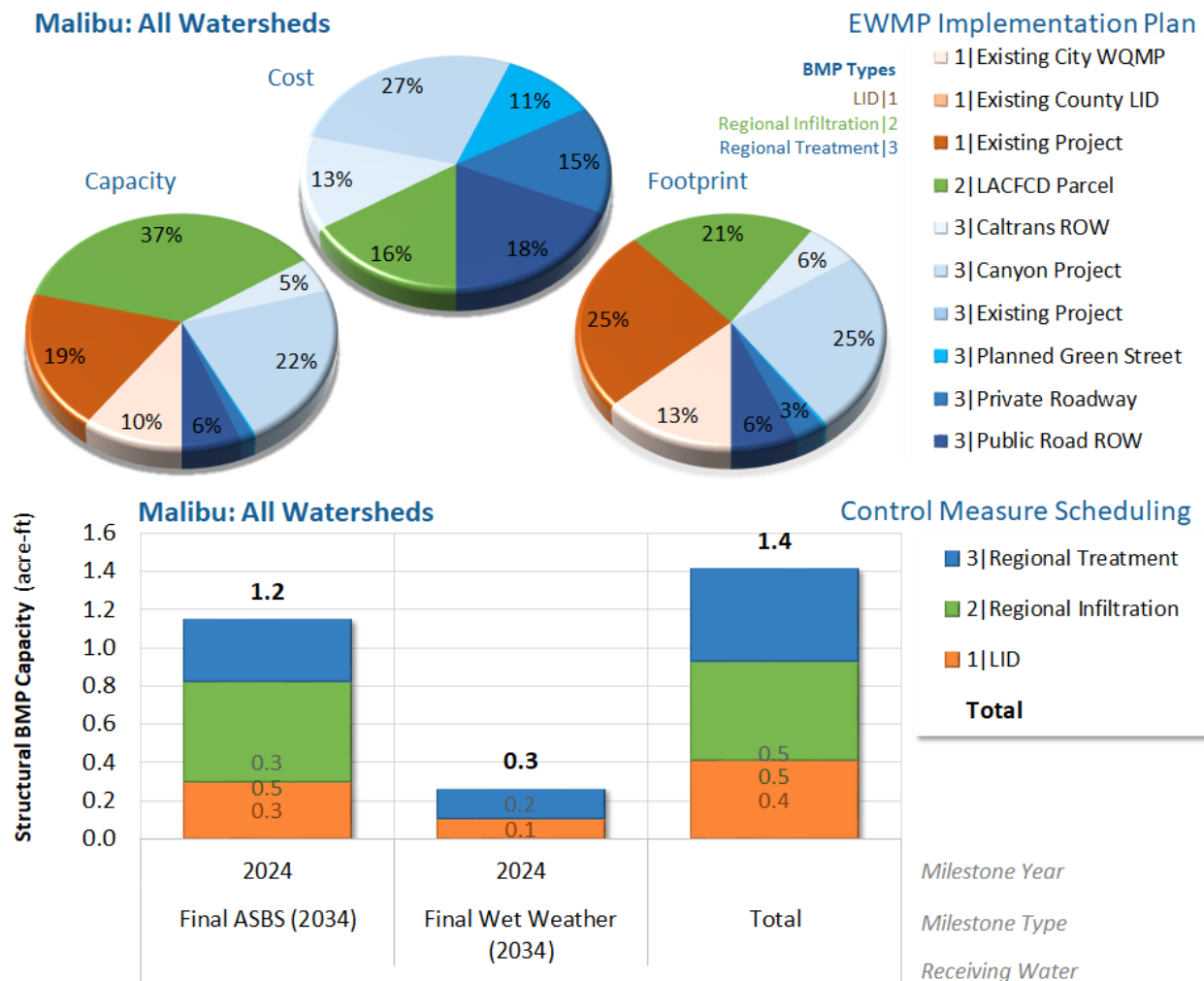
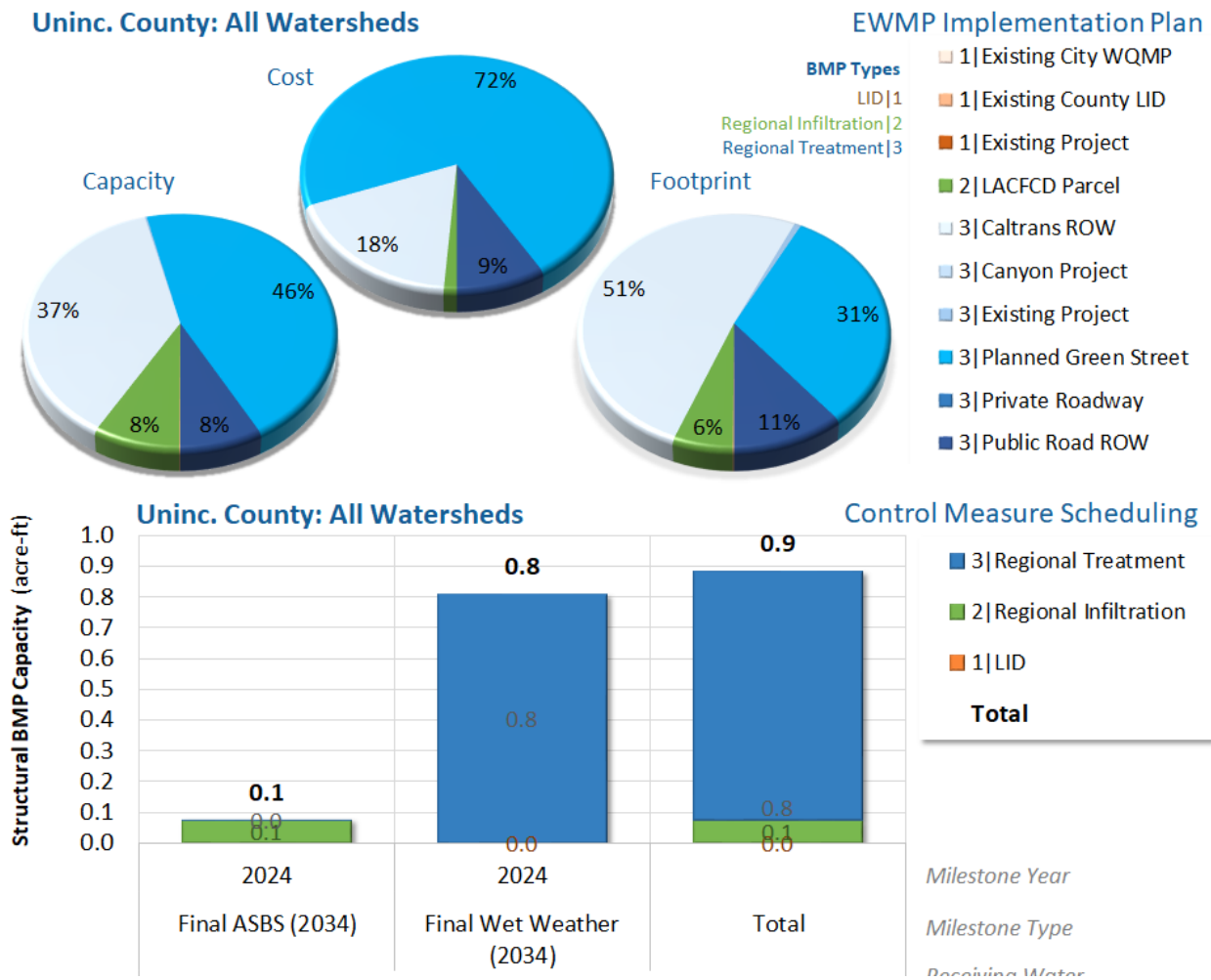


Figure 42. Scheduling of EWMP Implementation Plan to Address TMDL and ASBS Provisions



This panel presents the same results as the previous figure, except for the Unincorporated County portion only. The bars show scheduling of LID, regional infiltration and regional treatment BMPs to be implemented across the EWMP area for a 2024 deadline (or 2034 with a 10-year extension, as shown in parentheses and discussed in **Section 5.4**). The pie charts show a breakdown of the BMP types for capacity, footprint, and capital cost for all Priority Areas (corresponding to the 'Total' bar in the lower part of the panel).





5.4 IMPLEMENTATION SCHEDULE

The SMBB Bacteria TMDL deadline defines the pace of implementation of watershed control measures. The Regional Board adopted Resolution No. R21-001 on March 11, 2021, which extended the TMDL schedules for the SMBB Bacteria TMDL and the following TMDLs in the Malibu Creek Watershed: Bacteria TMDL, Nutrients TMDL, and Benthic TMDL. For each of the Malibu Creek Watershed TMDLs, the TMDL deadline for Los Angeles County MS4 Permittees (including the NSMBCW EWMP Group) was set at July 15, 2026. For the SMBB Bacteria TMDL, the revised TMDL deadline was set at July 15, 2024. As such, **Section 5.3** outlines a schedule consistent with the TMDL extensions adopted by the Regional Board. While the NSMBCW EWMP Group is appreciative of the extensions adopted by the Regional Board, there are numerous technical, logistical, and financial factors which render it infeasible to implement all of the control measures identified in **Section 5.2** by the revised deadline for the SMBB Bacteria TMDL (July 15, 2024) [Note that TMDLs for the Malibu Creek Watershed have already been addressed by the Legacy Park project as outlined in **Sections 4** and **5**]. The Regional Board and Regional Board staff have acknowledged on multiple occasions that this schedule cannot be achieved. Regional Board staff reiterated this stance by stating that they acknowledged (during the Public Workshop on December 16, 2020) that the proposed TMDL deadline extensions on their own may not provide enough time to complete all projects, and that is why a combination of TMDL extensions and possible future Time Schedule Orders (TSOs) are proposed.

As noted in this Response to Comments on the tentative TMDL extension BPA and during numerous Regional Board staff presentations (e.g., a slide from a Regional Board staff presentation is provided in **Figure 44**), Regional Board staff characterized the TMDL extension as a potential 13-year extension due to the potential for two TSOs to be approved by the Regional Board subsequent to the 2024 deadline. As such, each TSO would add an additional five years to the schedule (i.e., extending the overall schedule to 2034). The NSMBCW EWMP Group agrees with Regional Board's staff assessment that the TMDL deadline extension on its own may not provide enough time to complete all projects, and that TSOs will potentially be necessary to provide enough time to implement all projects. As such, the following subsections outline the implementation schedule for the NSMBCW EWMP to achieve all WLAs by 2034.

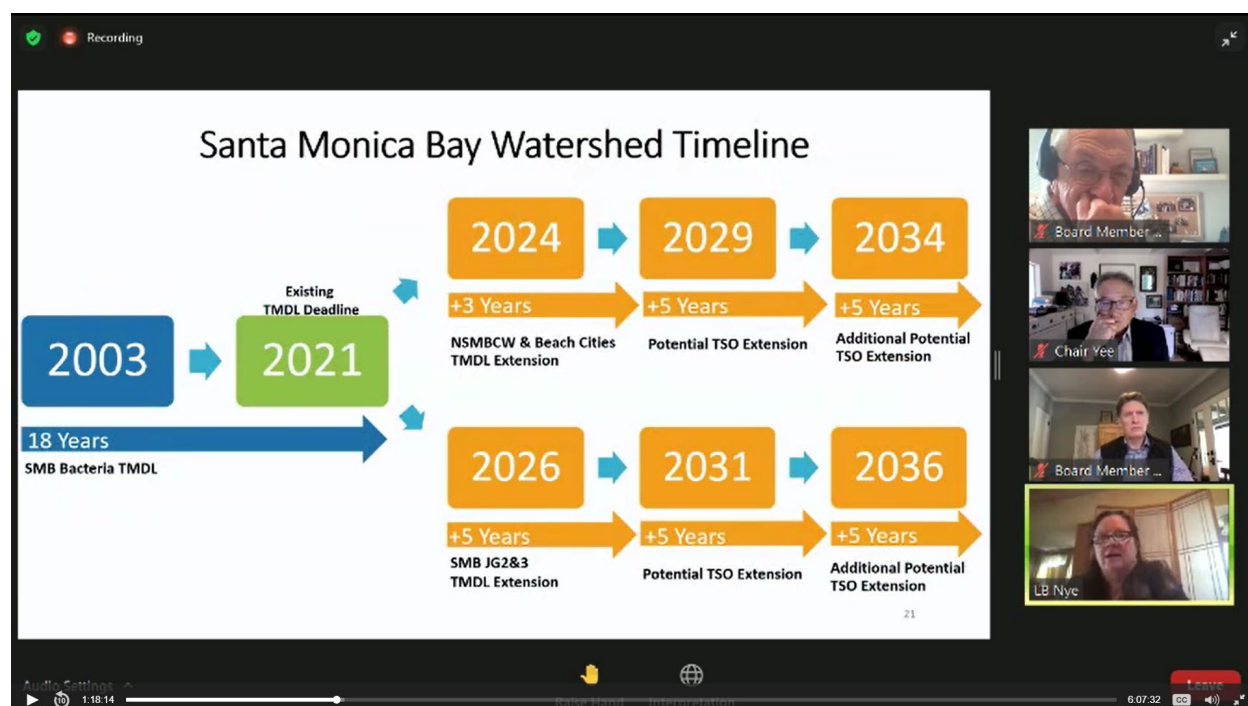


Figure 44. Excerpt of Regional Board Staff Presentation on Tentative TMDL Extension BPA during February 11, 2021, Regional Board Meeting

5.4.1 NEAR-TERM IMPLEMENTATION SCHEDULE (PRESENT TO 2024)

As previously stated, there are numerous technical, logistical, and financial factors which render it impossible to implement all of the control measures identified in **Section 5.2** by a 2024 deadline. The current schedule is not sufficient to carry out the planning and construction of the number of projects needed to comply with the TMDL schedules. Each project generally takes 5 to 7 years from concept development to construction and project optimization. Concept development and project design can take between 2 to 3 years given the need to engage stakeholders in the identification of projects, while the bid process can take 6 months to a year. Project construction and optimization can take an additional 2 to 3 years.

While funding is an important issue, especially as the City and County continue to recover from fires and address the current pandemic, funding is not the only issue. Even if the NSMBCW EWMP Group had the financial capability to fund all of the control measures outlined in this EWMP over the next three years, it is not possible to complete the design, construction, and optimization phases needed for all of these complex, multi-benefit projects given that this process takes up to seven years. See **Section 6.4** outlining the financial strategy and the significant gap between the EWMP Implementation Plan costs and the currently available funds. That being said, the NSMBCW EWMP Group will take meaningful actions which can be completed in the next three years to work toward implementing watershed control measures identified in **Section 5.2**. This includes implementing the non-structural control measures identified in **Section 3.2**, maintaining structural BMPs that have already been completed, and reaching critical project phases (i.e., developing feasibility studies, coordinating with Caltrans) for additional structural BMPs that



cannot be feasibly completed over the next three years. The structural BMPs for which critical project phases can be reached over the next three years are outlined in **Table 31**.

There are numerous technical, logistical, and economic barriers which the NSMBCW EWMP Group must overcome to implement the projects identified in the EWMP. In addition, the multi-benefit structural BMPs which the NSMBCW EWMP Group are pursuing require input from diverse stakeholder groups, coordination between multiple municipal agencies, and often additional financial support through grant funding. As such, please note that if the July 2024 schedule cannot be completed for a project identified in **Table 31**, that project will be replaced by a project of similar effectiveness, if possible, or a proposed modification will be submitted to the Regional Board EO for approval. Potential revisions to the projects identified in **Table 31** may be necessary based on the outcome of feasibility studies and design.

Table 31. Near-Term (3-Year) Implementation Schedule

Priority Area and Monitoring Site	Near-Term Implementation Schedule	Lead Agency
Puerco Canyon (O-2), Escondido Creek (ASBS) and Topanga Canyon (1-18)	Engage and coordinate with Caltrans to evaluate feasibility and progress implementation of regional wet weather control measures within Caltrans ROW, which is the primary available public land in these drainages.	Malibu (O-2 and ASBS) and County (1-18)
Marie Canyon (1-12)	Maintain Marie Canyon dry weather treatment facility and promote its benefits to the community.	County
Topanga Creek (1-18)	Develop final design plans and pursue funding for the Viewridge Road Green Street or similar wet weather project to manage runoff in Topanga Canyon and promoting its benefits to the community and Topanga Beach.	
Marie Canyon (1-12)	Complete construction and maintain Marie Canyon Green Street and promote its benefits to the community and Puerco Beach.	Malibu
	Develop feasibility study and if feasible, pursue funding for a wet weather project to manage the Unincorporated County portion of the Marie Canyon drainage and promote its benefits to the community and Puerco Beach.	County
Trancas Creek (1-4)	Integrate control measures from EWMP into Stormwater Master Plans for Malibu Estates and Point Dume which are being developed in response to recent fires.	Malibu
	Maintain Trancas Canyon Park project and promote its benefits to the community and Zuma Beach.	
Unnamed Gully (O-1)	Implement stormwater control measures integrated with the Kanan Dune Road widening project to capture runoff and improve beach water quality in Dume Cove.	
Las Flores Canyon (1-14)	Maintain Las Flores Restoration Project and promote its benefits to the community and Las Flores Beach.	
Paradise Cove (1-7)	Maintain Paradise Cove treatment facility and promote its benefits to the community. Continue to evaluate the performance of the project and itemize potential options to improve its efficacy for eliminating indicator bacteria.	
-----	Maintain Legacy Park and promote its benefits to the community and Malibu Creek Lagoon and Surfrider Beach.	



5.4.2 LONG-TERM IMPLEMENTATION SCHEDULE (2024 TO 2034)

Table 32 provides the long-term implementation schedule to attain all TMDLs and address other water quality priorities.

Table 32. Proposed NSMBCW EWMP Long-Term Implementation Schedule

Long-Term Implementation Schedule	Date ¹
Interim Phase 1 – EWMP Evaluation - Assess Progress toward Attainment of TMDL and ASBS Requirements and Evaluation of Data and any Pertinent Information	January 2024
EWMP Modifications and Adjust Schedule and BMP Implementation Schedule Based on Evaluation	June 2024
Interim Phase 2 – EWMP Evaluation - Assess Progress toward Attainment of TMDL and ASBS Requirements and Evaluation of Data and any Pertinent Information	January 2029
EWMP Modifications and Adjust Schedule and BMP Implementation Schedule Based on Evaluation	June 2029
Complete Implementation of all Structural BMP Capacities Identified in Section 5	July 2034

1. The date for completion of the EWMP modifications may be revised to align with MS4 Permit required updates (i.e., if the MS4 Permit requires a similar evaluation and update of the EWMP within one year of date presented, then the MS4 Permit schedule will be followed rather than the date presented in this table).



6. EWMP Implementation Costs and Financial Strategy

The purpose of this section is to present the implementation costs and an associated financial strategy for completion of the EWMP Implementation Plan detailed in **Section 5**.

6.1 BASIS OF EWMP COST ESTIMATES

The EWMP cost estimate is based on several local sources of cost information to ensure that cost estimates are relevant to Los Angeles County Permittees and reasonably accurate for projecting the cost of EWMP implementation. The following approach was used when developing the estimated costs for EWMP implementation:

- For planned projects, costs were based on those provided the City and County.
- Costs of optimized BMPs are based on adapted WMMS2 cost functions which are shown in **Section 4.6.5**. These costs are based on generic, modular cost functions developed for various BMP types specific to Los Angeles County. The cost functions include planning, design, permits, construction, O&M, and post construction monitoring.
- Costs for minimum control measures and other “baseline” MS4 Permit requirement are not included – the costs presented here are solely for future structural BMP implementation.
- Operations and maintenance costs are not included due to uncertainty in projecting those costs, particularly for regional treatment control measures which comprise a significant portion of the EWMP capital cost.
- Replacement costs were not included under the assumption that systems will be properly maintained and functional throughout and beyond the implementation schedule.

Together, the jurisdiction-provided costs and cost functions were used to create watershed- and jurisdiction-wide cost estimates presented in the next subsection.

6.2 ESTIMATED EWMP IMPLEMENTATION COSTS

This subsection presents the cost estimates for implementing the structural BMPs outlined in the EWMP Implementation Plan. The EWMP Implementation Plan sets a trajectory for implementation of a variety of watershed control measures (BMPs) including LID, green streets and regional projects. Based the RAA outputs, the total cost for the NSMBCW Group for EWMP implementation through 2024 (or 2034 with the proposed alternative schedule) is \$22.9M for capital costs. **Figure 45** provides a capital cost estimate summary and watershed-wide scheduling thru 2024 (or 2034 with proposed alternative schedule). **Figure 46** and **Figure 47** provide detailed capital cost breakdown and scheduling for City and County, respectively. **Figure 48** provides a capital cost estimate summary by distinct Priority Areas. **Figure 49** and **Figure 50** breakdown capital costs by distinct Priority Areas for City and County, respectively. It is important to note the costs provided here are planning level and can be refined as EWMP implementations continues to progress as actual BMP implementation costs are documented.

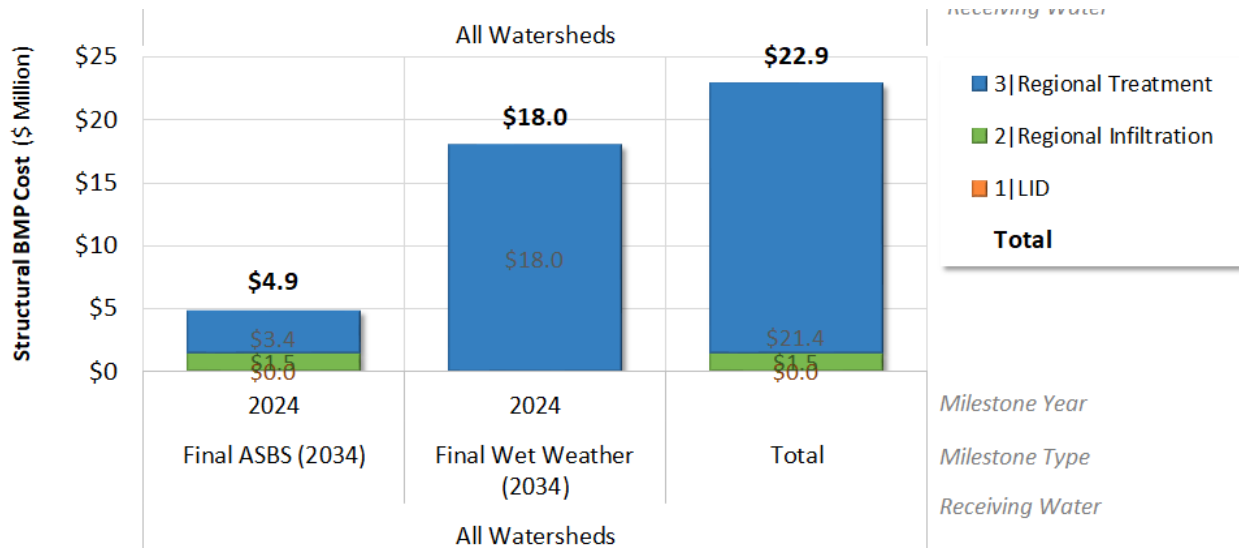


Figure 45. Watershed-wide Capital Costs for EWMP Implementation

Note: the TMDL deadline of 2024 could be extended to 2034 through time schedule orders

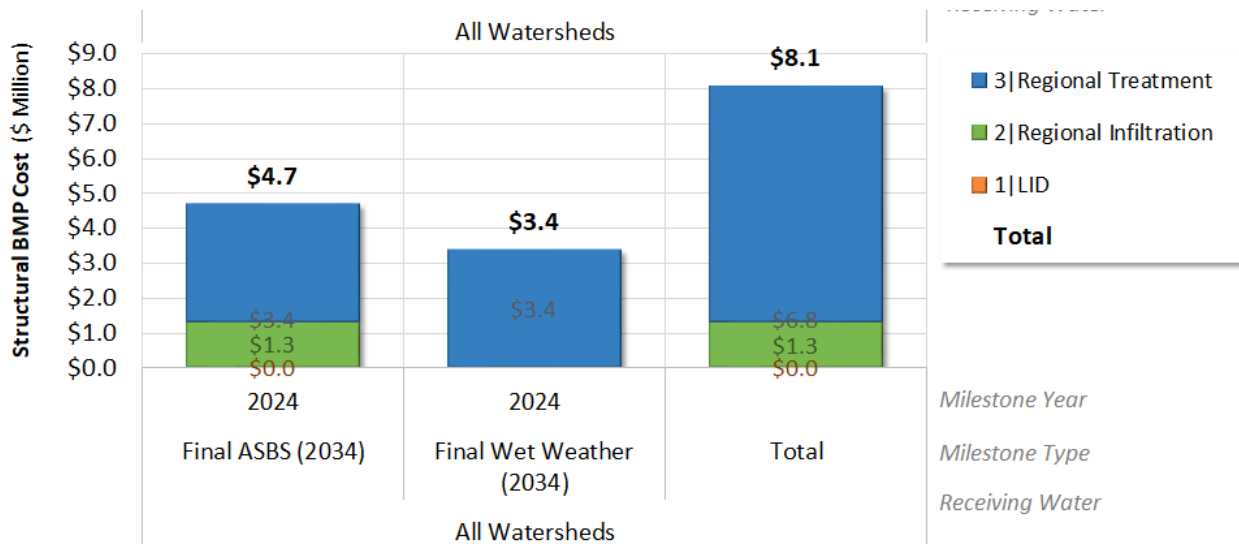


Figure 46. City of Malibu Capital Costs for EWMP Implementation

Note: the TMDL deadline of 2024 could be extended to 2034 through time schedule orders

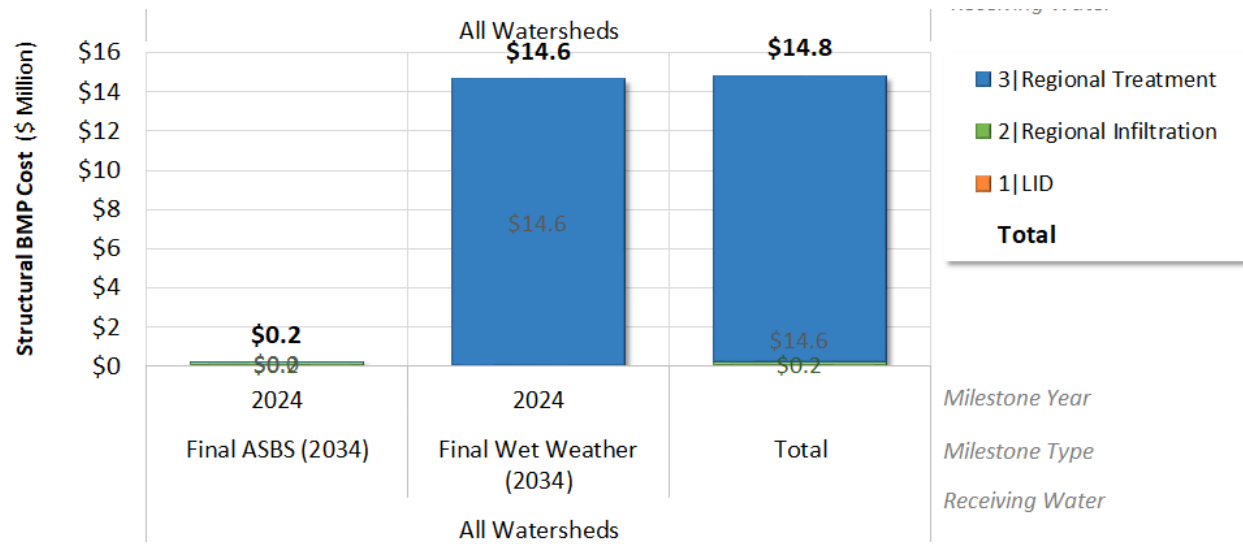


Figure 47. Unincorporated County Capital Costs for EWMP Implementation

Note: the TMDL deadline of 2024 could be extended to 2034 through time schedule orders

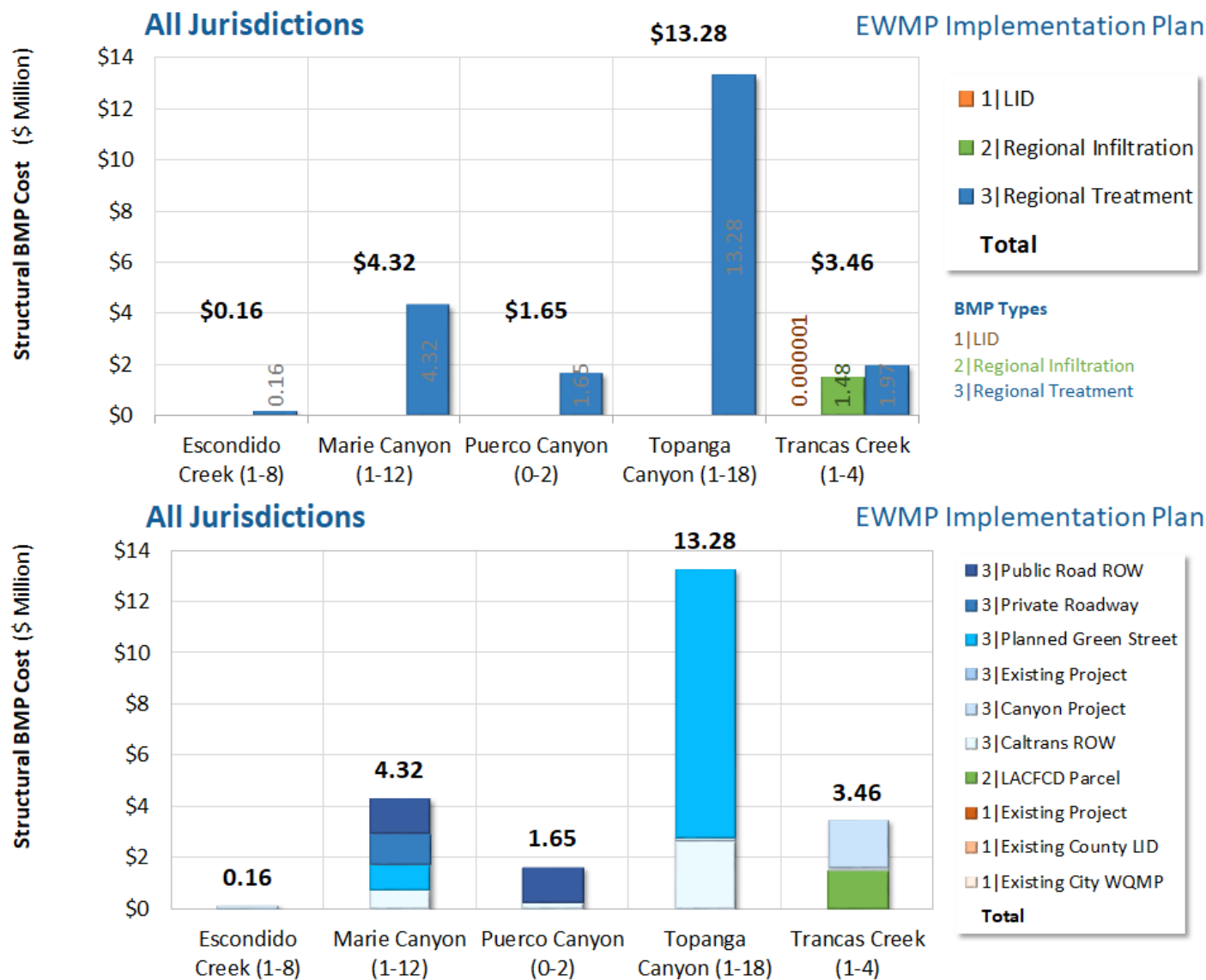


Figure 48. Watershed Capital Costs for EWMP Implementation by Priority Area

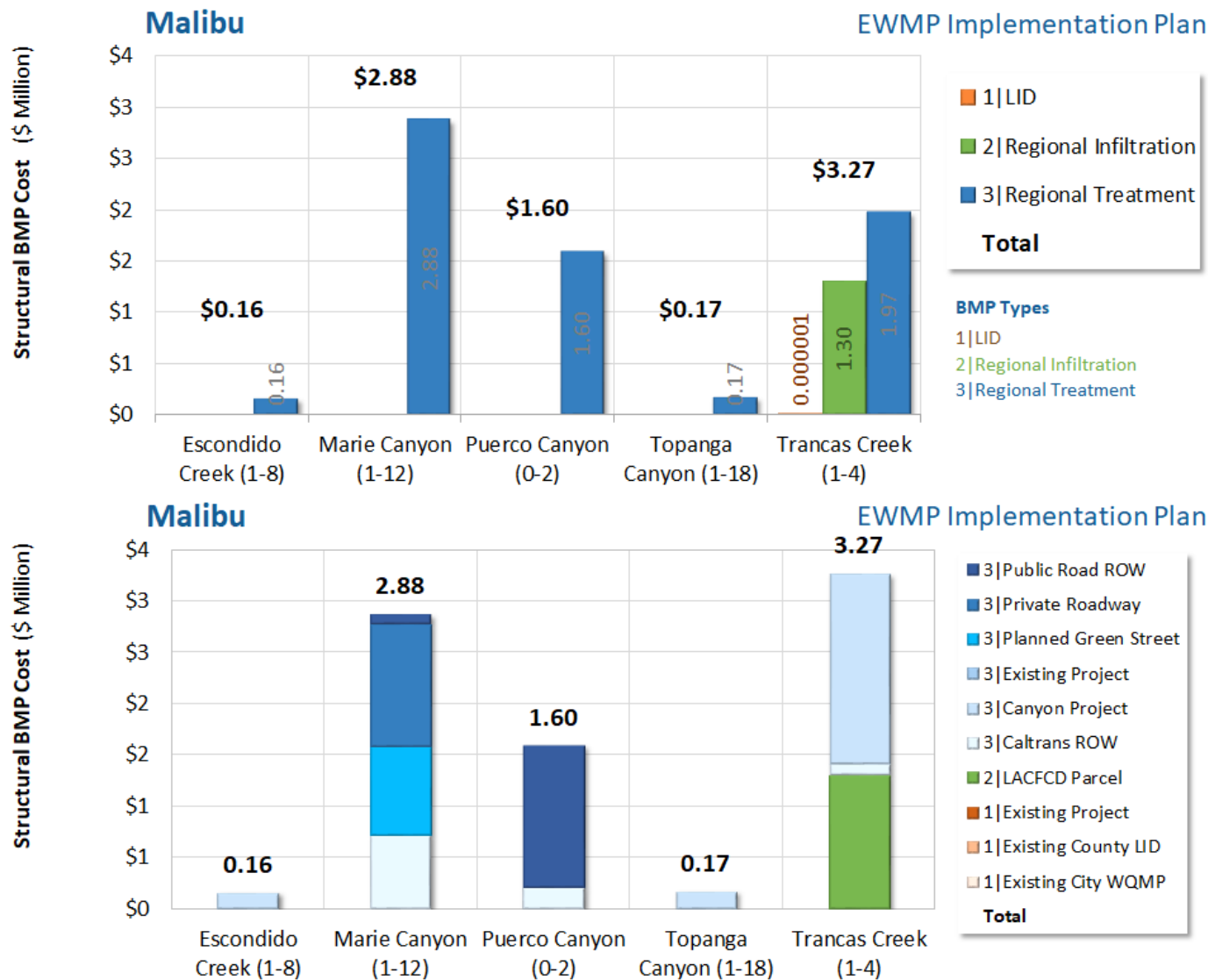


Figure 49. City of Malibu Capital Costs for EWMP Implementation by Priority Area

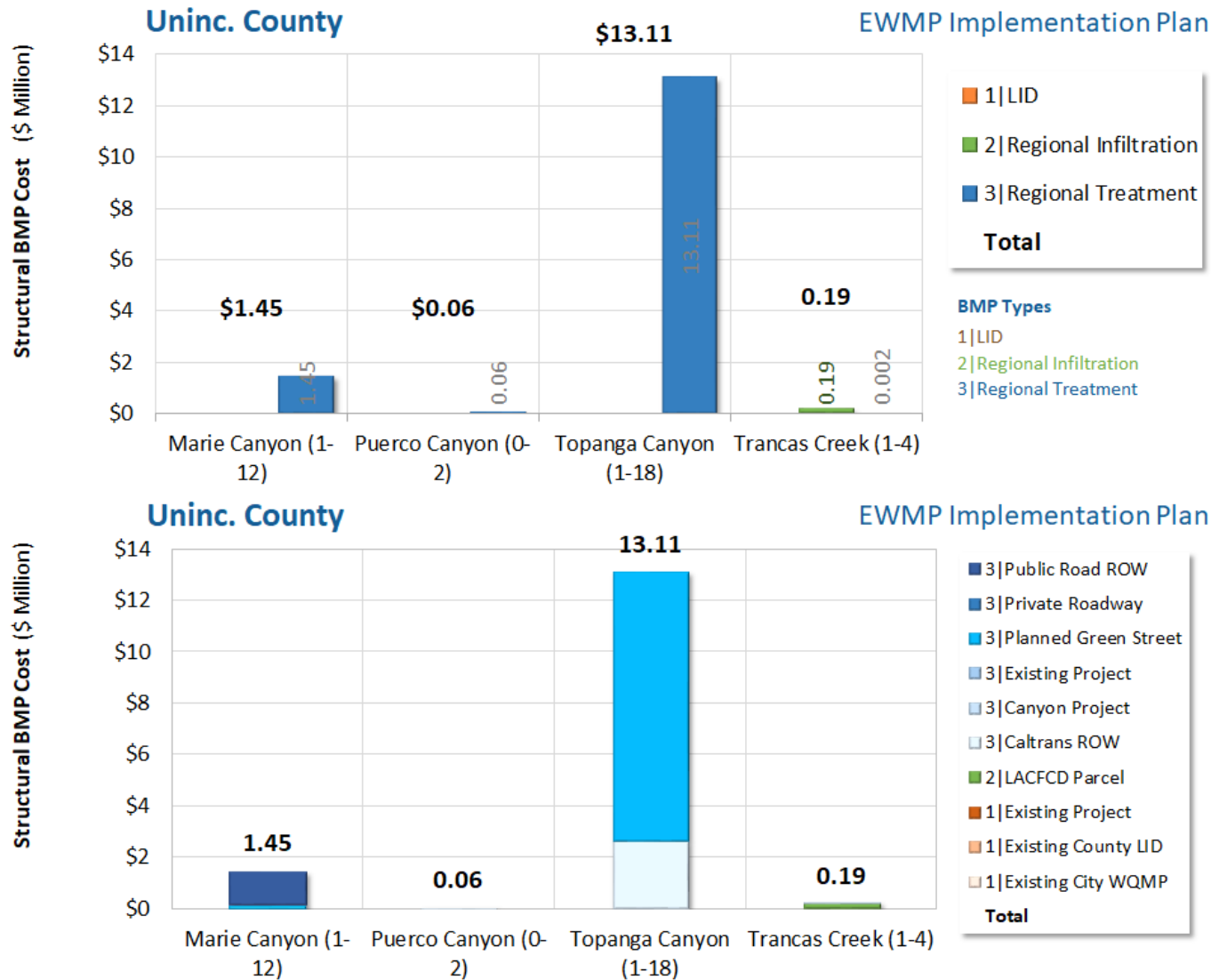


Figure 50. Unincorporated County Capital Costs for EWMP Implementation by Priority Area



6.3 WATERSHED MANAGEMENT PROGRAM BUDGETS

Table 33 provides watershed management program budget information for the City of Malibu and County of Los Angeles as presented in each agency’s Stormwater Annual Reports. Budget line items are determined and defined slightly differently by each agency, so variances and overlap between different program elements may exist.

The County’s NPDES MS4 Permit and EWMP implementation is funded by several sources, including the County General Fund, Gasoline Tax, Solid Waste Fund, Prop C, Prop A Local Return Funds, Measure R, and the Safe Clean Water Municipal Program. In Fiscal Year 2020-21, the Unincorporated Area Stormwater Program was allocated approximately \$20 million to manage the program and fund early project development. Approximately \$65 million was allocated to implement Minimum Control Measures, and approximately \$70 million was allocated for projects. Funds are distributed amongst 12 Stormwater Programs in 12 watersheds across the County.

The LACFCD allocated approximately \$40 million from the Flood Control District Fund for NPDES MS4 Permit implementation in Fiscal Year 2020-21.



Table 33. Watershed Management Program Budgets for the NSMBCW EWMP Group

Category		City of Malibu Program Budgets			Los Angeles County Program Budgets ¹		
		FY 18-19	FY 19-20	FY 20-21	FY 18-19	FY 19-20	FY 20-21 ²
Program Management		\$151,468	\$158,874	\$215,395	\$2,552,000	\$2,653,000	\$1,710,000
Minimum Control Measures	Public Information and Participation	\$44,695	\$47,087	\$40,569	\$3,772,000	\$4,004,000	\$3,899,000
	Industrial/Commercial	\$42,106	\$43,369	\$62,928	\$527,000	\$522,000	\$550,000
	Development Planning	\$54,962	\$56,611	\$50,891	\$877,000	\$1,165,000	\$1,219,000
	Development Construction	\$53,959	\$55,579	\$53,034	\$1,023,000	\$1,075,000	\$1,203,000
	Public Agency Activities	\$670,861	\$730,575	\$691,858	\$28,615,000	\$36,011,000	\$52,986,000
	IC/IDE Program	\$75,616	\$76,815	\$76,211	\$1,804,000	\$1,276,000	\$1,230,000
	Additional Institutional BMPs and Enhanced MCMs	\$0	\$0	\$0	\$5,636,000	\$8,085,000	\$7,782,000
Projects	Distributed Projects and Green Streets	\$0	\$35,000	\$57,000	\$4,653,000	\$3,858,000	\$7,241,000
	Regional Projects	\$0	\$0	\$0	\$29,150,000	\$26,227,000	\$39,410,000
	Restoration Projects	\$0	\$0	\$0	\$0	\$0	\$0
TMDL Related Activities		\$357,620	\$416,000	\$426,488	\$4,259,000	\$4,220,000	\$4,135,000
NPDES Permit Fees		\$0	\$0	\$	\$57,000	\$57,000	\$60,000
Other ³		\$202,245	\$213,600	\$22,100	\$3,129,000	\$3,180,000	\$4,785,000
Total		\$1,653,562	\$1,833,510	\$1,696,474	\$86,054,000	\$92,333,000	\$126,210,000

1. Expenditures for Los Angeles County Programs are reported on a Countywide basis and are not specific to the NSMBCW EWMP area.
2. Anticipated expenditures for FY20-21.
3. The amount spent on "Other" Program Elements includes costs for Watershed Management Program, Enhanced Watershed Management Program, and Coordinated Integrated Monitoring Program development and implementation; TMDL and ASBS monitoring and projects; and other projects with water quality benefits.



6.4 FINANCIAL STRATEGY

The purpose of this section is to present the financial strategy for addressing continued costs of implementing the 2012 MS4 permit, to making progress with the extensive sets of BMPs, or “recipe for implementation”, identified in **Section 5**. The financial strategy for implementing the EWMP consists of the identification of existing funding sources and a process for identifying future funding sources for the estimated costs that are not covered by existing funding sources.

6.4.1 CURRENTLY AVAILABLE REVENUE

The agencies within the NSMBCW EWMP historically utilized general funds to support their stormwater programs and will continue to do so. With the passage of Measure W, Regional and Municipal funds are now available to augment the general funds through the Safe Clean Water Program.

6.4.1.1 MEASURE W – SAFE, CLEAN WATER PROGRAM (SCWP)

In 2018, voters in Los Angeles County approved Measure W leading to the creation of the SCWP to increase the local water supply, improve water quality, and protect public health. Measure W provides regional and local funding to the SCWP that supports the development and implementation of projects and programs to reduce pollutants in stormwater, protect creeks and streams, build parks, and create green space for local communities. The goals of the SCWP are to:

- Implement a new plan for Los Angeles’ water system to capture billions of gallons of water that are otherwise lost each year;
- Protect coastal waters and beaches from the trash and contaminants in stormwater;
- Modernize the existing 100-year-old water system infrastructure using a combination of nature, science, and new technology;
- Protect public health, ensuring safer, greener, healthier, and more livable spaces for the community;
- Prepare the region for the effects of a changing climate including recurring cycles of drought, wildfire, and flooding; and
- Require strict community oversight and independent auditing to ensure local monies raised will stay local.

The special parcel tax on private properties is calculated based on the amount of total impermeable area on each parcel. Collection of funding was initiated in December 2019, with the first revenues available to the individual jurisdictions in early-2021.

Fifty percent of the revenues are used to fund watershed-level stormwater projects and programs. This funding, referred to as the Regional Program, is distributed among the nine watershed areas. Programs and projects are submitted by project proponents to a Watershed Area Steering Committee (WASC) for review. The Regional Program funds can be allocated to one of three categories: Infrastructure, Technical Resources, or Scientific Studies. Measure W requires that not less than 85 percent of the Regional Program budget be allocated to Infrastructure Program activities, and not more than 10 percent and five percent be allocated to Technical Resource Program activities and Scientific Studies Program activities, respectively. The NSMBCW EWMP and Malibu Creek Watershed EWMP areas fall within the North Santa



Monica Bay (NSMB) WASC. Project proponents can include the City, the County, the Flood Control District, individuals, or non-profit organizations, although non-municipal entities must have a municipal sponsor for infrastructure projects. The WASC selects projects on an annual basis for their Stormwater Investment Plan (SIP). The SIP is reviewed by a Regional Oversight Committee (ROC) and ultimately presented to the County of Los Angeles Board of Supervisors for approval.

Forty percent of the revenues are allocated directly to municipalities to fund local programs and projects. This portion of the program is referred to as the Municipal Program. Programs and projects for funding under the Municipal Program are proposed by each agency in their Annual Plan. Funding is distributed proportional to the tax revenues collected within the municipality.

The remaining 10% of the revenues are allocated to the Flood Control District to operate the District Program. These funds are for the administration of the SCWP; planning, implementing, and maintaining District Projects; administration of the Regional Program; technical assistance; oversight of regional water quality planning and coordination (including scientific studies and modeling); and the administration of public education programs, training of the local workforce, and outreach to schools.

Estimated Regional Program funds are identified in **Table 34**; however, as described above, Regional Program funds are distributed at the direction of the NSMB WASC and ultimately approved by the Board of Supervisors. Furthermore, the Regional Program project scoring criteria weigh water supply benefits heavily making it unlikely that many of the EWMP projects will score highly given the unique coastal features of the NSMBCW EWMP area that limit capture and reuse opportunities. As such, neither the City nor the County can rely on receiving the proportion of Regional Program funds generated by taxpayers in their jurisdictions. Estimated revenues from the Municipal Program are provided for NSMBCW EWMP Agencies in **Table 35**. However, publicly owned parcels, including schools, are exempt under state law. Credits for property owners who have installed stormwater-capture improvements are available. Qualifying low-income seniors and non-profit organizations are eligible for exemption. As such, the exact amount of SCWP funding may be less than estimated due to exemptions or credits.

Table 34. Anticipated Annual Regional Program Revenues under the SCWP for the NSMB Watershed Area and Potential Allocations to the NSMBCW EWMP Area (\$ Million/Year) ^{1,2}

Minimum for Infrastructure Program (85%)	Maximum for Technical Resources Program (10%)	Maximum for Scientific Studies Program (5%)	Total
\$0.614	\$0.072	\$0.036	\$0.723

1. Based on information from the Safe Clean Water Program website visited on May 20, 2021 (<https://safecleanwaterla.org/wp-content/uploads/2020/09/SCW-Regional-Return-Funds-by-Watershed-Area-20200809.pdf>). The exact amounts may be less than estimated due to exemptions or credits.
2. Assumes distribution of SCWP Regional Program funds are proportional to the tax revenues collected within the jurisdiction in the NSMBCW EWMP area. However, Regional Program funds are competitive and the neither the City of Malibu nor the County can rely on receiving the proportion of Regional Program funds generated by taxpayers in their jurisdictions.



Table 35. Anticipated Annual Municipal Program Revenues under the SCWP for the NSMB Watershed Area and Potential Allocations to Municipalities in the NSMBCW EWMP Area (\$ Million/Year)¹

County of Los Angeles	City of Malibu
\$0.177	\$0.390

1. Based on information from the Safe Clean Water Program website visited on May 20, 2021 (<https://safecleanwaterla.org/wp-content/uploads/2020/09/SCW-Local-Return-Funds-by-Municipality-20200809.pdf>). The exact amounts may be less than estimated due to exemptions or credits.

6.4.1.2 SUMMARY OF EXISTING FUNDING SOURCES

With the advent of the SCWP, an additional, sustained source of funding is now available for local programs. However, revenues continue to fall short of those needed to implement programs and projects necessary to meet current schedules. The shortfalls in revenue, evident under “normal” operating conditions, have been further exacerbated by the Woolsey Fire and COVID-19 pandemic. The COVID-19 pandemic has impacted municipalities that are largely dependent on local tax revenues (e.g., sales, tourism) to support the general fund. With declines in these revenues, programs have been severely impacted, especially those that are dependent on general funds. As such, the SCWP currently provides the primary source of capital funding for implementation of the EWMP. **Table 36** summarizes the annual funding anticipated from the SCWP and compares the totals to the projected needs. The exact amount of SCWP funding may be less than estimated due to exemptions or credits. NSMBCW EWMP Group members will pursue additional funds as described **Section 6.5** as opportunities arise.

Table 36. Summary of Anticipated Program Annual Revenues and Total EWMP Implementation Plan Capital Costs for Municipalities in the NSMBCW EWMP

Municipality	Total Capital Costs (\$ Million)	Total Annual Funding Need for Full EWMP Implementation (\$ Million/Year)		Safe Clean Water Program Expected Revenue Generation (\$ Million/Year) ¹
		By 2024	By 2034	
County of Los Angeles	\$14.80	\$4.93	\$1.14	\$0.40
Malibu	\$8.10	\$2.70	\$0.62	\$0.78
Total	\$22.90	\$7.63	\$1.76	\$1.18

1. Includes Regional and Municipal Program Infrastructure Program revenues. Regional and Municipal Program Revenues are based on information contained on the SCWP website (www.safecleanwaterla.org) accessed on May 20, 2021. Assumes distribution of SCWP Regional Program funds are proportional to the tax revenues collected within the jurisdiction in the NSMBCW EWMP area. However, Regional Program funds are competitive and the neither the City nor the County can rely on receiving the proportion of Regional Program funds generated by taxpayers in their jurisdictions. The exact amounts may be less than estimated due to exemptions or credits.

6.5 POTENTIAL ADDITIONAL FUNDING SOURCES

This region has historically shown an early and proactive approach to implementing projects that protect, improve, or restore water quality and environmental resources. These agencies have been diligent and



successful in obtaining funding from alternative sources, as well as allocations from the General Fund, and will continue to pursue such opportunities. Since 2001 funding sources for the NSMBCW EWMP Group have included:

- Civic Center Stormwater Treatment Facility: \$5,800,000 of total funding from various funding sources including California Integrated Waste Management Board (\$500,000), Santa Monica Bay Restoration Commission (\$1 million), State Board Clean Beaches Initiative (\$4 million), and General Fund (\$300,000);
- Cross Creek Road Improvements: \$2,441,215 of total funding from various funding sources including developer contributions (\$20,000), Caltrans (\$40,000), Traffic Safety Funds (\$367,000), Proposition C local return (\$798,700), Transportation Enhancement Act STPL Funds (\$180,000), Transportation Enhancement Act 21 Funds (\$563,000), and General Fund (\$472,515);
- Solstice Creek Bridge Replacement: Grants from State agencies including Department of Fish and Game (\$637,815), State Coastal Conservancy (\$145,000), Wildlife Conservation Board (\$145,000), and City match (\$239,308) for a total amount of \$1,167,123;
- Las Flores Park and Creek Restoration: \$2,970,075 of total funding from grants from State agencies, including Wildlife Conservation Board (\$600,000), Resources Agency (\$925,000), and Department of Water Resources (DWR) (\$835,000) and City match (\$610,075);
- Paradise Cove Stormwater Treatment: \$1,158,436 of total funding from Proposition 40 and American Recovery and Reinvestment Act in the amount of \$816,276 and City match of \$342,160;
- Malibu Legacy Park Project: \$35,561,174 from various state, county, and private grants; proposition funding; private donations; bonds; and general funds (\$4,000,000);
- Trancas Canyon Park: \$3,199,461 of total funding including Quimby Funds (\$18,000), Proposition 40 Grant (\$170,000), Trancas Canyon Park Designated Reserve (\$2,989,461), and General Fund (\$22,000);
- Broad Beach Road Biofiltration Project: \$2,500,000 of total funding including Proposition 84 funding in the amount of \$2,250,000 million and City match of \$250,000;
- Marie Canyon Water Quality Improvement Project: \$1,300,000 of total funding including \$950,000 from a State Board Proposition 13 Grant and \$350,000 from the Los Angeles County Flood Control District; and
- Wildlife Road Treatment Project: \$600,000 of total funding including Proposition 84 funding in the amount of \$540,000 and City match of \$60,000.
- Winter Canyon Green Street BMP: \$945,500 of total funding from Measure R.

A number of potential funding sources have been identified that will be considered by the NSMBCW EWMP Group to supply the remaining funding estimated to be necessary to meet the cost estimates for the EWMP. The potential funding strategies, potential uses, and constraints on the use of each strategy are included in **Table 37**.



Table 37. Potential Funding Strategies/Sources

Scale/ Source	Type	Background	Potential	Process	Conditions	Challenges
Local Agency	Enhanced Infrastructure Financing Districts (EIFD)s	Government entity created by City or County to construct or improve infrastructure, governed by a public financing authority (PFA) to use a portion of property taxes from the participating jurisdictions or other fees or investments to fund regional infrastructure projects.	Signed into law in Fall 2014, will allow agencies to collaboratively fund improvements benefitting water quality in their watersheds, which may not follow jurisdictional boundaries.	<ul style="list-style-type: none"> Determine if the prerequisites are met Identify projects, stakeholders, district members Establish PFA Formalize EIFD Develop Infrastructure Financing Plan (IFP) Review with public Adopt IFP and begin work 	<ul style="list-style-type: none"> Receive Finding of Completion (FOC) Certify no SA assets under litigation will benefit Comply with State Controller's asset transfer review	New concept which will need time to become standard practice; will require educating local decision makers of the opportunities and benefits of EIFDs.
Local Agency	Special Assessment Districts	Developed by watershed or sub-watershed to pay for EWMP improvements and maintenance.	Tailored to local watershed and community needs.	Resolution of Intention. Financing mechanism formed under The California Streets and Highways Code, Division 10 and 12.	Requires approval of a majority of the landowners based on the stated financial obligations to finance the improvements constructed or acquired by the District.	Proposition 218 ballots must be mailed to each property owner within the District. The majority must vote in favor for formation.
Local Agency	Collaborative opportunities with Other Agencies	Mutually beneficial program partnerships to share resources and meet regulatory requirements.	Will be well suited to be developed via the EIFD process above.	Varies on type of jurisdictions or entities included.	Varies on type of jurisdictions or entities included.	Case by case management can be resource intensive.
Local Agency	Public/Private Partnerships	Synergistic partnerships to develop funding opportunities.	Vary by jurisdictions, smaller scale projects may be more attainable or allow proof of concept.	Vary by project type and scale.	Vary by project.	May not be repeatable or of sufficient scale to justify public resource expenditure.
Local/ State	Municipal Bonds	Traditional infrastructure bonds.	Varies by project funding needs and jurisdiction.	Traditional bond development and approval processes.	Varies by type of bond and details.	Lack of public support from lack of knowledge of infrastructure funding shortcomings. Timelines of bond issuance process don't always match project timelines.



Scale/ Source	Type	Background	Potential	Process	Conditions	Challenges
State	State Revolving Fund (SRF) Loans	Funding source for any city county or district to fund projects including stormwater treatment, water reclamation and wastewater treatment systems.	Continuously available for application. Potential to leverage SCWP funds to support large scale SRF loans could be investigated.	Application available online on SWRCB site (https://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/)	Eligible projects include construction of publicly owned treatment facilities (including stormwater treatment); implementation of non-point sources projects to address pollution associated with agriculture, forestry, urban areas, marinas, hydromodification, and wetlands; and development and implementation of estuary comprehensive conservation and management plans.	Must have dedicated revenue stream to pay back loans.
State	Climate Change/ Greenhouse Gas (GHG) Emission Funding	AB32 established a comprehensive emission reduction program, including a “cap and trade” program that will auction emission credits creating up to \$3 billion annually, investment of these funds will be potential funding source.	Emission trading funds investment plan does include “water use and supply” projects that reduce GHG as eligible.	Emission trading market still developing.	To be determined	Role of stormwater projects in the cap and trade program and quantification of associated emission reduction is to be determined.
State	California Department of Transportation (Caltrans) Statewide TMDL Cooperative	Agreements with Caltrans can be executed to fund agency projects that address TMDLs where Caltrans is a responsible party.	Potential to fund implementation projects where there is benefit to both agencies.	Contact Caltrans Division of Local Assistance (https://dot.ca.gov/programs/local-assistance).	Funding can typically be used for project implementation but not for future operations and maintenance.	May have limited applicability depending on opportunities.



Scale/ Source	Type	Background	Potential	Process	Conditions	Challenges
	Implementation Agreements					
State	California Natural Resources Agency Bonds and Grants Program	Grants/loans for projects related to GHG reductions (Urban Greening Program); ocean and fisheries protection (Ocean Protection Council Program); mitigating environmental effects from transportation facilities (Environmental Enhancement and Mitigation Program); flood protection (Urban Stormwater and Waterways Improvement Program).	Potential for grant funding varies depending on program applicability: Urban Greening (\$28.5M); Flood Protection (\$87.5M); Ocean Protection (\$10M).	<ul style="list-style-type: none"> See https://resources.ca.gov/grants for more information on specific programs. 	Program specific.	Programs are in various stages of funding and solicitation. Review guidelines to determine which program is the best fit for the project. Highly competitive. The Urban Greening grant funded 25 projects of 77 requested statewide.
State	California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access for All Act of 2018.	On June 5, 2018, California voters passed a general obligation bond pursuant to Division 45 of the Public Resources Code, relating to drought, water, parks, climate, coastal protection, and outdoor access.	Total allocation of \$4.1B including \$725M for investments in environmental and social equity; \$285M for investments in protecting, enhancing, and accessing outdoor spaces; \$162M for CA River Recreation, Creek, and Waterway Improvements; \$175M for Ocean, Bay, and Coastal Protection; \$443M for Climate Preparedness, Habitat Resilience, Resource Enhancement, and Innovation; \$80M for Groundwater Sustainability; \$550M for Flood Protection and Repair; and \$390M for	Administered through various grant programs under the CA Natural Resources Agency. See http://bondaccountability.resources.ca.gov/Prop68Guidelines.aspx	Program specific.	Various restriction on use of funds and matching per Grant Guidelines.



Scale/ Source	Type	Background	Potential	Process	Conditions	Challenges
			Regional Sustainability for Drought and Groundwater and Water Recycling.			
State/ Federal	Water Infrastructure Finance and Innovation Act	Long-term, low-cost supplemental loans for regionally and nationally significant projects; established by the Water Infrastructure Finance and Innovation Act of 2014.	\$20M minimum project size for large communities; \$5M minimum size for small communities (25,000 or less).	See www.epa.gov/wifia/how-to-apply-wifia-assistance-1	Projects that are eligible for Clean Water SRF (notwithstanding the public ownership clause), Drinking Water SRF, wastewater conveyance/treatment; drinking water treatment; enhanced energy efficiency projects at drinking water and wastewater facilities; desalination, aquifer recharge, and water recycling projects; acquisition of property; a combination of eligible projects secured by a common security pledge or submitted under one application by an SRF program.	Funding up to 49% of eligible project costs; maximum maturity date is 35 years; maximum deferral is 5 years after substantial completion; projects must be credit worthy and have a dedicated source of revenue; NEPA, Davis-Bacon, American Iron and Steel, and all other federal cross-cutter provisions apply.
State/ Federal	Nonpoint Source (NPS) Pollutant Control Program	The State Water Board administers grant money from USEPA through Section 319(h) of the Clean Water Act and from the state Timber Regulation and Forest Restoration Fund.	Funding can be used to implement programs and projects that reduce pollution from NPS.	Details are provided on the NPS Grant Program website (https://www.waterboards.ca.gov/water_issues/programs/nps/319grants.html)	Funds must be used within the State's NPS priority watersheds. Proposals that address TMDL implementation and impaired waters are more likely to be funded. Projects that are specifically	Project awards range from \$80,000 to \$800,000 depending on the project type and may not offset the administrative burden. Note: the 2021 solicitation process is closed, but there is



Scale/ Source	Type	Background	Potential	Process	Conditions	Challenges
					required by an NPDES permit are ineligible.	typically a round each year.
State/ Federal	Sewer Overflow and Stormwater Reuse Municipal Grants (OSG Program)	Grant program was amended to include stormwater projects through America's Water and Infrastructure Act (2018).	Projects submitted, but not funded under Proposition 1 funding will comprise initial list. Project list/opportunities will likely be expanded in the future.	USEPA allocates funding to states; state administers funds through grants.	Prioritized funding for communities that are financially distressed, have a long-term municipal CSO or SSO control plan, or for projects that have requested a grant on their Clean Water State Revolving Fund (CWSRF) Intended Use Plan. At least 20 percent of a state's allocation must be used for GI, water and energy efficiency improvements, and other environmentally innovative activities.	Competitive grant process with limited funding. Funding is released nationwide and is highly competitive: the program received a \$28 million appropriation in Fiscal Year 2020 and a \$40 million appropriation in Fiscal Year 2021.
Federal	United States Army Corps of Engineers (USACE) Continuing Authorities Program (CAP)	The CAP is a group of nine legislative authorities under which USACE can plan, design, and implement certain types of water resources projects without additional project specific congressional authorization. The purpose of the CAP is to plan and implement projects of limited size, cost, scope and complexity.	Up to \$100,000 for feasibility studies and up to \$10M for other types of projects depending on the legislative authority.	Refer to USACE website at https://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/ .	Legislative authorities of interest may include: <ul style="list-style-type: none"> • Section 14, Flood Control Act of 1946 as amended for streambank and shoreline erosion protection • Section 205, Water Resources Development Act of 1992, as amended for flood control projects • Section 206, Water Resources 	May be challenging to find applicable projects; coordination with Federal agency; challenging long range planning processes (i.e., on the order of 10 years) that includes targets that must be met with no guaranteed appropriations in the end.



Scale/ Source	Type	Background	Potential	Process	Conditions	Challenges
					Development Act of 1996, as amended for aquatic ecosystem restoration Section 1135, Water Resources Development Act of 1986, as amended for project modifications for improvement of the environment	
Federal	Drinking Water and Wastewater Infrastructure Act of 2021 (DWWIA)	Bills, working their way through the legislature as of spring 2021, that contain new programs and seek to reauthorize several federal water infrastructure funding programs.	Increases to existing programs (e.g., Clean Water SRF, WIFIA) and potential for new water infrastructure funding programs totaling over \$35 billion over the next five years.	Bills have been passed in both houses; final language anticipated in mid-2021 that would then be eligible for inclusion in major infrastructure bill(s) such as the American Rescue Plan.	Various, depending on program. Supports various programs through loan forgiveness and better terms. Conditions may be better than previous arrangements.	TBD



6.6 NEXT STEPS

The NSMBCW EWMP Group members will utilize the following process to maximize opportunities to obtain the necessary funding. As noted in **Table 37**, constraints and challenges exist for all of the potential funding strategies. As a result, while the NSMBCW EWMP Group will implement the following process to attempt to gather the needed additional funding resources. Additionally, to the extent additional funding is obtained earlier in the implementation schedule, those resources will be utilized to implement additional actions.

Step 1: Implement procedures to maximize water quality benefits from existing maintenance and public agency processes. Examples of this include incorporating green streets into all major new roads projects and incorporating consideration of water quality benefits into all new flood control projects. Where these types of opportunities are identified, projects may be eligible for funding from various sources including:

- Local funding sources include local fee programs (e.g., SCWP), transportation funding, EIFDs, and/or special districts;
- State level funding sources include grant programs (e.g., Urban Greening through the California Natural Resources Agency) and Cooperative Implementation Agreements through Caltrans.

These projects represent the greatest opportunity for implementation due to increased coordination, available funding and rights of way, and lower overall costs. Where identified, projects will be included in Annual Plans and in the SIP to ensure they are candidates for funding through the SCWP. In parallel, other funding options will be investigated and pursued where possible. Agencies in NSMBCW are committed to implementing procedures within their stormwater programs to identify and fund these projects.

Step 2: Pursue multi-benefit projects. Stakeholders will work closely with each other, within their internal departments, and with local water agencies to identify projects that can be jointly funded or supported to enhance local water supplies, and increase public support through aesthetic enhancement, transit, active transportation and other community benefits.

These projects are typically more expensive and challenging to implement, however, there are now more opportunities for funding. Where identified, agencies are committed to ensuring that they are included in the Annual Plans for funding under the Municipal Program and/or in the SIP for funding under the Regional Program. In addition, agencies will review the list of multi-benefit projects that they need to implement and map out potential funding sources from **Table 37** that are applicable. If projects remain on Annual Plans and/or in the SIP and do not receive adequate funding within three years, agencies will pursue other potential sources. Outside of the SCWP, these types of multi-benefit projects may be eligible for funding through various local, state, and federal programs including local assessment districts, state grant programs (e.g., IRWM), state loans (SRF), and USACE CAP programs, and others. Where SCWP funding is secured, agencies may be able to leverage the new funding towards SCWP eligible expenditures through programs such as SRF to obtain larger amounts.

Step 3: Pursue grant funding opportunities. The NSMBCW EWMP Group will incorporate identified EWMP projects into the IRWMP and any other planning documents necessary to make them eligible for state grant funding. Additionally, the agencies will evaluate opportunities to obtain other types of grants for funding projects.

Step 4: When funds are needed, the stakeholders can pursue bond financing or obtaining a loan.



7. Adaptive Management and Assessment

Adaptive management is a critical component of the EWMP implementation process. The NSMBCW EWMP Group is committed to an adaptive management process that considers the following, in accordance with Permit Section VI.C.8.a.i:

- Progress toward achieving applicable limitations;
- Progress toward achieving improved water quality ;
- Re-evaluation of the water quality priorities identified in the EWMP based on more recent water quality data;
- Availability of new information and data from sources other than the NSMBCW CIMP;
- Regional Water Board recommendations; and
- Recommendations for modifications submitted through a public participation process.

The CIMP gathers additional data on receiving water conditions and stormwater/non-stormwater quality. These data 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 NSMBCW EWMP Group will continue to encourage public participation in EWMP implementation. As projects are being designed and implemented, there are several steps in the process that require public input. This allows public participation through availability of project information presented in the staff report and provides opportunity for the public to comment. Further, direct outreach to impacted neighborhoods or properties occurs when necessary, such as for CEQA purposes.

The adaptive management approach for the NSMBCW 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 within the EWMP.
2. Provide a structured decision-making process for modifications to the EWMP based on the new information.
3. Propose a structure for evaluating attainment of water-quality based permit requirements within an adaptive structure.

While the EWMP identifies actions that will address TMDL and ASBS requirements, the specific actions are informed by monitoring data collected under the CIMP, special studies conducted during implementation, and applicable regulatory changes that could influence the remaining schedule. For example, bacteria are prevalent throughout the watershed including numerous natural, non-anthropogenic, and/or non-MS4 sources. Therefore, the NSMBCW EWMP Group may consider options to perform special studies to evaluate options for meeting the goal of protecting human health embodied in the SMBB Bacteria TMDL. Various pathways are available, including use of microbial source tracking to support a natural source

exclusion, and quantitative microbial risk assessment. Through the adaptive management process, the RAA may be reevaluated after any changes to applicable regulations (e.g., TMDL, MS4 Permit).

Monitoring data is utilized to measure progress towards achieving RWLs and WQBELs. As the EWMP Implementation Plan is targeting attainment of the SMBB Bacteria TMDL and the ASBS RWLs, an evaluation of monitoring data and implementation progress will follow the process outlined in **Figure 51**. Modifications that are warranted because RWLs and/or WQBELs are achieved *more quickly* than anticipated can be made at any time (i.e., no further actions are needed if fewer control measures result in meeting RWLs and/or WQBELs) and will be noted in the annual report. Modifications that are needed because insufficient progress is being made will be noted in the annual report and a schedule for implementation will be provided. 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, or if otherwise required by the Regional Board or State Board. However, at any point, the NSMBCW Agencies could choose to update the EWMP and the associated RAA, particularly if deemed appropriate based on monitoring data.

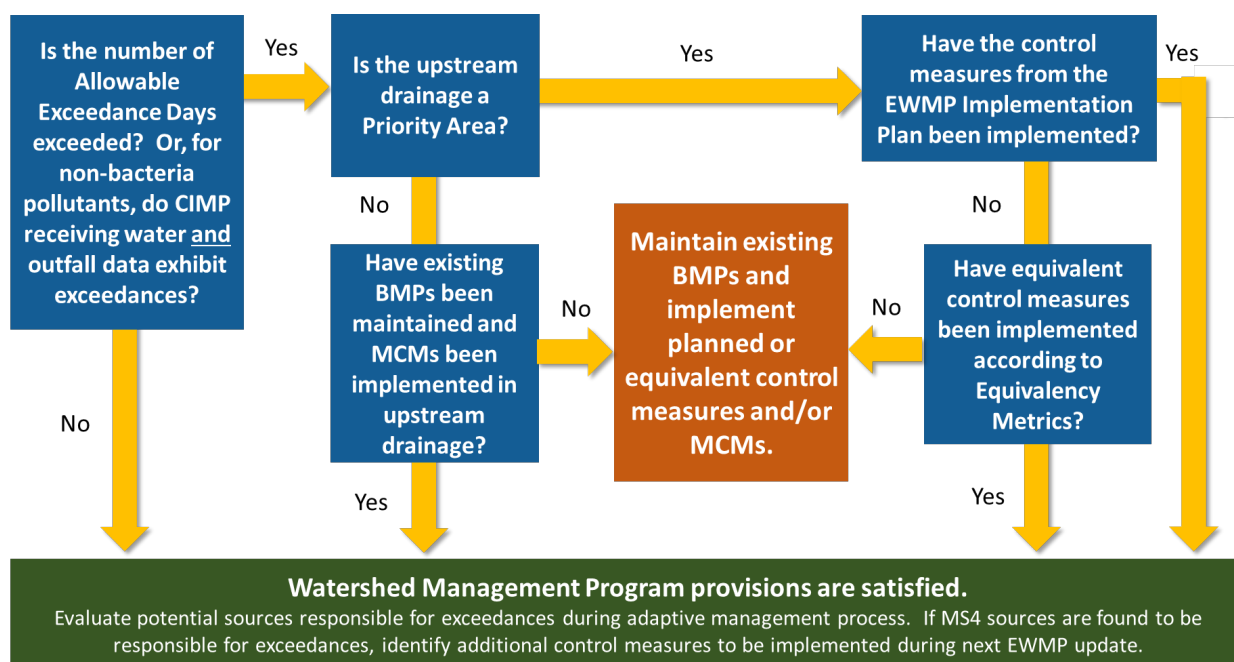


Figure 51. Adaptive Management Approach



8. Legal Authority

The NSMBCW EWMP Agencies, including the City of Malibu, County of Los Angeles, and Los Angeles County Flood Control District, have adequate legal authority to implement and enforce the requirements in the 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.

As required by the Permit, each Agency has submitted and will continue to submit as part of its Annual Report a statement certified by its chief legal counsel that verifies their legal authority. What follows is a summary of each Agency's legal authority.

8.1 CITY OF MALIBU

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 13.04 of the Malibu Municipal Code, which contains the City's regulations enabling it to impose the legal requirements of the Permit. The City's Local Coastal Program as certified by the California Coastal Commission includes a Land Use Plan and Local Implementation Plan. The LCP details many environmentally protective standards for new development and redevelopment projects, some of which are equally or more stringent than those in the Permit. Thus, the City has the legal authority as required under Part VI.A.2 of the 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 Malibu Municipal Code Chapters 1.10 – Administrative Citation and Penalties, 1.16 – General Penalty, and 13.04 – Storm Water Management and Discharge Control, the City's regulations may be enforced administratively, civilly, and criminally. The Malibu Municipal Code also provides various procedures to modify and/or revoke city-issued permits for unlawful and/or environmentally disruptive activity.

8.2 COUNTY OF LOS ANGELES

Although many portions of State law, the Charter of the County of Los Angeles, and the Los Angeles County Code are potentially applicable to the implementation and enforcement of the Permit requirements, the primary applicable laws and ordinances are:

- Los Angeles County code, Title 12, Chapter 12.80 – Stormwater and Runoff Pollution Control;
- Los Angeles County Code, Title 12, Chapter 12.84 – Low Impact Development Standards;
- Los Angeles County Code, Title 22 – Planning and Zoning, Part 6 – Enforcement Procedures;



- Los Angeles County Code, Title 26 – Building Code;
- California Government Code §6502;
- California Government Code §23004.

8.3 LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

Although many portions of State law, the Charter of the County of Los Angeles, the Los Angeles County Code, and the Los Angeles County Flood Control District Code are potentially applicable to the implementation and enforcement of the Permit requirements, the primary applicable laws and ordinances are:

- Los Angeles County code, Title 12, Chapter 12.80 – Stormwater and Runoff Pollution Control;
- Los Angeles County Code, Title 12, Chapter 12.84 – Low Impact Development Standards;
- Los Angeles County Code, Title 22 – Planning and Zoning, Part 6 – Enforcement Procedures;
- Los Angeles County Code, Title 26 – Building Code;
- LACFCD Code Chapter 21 – Stormwater and Runoff Pollution Control;
- California Government Code §6502;
- California Government Code §23004;
- California Water Code §8100 et. seq.



9. References

Allen, J, 1985. Principles of Physical Sedimentology, George Allen and Unwin, London.

Boehm, A., C. Bell, N. Fitzgerald, E. Gallo, C. Higgins, T. Hogue, R. Luthy, A. Portmann, B. Ulrich, J. Wolfand, 2020. "Biochar-augmented biofilters to improve pollutant removal from stormwater – can they improve receiving water quality?" Environ. Sci.: Water Res. Technol. 6: 1520-1537.

Chesapeake Stormwater Network, 2015. Potential Benefits of Nutrient and Sediment Practices to Reduce Toxic Contaminants in the Chesapeake Bay Watershed Part 1: Removal of Urban Toxic Contaminants FINAL REPORT. Prepared for Toxics Work Group Chesapeake Bay Partnership. Prepared by: Tom Schueler and Anna Youngk Chesapeake Stormwater Network Date: December 10, 2015

City of Malibu, 2012. Comment Letter – Bacteria TMDL Revisions for Santa Monica Bay Beaches. May 7, 2012.

City of Malibu, Los Angeles County Department of Public Works (LACDPW), 2015. Area of Biological Significance 24: Compliance Plan for the County of Los Angeles and City of Malibu. September 20, 2015.

City of Malibu, 2016. Area of Biological Significance: Special Protections Monitoring. Monitoring Report 2015 – 2016 Season. December 2016.

City of Los Angeles Bureau of Sanitation, 2012. Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL Implementation Plan. March 2012.

City of Los Angeles (City of LA), 2018. Permeable Pavers at Parkway - Standard Plan: S-489-0. City of Los Angeles Department of Public Works, Bureau of Engineering, Los Angeles, CA.

Contech Engineered Solutions (Contech ES), 2020. Filtterra® Bioretention. Accessed October 2020 at <https://www.conteches.com/stormwater-management/biofiltration-bioretenction/filtterra>.

Dagit, R., Krug, J., Adamek, K., Montgomery, E., Garcia, C., Albers, S., Jay, J., Riedel, T., Zimmer-Faust, A., Thulsiraj, V., Marambio, C., Braband, S., Tufto, D., and Sherman, R., 2014. Topanga Source ID Study FINAL Report Dec 2012 – August 2014. October 23, 2014.

DiBlasi, Li, Davis, and Ghosh, 2019. Removal and Fate of Polycyclic Aromatic Hydrocarbon Pollutants in an Urban Stormwater Bioretention Facility Environ. Sci. Technol. 2009, 43, 2, 494–502

Frere, M., C. Onstad, H. Holtan, 1975. "ACTMO, An Agricultural Chemical Transport Model". United States Department of Agriculture, Agricultural Research Service, Washington, DC.

Ghavanloughajar, M., R. Valenca, H. Le, M. Rahman, A. Borthakur, S. Ravi, M. Stenstrom, S. Mohanty, 2020. "Compaction conditions affect the capacity of biochar-amended sand filters to treat road runoff". Science of the Total Environment 735.



Holtan, H and N. Creitz, 1967. "Influence of Soils, Vegetation and Geomorphology on Elements of the Flood Hydrograph". Symposium on Floods and their Computation; Leningrad, Russia.

Izbicki, J., Swarzenski, P., Burton, C., and L.C. Van DeWerfhorst, 2012. "Sources of fecal indicator bacteria to groundwater, Malibu Lagoon, and the near-shore ocean, Malibu, California." Submitted 2012.

Jay, J.A., Ambrose, R.F., Thulsiraj, V., and S. Estes, 2011. "2009 Investigation of Spatial and Temporal Distribution of Human-specific Bacteroidales marker in Malibu Creek, Lagoon and Surfrider Beach." DRAFT.

Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority (LVMWD), 2012. Water Quality in the Malibu Creek Watershed, 1971-2010. LVMWD Report No. 2475.00. Revised on June 13, 2012.

Lau, A., D. Tsang, N. Graham, Y. Ok, X. Yang, X. Li, 2017. "Surface-modified biochar in a bioretention system for Escherichia coli removal from stormwater". Chemosphere 169: 89-98.

Los Angeles County Department of Parks and Recreation (LACDPR), 2011. Urban Forestry Manual. County of Los Angeles Department of Parks and Recreation. June 2011. Data accessed November 2020 at http://file.lacounty.gov/SDSInter/dpr/184720_UFPMANUAL080211.pdf.

Los Angeles County Department of Public Works (LACDPW), 2010a. Los Angeles County Watershed Model Configuration and Calibration—Part I: Hydrology. Prepared for County of Los Angeles Department of Public Works, Watershed Management Division, Los Angeles County, CA, by Tetra Tech, Pasadena, CA.

Los Angeles County Department of Public Works (LACDPW), 2010b. Los Angeles County Watershed Model Configuration and Calibration—Part II: Water Quality. Prepared for County of Los Angeles Department of Public Works, Watershed Management Division, Los Angeles County, CA, by Tetra Tech, Pasadena, CA.

Los Angeles County Department of Public Works (LACDPW), 2014. Low Impact Development Standard Manual. Los Angeles County Department of Public Works, Watershed Management Division, Alhambra, CA. February 2014. Accessed November 2020 at <https://dpw.lacounty.gov/idd/lib/fp/Hydrology/Low%20Impact%20Development%20Standards%20Manual.pdf>.

Los Angeles County Department of Public Works (LACDPW) and Los Angeles County Flood Control District, 2016. Los Angeles County Flood Control District and Los Angeles County Unincorporated Areas: Area of Special Biological Significance. Special Protections Monitoring. 2015-2016 Season Monitoring Report. August 2016

Los Angeles County Department of Public Works (LACDPW), 2017a. Low Impact Development Review Sheet (Los Angeles County Building Code, Residential Code, and Green Building Standards Code). Building and Safety/Land Development Division, Alhambra, CA. Accessed November 2020 at



[https://dpw.lacounty.gov/bsd/lib/fp/Drainage%20and%20Grading/LID%20and%20NPDES/LID%20Review%20Sheet%20-%20Small%20Non-Residential%20%20\(4-4-17\).pdf](https://dpw.lacounty.gov/bsd/lib/fp/Drainage%20and%20Grading/LID%20and%20NPDES/LID%20Review%20Sheet%20-%20Small%20Non-Residential%20%20(4-4-17).pdf).

Los Angeles County Department of Public Works (LACDPW), 2019a. LADPW Storm Drain System. Los Angeles County Department of Public Works, Watershed Management Division, Alhambra, CA. Data accessed November 2020 at <https://egis-lacounty.hub.arcgis.com/datasets/c62ae2f244f04e8086c89e8db3f530d8>.

Los Angeles Department of Building and Safety (LADBS), 2020. Guidelines for Storm Water Infiltration. Information Bulletin / Public -Building Code, Document Number P/BC 2020-118. City of Los Angeles Department of Building and Safety.

Los Angeles Region Imagery Acquisition Consortium (LARIAC), 2014. LARIAC 4 Product Guide. August 2015. Accessed November 2020 at https://egis2.lacounty.gov/hub/lariac_documents/LARIAC4-Product-Guide-1.pdf.

Los Angeles Regional Water Quality Control Board (Regional Board), 1995. Updated 2011. Water Quality Control Plan, Los Angeles Region.
http://www.waterboards.ca.gov/rwqcb4/water_issues/programs/basin_plan/index.shtml

Los Angeles Regional Water Quality Control Board (Regional Board), 2012. Reconsideration of Certain Technical Matters of the Santa Monica Bay Beaches Bacteria TMDLs; the Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL; and the Los Angeles Harbor Inner Cabrillo Beach and Main Ship Channel Bacteria TMDL. Staff Report. Revised. May 2012.

Los Angeles Regional Water Quality Control Board (Regional Board), 2014. Guidelines for conducting reasonable assurance analysis in a watershed management program, including an enhanced watershed management program. March 25, 2014.

Los Angeles Regional Water Quality Control Board (Regional Board), 2021. Consideration of Extension of Final TMDL Implementation Deadlines for Certain TMDLs in the Los Angeles Region. February 2021.

Malibu Bay Company, 2002. Monitoring and Reporting for Malibu Bay Company at Malibu Colony Plaza – Winter Canyon Disposal Site – Annual Report for January 1, 2001 – December 31, 2001. Report submitted to the LARWQCB.

Mohanty, S., K. Cantrell, K. Nelson, A. Boehm, 2014. "Efficacy of biochar to remove *Escherichia coli* from stormwater under steady and intermittent flow". Water Research 61(15): pp 288-96.

Noble, R.T., Griffith, J.F., Blackwood, A.D., Fuhrman, J.A., Gregory, J.B., Hernandez, X., Liang, X., Bera, A.A., and K. Schiff, 2005. "Multi-Tiered Approach Using Quantitative Polymerase Chain Reaction for Tracking Sources of Fecal Pollution to Santa Monica Bay, California." SCCWRP Technical Report #446.



North Santa Monica Bay Coastal Watersheds EWMP Group (NSMBCW EWMP Group), 2014. Area of Special Biological Significance 24, Draft Pollution Prevention Plan for the County of Los Angeles and City of Malibu. September 20, 2014.

North Santa Monica Bay Coastal Watersheds EWMP Group (NSMBCW EWMP Group), 2015a. Area of Special Biological Significance 24, Compliance Plan for the County of Los Angeles and City of Malibu. September 20, 2015.

North Santa Monica Bay Coastal Watersheds EWMP Group (NSMBCW EWMP Group), 2015b. Area of Special Biological Significance 24, Pollution Prevention Plan for the County of Los Angeles and City of Malibu. September 20, 2015.

North Santa Monica Bay Coastal Watersheds EWMP Group (NSMBCW EWMP Group), 2015c. Coordinated Integrated Monitoring Program. July 14, 2015.

Northwest Cascade Inc, 2016. Manchester Stormwater Park. Accessed October 2020 at <https://nwcascade.com/projects/manchester-stormwater-park>.

Natural Resources Conservation Service (NRCS), 2019. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture, Washington D.C. Data accessed March 2019 from <link>.

Orange County Department of Public Works (OCDPW), 2011. Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans. Orange County Department of Public Works, Santa Ana, CA.

Riverside County, 2018. Santa Margarita River Watershed Region Design Handbook for Low Impact Development Best Management Practices. Riverside County Flood Control and Water Conservation District, Riverside, CA.

San Mateo County (SMC), 2020. C.3 Regulated Projects Guide v1.0. San Mateo Countywide Water Pollution Prevention Program. San Mateo City/County of Governments, Redwood City, CA. January 2020.

Shen, J., A. Parker, J. Riverson, 2005. "A New Approach for a Windows-based Watershed Modeling System Based on a Database-supporting Architecture". Environmental Modelling & Software, 20(9) pp 1127-1138.

State of Washington (State of WA), 2019a. General Use Level Designation for Basic (TSS), Enhanced, Phosphorus & Oil Treatment for Contech Engineered Solutions Filtterra® Bioscape™. State of Washington Department of Ecology. September 2019. Accessed November 2020 at <link>.

State Water Resources Control Board (SWRCB), 2012. Approving exceptions to the California Ocean Plan for selected discharges into Areas of Special Biological Significant, including special protection for beneficial uses, and certifying a program Environmental Impact Report. Order No. 2012-0012. March 20, 2012.



State Water Resources Control Board (SWRCB), 2019. California Ocean Plan. Water Quality Control Plan, Ocean Waters of California.

State Water Resources Control Board (SWRCB), 2020. About GeoTracker. Accessed November 2020 at https://www.waterboards.ca.gov/ust/electronic_submittal/about.html.

Sutula, M., Kamer, K., and Cable, J., 2004. Sediments as a non-point source of nutrients to Malibu Lagoon, California (USA). Southern California Research Project (SCCWRP), Technical Report 441. October 2004.

United States Environmental Protection Agency (USEPA), 2002. The Loading Simulation Program in C++ (LSPC) Watershed Modeling System – User’s Manual. Tetra Tech, Fairfax, VA, and U.S. Environmental Protection Agency, Washington, DC.

United States Environmental Protection Agency (USEPA), 2003. Total Maximum Daily Loads for Nutrients, Malibu Creek Watershed. U.S. Environmental Protection Agency Region IX, San Francisco, CA. United States

United States Environmental Protection Agency (USEPA), 2012. Santa Monica Bay Total Maximum Daily Loads for DDTs and PCBs.

United States Geological Survey (USGS), 1975. Topographic-Bathymetric Map Los Angeles, CA. May 19, 1977. <https://store.usgs.gov/product/47209>

Yerkes, R.F. and R.H. Campbell, 1980. Geologic Map of East-Central Santa Monica Mountains, Los Angeles County, California. U.S. Geological Survey Map I-1146.

Appendix 1: ASBS Analysis and Source Assessment

Introduction

This appendix provides detailed information supporting the Area of Special Biological Significance (ASBS) water quality characterization and source assessment presented in **Section 2** of the North Santa Monica Bay Coastal Watershed (NSMBCW) Enhanced Watershed Management Program (EWMP). This appendix includes the following:

- ASBS Water Quality Characterization
- Common Sources of TMDL Water-Body Pollutant Combinations
- Common Sources of Non-TMDL Water-Body Pollutant Combinations
- Land Use Specific Modeling Results
- References

ASBS Water Quality Characterization

The State Water Resources Control Board (State Board) adopted Resolution No. 74-28 on March 21, 1974 which designated 31 Areas of Special Biological Significance (ASBS). ASBS are ocean areas requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable. One of the ASBS designated by the State Board by Resolution No. 74-28 was the portion of the California coastline from Laguna Point to Latigo Point in the Los Angeles Region (ASBS 24). Part of ASBS 24 is within the City of Malibu (City). The remaining portion of ASBS 24 is within an unincorporated portion of Los Angeles County (County).

The California Ocean Plan (Ocean Plan) prohibits the discharge of waste to designated ASBS. On October 18, 2004, the State Board notified several parties that they must cease the discharge of stormwater and nonpoint source waste into ASBS or request an exception to the Ocean Plan. The State Board received 27 applications for an exception to the Ocean Plan prohibition against waste discharges into an ASBS, including from the City, County, and Los Angeles County Flood Control District (LACFCD). On March 20, 2012, in Resolution No. 2012-0012, the State Board adopted a General Exception to the Ocean Plan ASBS waste discharge prohibition (General Exception), for stormwater and nonpoint source waste discharges from these 27 applicants, including Special Protections (Attachment B to the General Exception).¹ The Special Protections outlined the special conditions which must be met for discharges into an ASBS from the 27 applicants to be allowed.

Two key provisions of the Special Protections which outline requirements which point source dischargers must meet to comply with the Special Protections are Part I.A.2 (Compliance Plans) and Part IV.B (Monitoring Requirements). Part I.A.2 requires point source discharges of stormwater to develop compliance plans and specifies the components which must be included within those plans. Part IV.B of

¹ On June 19, 2012, the State Board adopted Resolution No. 2012-0031 which amended sections A.2.d(2) and B.2.b(2) of the Special Protections in Attachment B to the General Exception, originally adopted in Resolution 2012-0012, to require pollutant reductions to be achieved within six years, to be consistent with the compliance schedules in sections I.A.3 and I.B.3.

the Special Protections contains monitoring requirements for authorized discharges to the ASBS that include both: (A) core discharge monitoring, and (B) ocean receiving water monitoring.

Ocean receiving water monitoring results can be used to determine if natural water quality conditions in the receiving water are being achieved. If natural water quality is being altered, core discharge monitoring results can be used to determine the degree to which stormwater flows or pollutant loading need to be reduced to achieve natural water quality conditions (and the schedule which would be necessary to construct the necessary BMPs). Core discharge monitoring results obtained by meeting the requirements of Part IV.B of the Special Protections can be used to determine whether stormwater runoff is causing or contributing to an alteration of natural ocean water quality in the ASBS.

As specified in the definition of natural ocean water quality provided in the glossary of the Special Protections, determining whether stormwater runoff is causing or contributing to an alteration of natural ocean water quality in an ASBS is a two-step process. The first step in the process is identifying whether an alteration of natural water quality has taken place. The process for identifying which constituents have altered natural water quality is illustrated within Attachment 1 of the Special Protections (**Figure 1**) and summarized as follows:

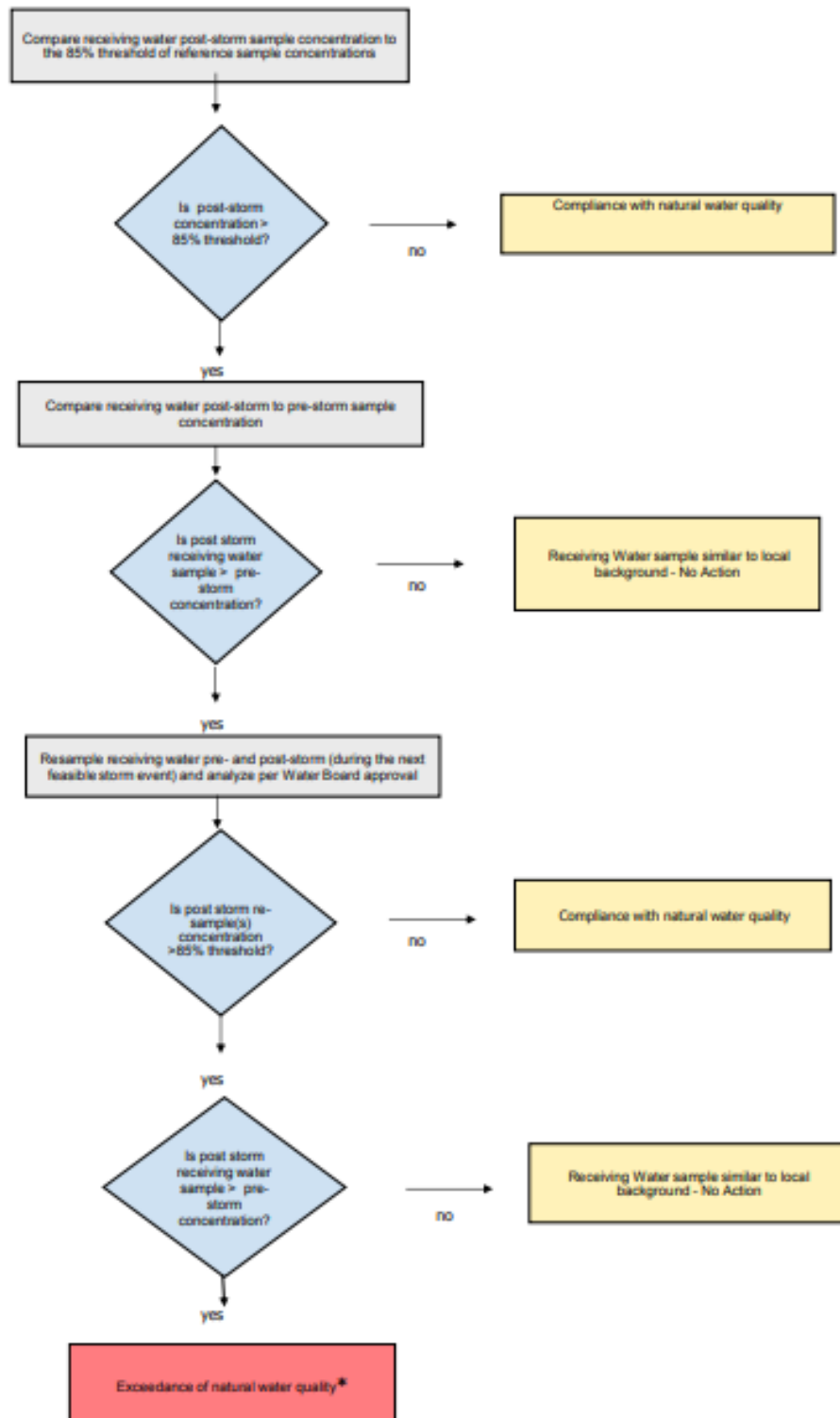
1. The receiving water post-storm sample concentration is compared to the 85th percentile threshold of reference sample concentrations (taken from the Southern California Bight Regional Monitoring Program).
 - a. If the receiving water post-storm sample concentration is less than or equal to the 85th percentile threshold of reference sample concentrations, then natural water quality is not altered.
 - b. If not, then proceed to Step 2.
2. The receiving water post-storm sample concentration is compared to the pre-storm sample concentration.
 - a. If the receiving water post-storm sample concentration is less than or equal to the pre-storm sample concentration, then no further action is required.
 - b. If not, then proceed to Step 3.
3. The receiving water is resampled pre-storm and post-storm during the next feasible storm event and Step 1 is repeated using the resampled post-storm sample concentration.
 - a. If the receiving water post-storm sample concentration is less than or equal to the 85th percentile threshold of reference sample concentrations, then natural water quality is not altered.
 - b. If not, then proceed to Step 4.
4. Step 2 is repeated using the resampled post-storm sample concentration and the resampled pre-storm sample concentration.
 - a. If the receiving water post-storm sample concentration is less than or equal to the pre-storm sample concentration, then no further action is required.
 - b. If not, then natural water quality has been altered.

If natural water quality is determined to have been altered, the next step in the process of determining whether stormwater runoff is potentially causing or contributing to the alteration of natural ocean water quality in an ASBS is conducting the evaluation of whether a discharge is contributing to the alteration of natural water quality. The definition of natural ocean water quality provided in the glossary of the Special

Protections states the following related to determining whether stormwater runoff is causing or contributing to an alteration of natural ocean water quality in an ASBS:

“If monitoring information indicates that natural ocean water quality is not maintained, but there is sufficient evidence that a discharge is not contributing to the alteration of natural water quality, then the Regional Water Board may make that determination. In this case, sufficient information must include runoff sample data that has equal or lower concentrations for the range of constituents at the applicable reference area(s).”

As such, if runoff sample data (i.e., core discharge monitoring data) for the constituents for which natural water quality has been altered are less than or equal to the applicable reference data (i.e., the 85th percentile threshold of reference sample concentrations taken from the Southern California Bight Regional Monitoring Program), then there is sufficient information for the Regional Board to make a determination that stormwater runoff is not causing or contributing to an alteration of natural water quality.



* When an exceedance of natural water quality occurs, the discharger must comply with section LA.2.h (for permitted storm water) or section LB.2.c (for nonpoint sources). Note, when sampling data is available, end-of-pipe effluent concentrations will be considered by the Water Boards in making this determination.

Figure 1. Flowchart to Determine Compliance with Natural Water Quality – Attachment 1 of Special Protections

The monitoring conducted by the City, County, and LACFCD was performed over several years and summarized in the following three documents:

- Area of Special Biological Significance 24 Compliance Plan for The County of Los Angeles and City of Malibu (Compliance Plan) (City of Malibu, Los Angeles County Department of Public Works, 2015)
- City of Malibu Areas of Special Biological Significance Special Protections Monitoring Report 2015-2016 Season (City 2015-16 ASBS Monitoring Report) (City of Malibu, 2016)
- Los Angeles County Flood Control District and Los Angeles County Unincorporated Areas: Areas of Special Biological Significance Special Protections 2015-2016 Season Monitoring Report (County 2015-16 ASBS Monitoring Report) (Los Angeles County Department of Public Works and Los Angeles County Flood Control District, 2016)

The following subsections provide a summary of the results presented in the Compliance Plan, the City 2015-16 ASBS Monitoring Report, and the County 2015-16 ASBS Monitoring Report.

SUMMARY OF COMPLIANCE PLAN RESULTS

The Compliance Plan details wet weather ocean receiving water monitoring and core discharge monitoring conducted by the City, County, and LACFCD during the 2012-13 (two events), 2013-14 (one event), and 2014-15 (one event) wet seasons. An evaluation of which constituents altered natural water quality is provided in **Table 1**. An evaluation of whether stormwater runoff potentially contributed to each alteration of natural water quality is provided in **Table 2**.

Table 1. Identification of Constituents Which Exceeded Natural Water Quality Based on Compliance Plan Ocean Receiving Water Monitoring Results (Red text identifies Constituents Which Are Greater Than the 85% Threshold and Pre-Storm Concentration During Same Event)

Site	Date	Constituents for Which Post-Storm Concentration > 85% Threshold ^{1,2}	Constituents for Which Post-Storm Concentration > Pre-Storm Concentration	Constituents Which Altered Natural Water Quality
S-02	February 2013	Selenium; Total PAHs; Total Pyrethroids	Selenium; Total PAHs; Total Pyrethroids Orthophosphate; TSS; Chromium; Copper; Lead; Nickel; Zinc; Esfenvalerate	N/A ³
	March 2013	Nitrate; Copper; Lead; Mercury; Selenium; Zinc; Total PAHs Total Pyrethroids	Nitrate; Copper; Lead; Mercury; Selenium; Zinc; Total PAHs Orthophosphate; TSS; Arsenic; Cadmium; Chromium; Nickel; Bifenthrin	Selenium; Total PAHs
	February 2014	Orthophosphate; TSS; Mercury; Selenium; Silver; Total PAHs; Total Pyrethroids Arsenic; Cadmium; Chromium; Copper, Lead; Nickel	Orthophosphate; TSS; Mercury; Selenium; Silver; Total PAHs; Total Pyrethroids Bifenthrin	Mercury; Selenium; Total PAHs
S-01	February 2014	Mercury; Silver; Zinc; Total PAHs	Mercury; Silver; Zinc; Total PAHs TSS	N/A ³
24-BB-03R	February 2014	Selenium Silver; Total PAHs	Selenium Cadmium; Copper; Lead; Nickel; Zinc	N/A ³
	December 2014	Ammonia; Silver; Total PAHs	Ammonia; Silver; Total PAHs Arsenic; Selenium; Zinc	None

1. Please note that the 85% Threshold from Bight 2013 was not consistently used. In these instances, the 85% Threshold used does not match the threshold indicated in Bight 2008 either. As such, the source of the 85% Thresholds used for these constituents (e.g., selenium) is unclear.
2. Summed totals (e.g., Total PAHs) in the Compliance Plan and the Bight 2013 report² were said to include half the detection limit for NDs and the 85% Threshold was set at this value; however, there is information presented in the Bight 2013 report which may indicate that the 85% Threshold was not accurately calculated. That being said, the Bight 2013 report does not provide sufficient data to verify whether or not this was the case.
3. An exceedance of natural water quality requires results from two consecutive storm events.

² South Coast Areas of Special Biological Significance Regional Monitoring Program Year 2 Results. Southern California Coastal Water Research Project. Technical Report 852. February 2015.

Table 2. Identification of Discharges Which Potentially Contributed to Alterations of Natural Water Quality Based on Compliance Plan Core Discharge Monitoring Results

Site	Date	Constituent	85% Threshold Concentration	Runoff Sample Concentration	Discharge Potentially Contributing to Alteration of Natural Water Quality?
ASBS-028 ¹	March 2013	Selenium	0.0025 µg/L	1.004 µg/L	Yes
		Total PAHs	0.0125 µg/L	1.7542 µg/L	Yes
	February 2014	Mercury	0.0006 µg/L	<0.0012 µg/L	No
		Selenium	0.0025 µg/L	0.334 µg/L	Yes
		Total PAHs	0.0125 µg/L	1.1788 µg/L	Yes

1. Site associated with Receiving Water Station S-02.

SUMMARY OF CITY 2015-16 ASBS MONITORING REPORT RESULTS

The City 2015-16 ASBS Monitoring Report details wet weather core discharge monitoring and ocean receiving water monitoring conducted by the City during the 2015-16 (two events) wet season. An evaluation of which constituents altered natural water quality is provided in **Table 3**. An evaluation of whether stormwater runoff potentially contributed to each alteration of natural water quality is provided in **Table 4**.

Table 3. Identification of Constituents Which Exceeded Natural Water Quality Based on City 2015-16 ASBS Monitoring Report Ocean Receiving Water Monitoring Results (Red text identifies Constituents Which Are Greater Than the 85% Threshold and Pre-Storm Concentration During Same Event)

Site	Date	Constituents for Which Post-Storm Concentration > 85% Threshold	Constituents for Which Post-Storm Concentration > Pre-Storm Concentration	Constituents Which Altered Natural Water Quality
24-BB-03R	February 2014 ¹	Selenium Silver; Total PAHs	Selenium Cadmium; Copper; Lead; Nickel; Zinc	N/A ²
	December 2014 ¹	Ammonia; Selenium; Silver; Total PAHs	Ammonia; Selenium; Silver; Total PAHs Arsenic; Zinc	Selenium
	January 2016	Ammonia; Selenium; Silver	Ammonia; Selenium; Silver Arsenic; Cadmium; Copper; Lead	Ammonia; Selenium; Silver
	March 2016	Arsenic; Lead; Selenium Silver; Total PAHs	Arsenic; Lead; Selenium Orthophosphate; TSS; Cadmium; Chromium; Copper; Nickel; Zinc; Total Pyrethroids	Selenium

- Results for these events were also provided in the Compliance Plan; however, some of the conclusions differ between the Compliance Plan and the City 2015-16 ASBS Monitoring Report due to different values being used for the 85th Percentile of Reference Data for certain constituents.
- An exceedance of natural water quality requires results from two consecutive storm events.

Table 4. Identification of Discharges Which Potentially Contributed to Alterations of Natural Water Quality Based on City 2015-16 ASBS Monitoring Report Core Discharge Monitoring Results

Site	Date	Constituent	85% Threshold Concentration	Runoff Sample Concentration	Discharge Potentially Contributing to Alteration of Natural Water Quality?
24-BB-03Z ¹	December 2014	Selenium	0.0025 µg/L	0.304 µg/L	Yes
	January 2016	Ammonia	0.015 mg/L	0.82 mg/L	Yes
		Selenium	0.0025 µg/L	0.132 µg/L	Yes
		Silver	0.08 µg/L	<0.01 µg/L	No
	March 2016	Selenium	0.0025 µg/L	0.198 µg/L	Yes

1. Site associated with Receiving Water Station 24-BB-03R.

SUMMARY OF COUNTY 2015-16 ASBS MONITORING REPORT RESULTS

The County 2015-16 ASBS Monitoring Report details wet weather core discharge monitoring and ocean receiving water monitoring conducted by the County and LACFCD during the 2015-16 (two events) wet season. An evaluation of which constituents altered natural water quality is provided in **Table 5**. An evaluation of whether stormwater runoff potentially contributed to each alteration of natural water quality is provided in **Table 6**.

Table 5. Identification of Constituents Which Exceeded Natural Water Quality Based on County 2015-16 ASBS Monitoring Report Ocean Receiving Water Monitoring Results (Red text identifies Constituents Which Are Greater Than the 85% Threshold and Pre-Storm Concentration During Same Event)

Site	Date	Constituents for Which Post-Storm Concentration > 85% Threshold	Constituents for Which Post-Storm Concentration > Pre-Storm Concentration	Constituents Which Altered Natural Water Quality
S-01	January 2016	Ammonia; Silver Selenium	Ammonia; Silver Arsenic; Chromium; Copper; Zinc	Silver ¹
	March 2016	Oil & Grease; Orthophosphate; TSS; Arsenic; Chromium; Copper; Lead; Nickel; Selenium; Total PAHs	Oil & Grease; Orthophosphate; TSS; Arsenic; Chromium; Copper; Lead; Nickel; Selenium; Total PAHs Ammonia; Nitrate; Cadmium; Zinc	None
S-02	January 2016	Chromium; Copper; Lead; Nickel; Selenium; Silver; Total PAHs	Chromium; Copper; Lead; Nickel; Selenium; Silver; Total PAHs Ammonia; Orthophosphate; TSS; Arsenic; Cadmium; Zinc	Selenium; Silver; Total PAHs ¹

- Results presented in the Compliance Plan were used to determine which constituents were greater than the 85th Percentile Threshold and pre-storm concentrations during the previous storm.

Table 6. Identification of Discharges Which Potentially Contributed to Alterations of Natural Water Quality Based on County 2015-16 ASBS Monitoring Report Core Discharge Monitoring Results

Site	Date	Constituent	85% Threshold Concentration	Runoff Sample Concentration	Discharge Potentially Contributing to Alteration of Natural Water Quality?
ASBS-016 ¹	January 2016	Silver	0.08 µg/L	0.08 µg/L	No
ASBS-028 ²	January 2016	Selenium	0.0025 µg/L	1.482 µg/L	Yes
		Silver	0.08 µg/L	0.01J µg/L	No
		Total PAHs	0.0125 µg/L	2.1612 µg/L	Yes

- Site associated with Receiving Water Station S-01.
- Site associated with Receiving Water Station S-02.

Common Sources of TMDL Water-Body Pollutant Combinations

The following subsections present common sources of pollutants addressed by TMDLs relevant to the NSMBCW EWMP area.

INDICATOR BACTERIA

The Santa Monica Bay (SMB) Beaches (SMBB) Bacteria TMDL for both dry and wet weather was the first bacteria TMDL adopted by the Los Angeles Regional Water Quality Control Board (Regional Board). The SMBB Bacteria TMDL was revised in 2012, although the source assessment was not part of this update. As a result, the general findings from the original source assessment remain unchanged. These findings are summarized in the 2012 Basin Plan Amendment for the reopened SMBB Bacteria TMDL (Attachment A to Resolution No. R12-007):

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

Although definitive information regarding the specific sources of bacteria within the watershed is not presented, speculation provided in the dry weather staff report for the original TMDL provides some insight into possible sources:

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

Following the TMDL, a study by the Southern California Coastal Water Research Project (SCCWRP) investigated bacteria runoff concentrations from various land uses in the Los Angeles region (Stein et al., 2007). Results showed that wet weather runoff event mean concentrations (EMCs) for fecal coliform bacteria were highest for agricultural land uses, followed by commercial and educational, single family residential, multi-family residential, open space, industrial, and transportation. In this 2007 SCCWRP study, results also showed that in some cases, the levels of fecal indicator bacteria at the recreational (horse) and agricultural land use sites were as high as those found in primary wastewater effluent in the United States. Tiefenthaler et al. (2011) also found that horse stable sites contributed significantly higher wet weather EMCs than other land use types.

The 2010-2011 and 2011-2012 Los Angeles County Municipal Stormwater Permit Individual Reports for Malibu, the County, and LACFCD reported that, while eliminated shortly after being reported, leaks from onsite wastewater treatment systems (OWTSs) and illicit connections/illicit discharges sometimes occur within their jurisdictions. While much of the NSMBCW area lacks a sewer system and instead relies on OWTSs, OWTSs have been studied extensively and have not been found to be a source of fecal indicator bacteria (FIB) to SMB, Malibu Lagoon, or MS4 discharges. This is supported by a recent USGS study (USGS 2011) conducted in the Malibu Lagoon area, which found that bacteria in groundwater wells were nearly absent even in wells that contained water with a wastewater history, likely due to a combination of microbial filtration, sorption, death, predation, and other factors within the soil. Since the only pathway from an OWTS to the receiving waters or the MS4 would be via groundwater, the USGS study suggested other, more likely sources of bacteria including beach kelp and movement of water through the berm separating the lagoon from the ocean.

Additionally, information on non-MS4 sources of surf zone bacteria were provided by Malibu, based on a comprehensive review of Southern California published literature, as part of comments on the reopened Bacteria TMDL (City of Malibu, 2012):

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

Furthermore, monitoring results from microbial source tracking (MST) studies conducted in the NSMBCW area indicate that human fecal contributions are minor or non-existent (City of Malibu, 2012):

“Several MST studies have been conducted within North Santa Monica Bay subwatersheds to assess the presence of human fecal contamination during dry weather. Noble et al (2005) sampled from Malibu Creek, Malibu Lagoon and from the discharge of the lagoon to the beach. Jay et al (2011) collected samples from the Malibu Creek, Malibu Lagoon, and Surfrider Beach, and Izbicki et al (2012b) tested Malibu Lagoon and near-shore ocean water. Two of the three studies (Noble et al 2005 and Izbicki et al 2012b) found no detection of human markers in any of the surface water samples tested, and Jay et al found no evidence of human fecal marker HF183 at Surfrider Beach, however, Jay et al did detect low levels of human marker HF183 in several samples (5 out of 80 samples, or 6 percent) that were collected from lower Malibu Creek and Malibu Lagoon. It was noted that the detected lagoon levels correspond to 0.00005-0.0009 percent sewage or

greater than 5-log (>100,000 times) dilution. Potential sources for human contributions were not identified, however the Izbicki study specifically investigated the potential for OWTS to serve as sources of human fecal contamination to Malibu Lagoon, and did not find evidence linking microbial communities (based on TRFLP [terminal restriction fragment length polymorphism] community analysis) found in these systems to those found in the lagoon or beach; furthermore all 25 groundwater samples were negative (non-detect) for HF183 (Izbicki, 2012a). Weisberg et al (2009) similarly studied Ramirez and Escondido Creeks and found little to no evidence of human sources in either creek and suggested regrowth³ (grass clippings and high nutrients in Ramirez and presence of enclosed berm at Escondido) as a potential source of the minor levels measured at the very low end of the detection range. In fact, of 332 samples tested for both creeks, only one sample from Escondido Creek tested positive for optical brighteners (a correlate of human fecal contamination) (Barnett et al 2008 [Year 2 Progress Report on Weisberg study]). Weisberg et al also tested human Bacteroides markers in both creeks but results were inconclusive. Following the study period at Paradise Cove/Ramirez Creek, Malibu installed a stormwater treatment facility with City and State bond funds. This facility effectively disinfects all flows in dry weather and most flows in wet weather. Compliance and project monitoring show that the treated effluent is bacteria free but as soon as these flows reach the beach, bacteria levels rebound, and shoreline samples exceed TMDL WLAs.

Malibu's final Project Certification to the SWRCB (Brown 2011) acknowledges that the project monitoring site PC-5 at the interface of the treated discharge and the sand was regularly above FIB standards. It was clear that once the treated water flowed across the sand and the accumulated kelp wrack, there was a dramatic decline in water quality and bacteria levels had increased. This is consistent with findings from other Southern California urban runoff disinfection projects, such as in Aliso Creek (Orange County) and Moonlight Beach (San Diego County), where FIB concentrations rebound immediately downstream of the treated discharges.”⁴

More recently, a bacteria source identification study was conducted in the Topanga Creek subwatershed. For the Topanga Source ID Study (Dagit, et. al., 2014), intensive, long-term monitoring during wet and dry seasons, and measurement of quantitative polymerase chain reaction (qPCR) markers was conducted at 14 locations (5 locations within the subwatershed, 9 locations on the beach) to attempt to characterize bacteria levels and potential sources within the Topanga Creek subwatershed due to poor water quality ratings at Topanga State Beach. Based on this study, elevated bacteria levels were observed throughout the subwatershed in association with human, dog, and gull markers. Other conclusions from the study included:

³ “Regrowth” is a general term being used here to describe persistence and multiplication of bacteria within natural or engineered systems such as sediments or storm drains, where decomposing organic matter, nutrient supplies, and/or protection from UV light create favorable conditions for this to occur. Studies by SCCWRP have demonstrated the ability of Enterococcus to grow on sterile concrete surfaces under such conditions, and the speciation of these Enterococcus colonies showed them to be primarily of environmental origin (mostly from plants and decomposing organic matter) (Griffith 2012). Regrowth can serve as an internal source of bacteria to waterbodies, as opposed to external inputs such as urban runoff.

⁴ These findings are also consistent with monitoring data from LACFCD's Marie Canyon Treatment Facility.

- The finding that the upper subwatershed is not contributing to the exceedances observed at Topanga Beach;
- The finding that concentrations of FIB and nutrients decrease as the creek flows downstream from town through the Narrows;
- The finding that FIB and/or pathogens are generally not caused by leakage from faulty septic systems in the lower subwatershed;
- The finding that contributions from Topanga Lagoon are correlated with FIB levels in the ocean during rain events and when the lagoon is connected to the ocean directly. These elevated levels of bacteria appear to be the result of dog and gull inputs. Human marker, on the other hand, was detected infrequently in the creek, lagoon, and ocean.
- Based on the results of this study, it appears that County inputs from the MS4 are not causing or contributing to bacteria exceedances at Topanga beach.

Other sources of bacteria during wet weather are anticipated to include other permitted and non-permitted stormwater discharges, such as Construction General Permit sites, Phase II MS4 Sites (e.g., college campuses), State/Federal owned lands, recreational areas, private storm drains, and Caltrans' MS4. NSMBCW Coordinated Integrated Monitoring Program (CIMP) results from water samples from the MS4 outfalls have been observed above the receiving water's water quality objectives (WQOs) for FIB during the four years that the outfalls have been sampled, which is shown in **Table 7**. As shown in **Table 8** and **Table 9**, FIB densities observed from MS4-related land uses are significantly elevated.

DDT AND PCBS

DDT is an organochlorine insecticide that was widely used on agricultural crops and to control disease-carrying insects. In California, DDT was used primarily for agricultural activities. The use of DDT was banned in the United States in 1972, except for public health emergencies involving insect diseases and control of body lice. Although DDT is no longer used, it persists in the environment, adhering strongly to soil particles.

In a study by Young et al. (1973), the annual wet weather loads for DDTs from the nearby Ballona Creek watershed were around 18 kg during 1971-1972 water year, which was defined as a particularly wet year in the study. In the 1987-88 period, wet weather loadings for DDT during a comparable size storm year were around 8 kg (Stein et al., 2003). There were no detectable concentrations of DDT in stormwater samples from 1994 to 2005 (LADPW, 2005); however, the detection limits used for DDT (0.1 ug/L) were orders of magnitude higher than the California Toxics Rule objectives (0.00059 ug/L) for the protection of human health.

As discussed in the Santa Monica Bay DDTs and PCBs TMDL (SMB Toxics TMDL) and presented in Curren et al. (2011) the contribution of subwatersheds to chlorinated pesticide loading from storm drains in the Los Angeles area were evaluated during wet weather. The results of the study found DDT concentrations in stormwater during the 2005-2006 season that ranged from non-detect to 0.4 ng/l. This indicates that DDT concentrations in stormwater may not exceed the California Toxics Rule (CTR) human health criteria of 0.59 ng/L. Results presented in Curren et al. (2011) were used in the SMB Toxics TMDL to estimate loading of DDTs from the watersheds discharging to Santa Monica Bay based on the percentage of urban area and found that the total loads were 28 g/yr. Based on the SMB Toxics TMDL, the concentrations of

DDT in the wastewater effluent are currently at or near the detection limits. From 1947 to 1971 large quantities of DDT were discharged to Santa Monica Bay from the Montrose Chemical plant, which manufactured DDT, through the Los Angeles County Joint Water Pollution Control Plant (JWPCP). The concentrations of DDT in surface sediments have decreased substantially since the early 1970s as much of the contamination has been buried below the active sediment layer or degraded as a result of natural processes (USEPA, 2012). Samples collected during the 18-month CTR test period did not find any detectable concentrations of DDTs in the one publicly owned treatment plant (POTW) in the Malibu Creek Watershed (MCW) (LVMWD, 2012).

Polychlorinated biphenyls (PCBs) are mixtures of up to 209 individual chlorinated compounds (known as congeners). PCBs were used in a wide variety of applications, including dielectric fluids in transformers and capacitors, heat transfer fluids, and lubricants. In 1976, the manufacture of PCBs was prohibited because of evidence that they build up in the environment and can cause harmful health effects. PCBs are typically associated with more urban areas. In addition, PCBs were commonly used in several household products (e.g., fluorescent light fixtures, paints, waxes, caulking). Although there is little information available to estimate the potential loads from rural areas, rural areas are unlikely to be a major source of PCBs (USEPA, 2012).

In the 1971-1972 water year, the annual wet weather loads for PCBs from the nearby Ballona Creek were around 15 kg (Young et al., 1973). In the 1987-88 water year, the wet weather loadings for PCBs during a comparable size storm year were around 7 kg. During the 1995-1996 water year, Suffet and Stenstrom (1997) measured PCB congeners and found elevated concentrations of total PCBs (calculated as the sum of 18 congeners) ranging between 15,100 ng/l to 390,000 ng/l in stormwater runoff to Ballona Creek. More recently, Curren et al. (2011) found concentrations of total PCBs that were much lower, ranging from 0.74 ng/l to 16.07 ng/l in the 2005-06 wet season. These more recent values are all higher than the CTR objective of 0.17 ng/L. Results from Curren et al. (2011) were used in the SMB Toxics TMDL to estimate loading of PCBs in the watersheds based on the percentage of urban area and found that the total loads from all watersheds to Santa Monica Bay were 145 g/yr.

Based on the approved TMDL for the Calleguas Creek Watershed Organochlorine Pesticides and PCBs, most PCB residues in the watershed are due to past use of PCBs as coolants and lubricants in transformers, capacitors, and other electrical equipment. Atmospheric deposition is also a potential source of PCBs. Urban runoff and POTWs are minor sources of PCBs (California RWQCB, 2005). Potential pollutants from construction sites include sediment, which may contain historic PCBs from construction materials and the heavy equipment used on construction sites.

Limited data are available characterizing DDT and PCBs within Santa Monica Bay, particularly since direct discharges of these pollutants from publicly owned treatment works (POTWs) have ceased. The largest concentration of DDT and PCBs within Santa Monica Bay is contained within the Palos Verdes shelf, which is being addressed by the USEPA as a Comprehensive Environmental Response, Compensation, and Liability Act 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.” The TMDL also states that the detection limits used to analyze DDT and PCB concentrations were too high to appropriately assess the water quality. Stormwater inputs are assumed to come from urban areas, as the TMDL specifically states that rural areas in the NSMBCW are not likely to be a major source of PCBs or DDT (USEPA, 2012).

As shown in **Table 7**, DDTs and PCBs were observed within discharges from MS4 outfalls during the last four years. The land use monitoring conducted within the Los Angeles region produced mostly data that were not detected for DDTs and PCBs (**Table 8** and **Table 9**).

TRASH

Source information for trash within Malibu Creek and Santa Monica Bay is provided by those waterbodies’ respective TMDLs. A detailed source breakdown is not provided, but the following general summary from the Malibu Creek Watershed Trash TMDL is generally applicable to SMB as well:

“Litter from adjacent land areas, roadways, and direct dumping and deposition are sources of trash to Malibu Creek Watershed. Point sources such as storm drains are also sources of trash discharged to Malibu Creek Watershed” (Regional Board, 2008).

Transport mechanisms include: (1) storm drains: trash is deposited throughout the watershed and is carried to the various reaches and tributaries during and after significant storms through storm drains, (2) wind action: trash can also blow into the waterways directly, and (3) direct disposal. Several studies conclude that urban runoff is the dominant source of trash. The correlation between trash and urban runoff through storm drains can be evidenced by the large amount of trash that accumulates at the base of storm drains (LARWQCB, 2007).

The requirement in the SMB Debris TMDL to prepare and implement a Plastic Pellet Monitoring and Reporting Program (PMRP) is not applicable to the NSMBCW EWMP Group. The Regional Board provided a letter on October 20, 2014 finding that the City of Malibu submitted adequate documentation demonstrating that a PMRP is not necessary and confirmed that a Plastic Pellet Spill Response Plan had been submitted as required. Additionally, it has been verified that there are no County-owned facilities in the NSMBCW EWMP area and thus a PRMP is not necessary.

NUTRIENTS

The USEPA’s 2003 TMDL for Nutrients in the Malibu Creek Watershed (Nutrients TMDL) cites a 2002 source analysis study (Tetra Tech, 2002) as the basis for the source assessment. The analysis compiled an inventory of sources of nutrients to the waterbody and used both “simple methods and computer modeling” (using Hydrological Simulation Program-Fortran) to estimate nutrient loads within the Malibu Creek Watershed (MCW). The analysis estimated both annual and summer (May 1 through October 31) loading contributions of nitrogen and phosphorus. Although the TMDL source assessment does not estimate loadings from Malibu in particular, it does estimate loadings by subwatershed, including “Lower Malibu Creek” and “Malibu Lagoon.” For simplicity, these two subwatersheds are conservatively assumed

to comprise the portion of the MCW covered by the NSMBCW EWMP Group's watershed management area (WMA).

The portion of the MCW within the NSMBCW EWMP Group's WMA is estimated to be responsible for 9.2 percent of the annual nitrogen loads and 7.4 percent of the annual phosphorus loads within the entire watershed, according to the 2003 TMDL (USEPA, 2003). The specific sources of nitrogen and phosphorus within the NSMBCW EWMP Group's WMA are estimated to be (in order of decreasing magnitude): natural sources, such as birds, tidal inflow, and sediment release⁵; septic systems; runoff from undeveloped land; runoff from developed land; runoff from agriculture/livestock areas; and runoff from local golf courses.

The USEPA's 2013 Malibu Creek & Lagoon TMDL for Sedimentation and Nutrients to Address Benthic Community Impairments (Benthic TMDL) contains a robust data analysis and source assessment for nutrients within the MCW, though it relies significantly on the source assessment findings from the 2003 Nutrients TMDL. Like the Nutrients TMDL, the Benthic TMDL found that Tapia Water Reclamation Facility (WRF) was the largest contributor of nutrients to Malibu Creek during the winter. Aside from the Tapia WRF, major contributors in the winter were found to be undeveloped runoff, OWTS inputs, urban runoff, and golf course runoff. In the summer, when Tapia WRF is under a no-discharge prohibition, main contributors were estimated to be OWTS inputs and urban runoff.

Within the MCW, undeveloped areas with Monterey/Modelo Formation geology are a significant nonpoint source of phosphate (LVMWD, 2012). The 2013 Benthic TMDL supports this claim in part, recognizing that the Monterey/Modelo Formation geology may result in elevated levels of phosphorus at un-impacted sites. However, the TMDL also points out that "substantial elevated orthophosphate levels downstream of Tapia's discharge (more than twenty-fold)" suggests that phosphorus concentrations are consistently elevated in the Creek due to discharges from the Tapia WRF (USEPA, 2013). The Benthic TMDL also states that inorganic nitrogen concentrations are associated with development, rather than geology (USEPA, 2013).

EMC data for various land uses within Los Angeles County (LACDPW, 2000) and agricultural land uses within Ventura County (Ventura County, 2003) show that the highest concentrations of nitrate are associated with runoff from (in descending order): agriculture, multi-family residential, vacant/open space, industrial, single family residential, educational, and commercial. Similarly, the highest concentrations of total phosphorus are associated with runoff from (in descending order): agriculture, transportation, single family residential and commercial, industrial, education, multi-family residential, and vacant/open space. Many of these land uses exist in the MCW above the City of Malibu. Within the City of Malibu area in the MCW, land uses with the highest nutrient EMCs based on the County's findings are (in descending order): single family residential and vacant/open-space, commercial, industrial, and multi-family residential. Runoff from these areas is expected to be the most significant source of nutrients within the NSMBCW area in the MCW. Open space, unpaved urban surfaces, and residential paved

⁵ Sutula et al (2004) found that sediment enriched in particulate nitrogen and phosphorus was deposited in Malibu Lagoon during the wet season. These particulate nutrients were remobilized as dissolved inorganic nutrients to the surface waters during the dry season. The study reported that sediment release approximately equals 18% of the total nitrogen source and 5% of the total phosphorus source from other nonpoint source inputs to the Lagoon during the dry season (Sutula et al., 2004).

surfaces are the land uses that are considered the major sources of nitrogen and phosphorus in the NSMBCW, which are detailed in **Figure 2** through **Figure 15**. As shown in **Table 7**, nutrients were observed within the discharges from MS4 outfalls during the last four years. As shown in **Table 8** and **Table 9**, MS4-related land use monitoring results observed for nitrogen and phosphorus varied widely but were mostly not significantly elevated.

SEDIMENTATION

The main sources of total suspended solids (TSS) within the MCW can be attributed to natural geology, fire impacts⁶, altered hydrology, channel alteration, urban runoff, and agricultural runoff (USEPA, 2003). Within the MCW, open space land uses are a major source of sediment loads. Similarly, open Land uses are also a major source of sediment loads in the NSMBCW (**Figure 16** through **Figure 22**). LACDPW has been collecting TSS data during wet and dry weather conditions at their mass emissions stations that coincide with the F-130 flow gage on Malibu Creek for over 20 years. TSS values measured at the mass emissions station showed high suspended solids during wet weather events (EPA, 2003). Increased impervious surface in a watershed has been shown to increase the stream flashiness (Walsh et al., 2005; Allan, 1994). Altered flood hydrology increases instream erosion, which leads to increased TSS/SSC concentrations during storm events in the MCW. The best estimate of long-term TSS loads was provided by a stratified flow-weighted averaging estimator in the study by Preston et al. (1989). Flows less than 80 CFS had an average flow weighted concentration of 125.9 mg/L and flows greater than or equal to 80 CFS had a flow weighted concentration of 301.8 mg/L (Preston et al., 1989). Additionally, sediment transport in a flashy stream like Malibu Creek is better represented by the instantaneous peak flow than the average daily flow. Thus, the relationship between flow weighted TSS concentrations and daily average flow is not strong.

Generally, median and maximum turbidity values within the main stem of Malibu Creek are greater than values measured at associated reference sites. For most months, average turbidity in the main stem is below 1 NTU. The USEPA measured TSS and turbidity values between February 16, 2011 and April 25, 2012 and found a strong relationship between turbidity and TSS and suggested that turbidity could be used as a surrogate for TSS (USEPA, 2013).

As shown in **Table 7**, total suspended solids are detected in water samples collected from the MS4 outfalls. The Los Angeles region land use data collected by SCCWRP found that low density residential and recreational land uses had the highest mean concentrations of TSS in the greater Los Angeles region as shown in **Table 8**. Similarly, the Los Angeles region land use data collected by the County of Los Angeles that examined the concentrations of pollutants in stormwater runoff from various land uses in Los Angeles County found that light industrial and vacant land were the largest contributors to TSS, which is detailed in **Table 9**.

BENTHIC COMMUNITY EFFECTS

The 2010 integrated report for the Los Angeles Region stated, “The water quality chemistry and bioassessment data provide a substantial basis that benthic macroinvertebrate populations are impacted

⁶ The Malibu Times, “A brief history of Malibu wildfires”. Vicky Shere. November 21, 2017. http://www.malibutimes.com/news/article_8797d932-b885-5d84-8dcd-aa7191952730.html

by a wide range of anthropogenic stressors” (USEPA, 2013). The key stressors impacting the benthic community (both directly and indirectly) are sedimentation and nutrient loading (USEPA, 2013). Please refer to the nitrogen and phosphorus and sedimentation sections of this source assessment for details related to the sources of these stressors.

CHLOROPHYLL-A

High levels of algae in the lagoon and streams in the MCW have the potential to lead to issues with dissolved oxygen, aquatic life, and appearance. The types of algae, the coverage of the algal mats, and the chlorophyll-a concentrations indicate that the streams are near conditions that are eutrophic. These conditions seem to be more problematic in the summer months (EPA, 2003). The conditions are consistent with the Lakes study (Lund et al., 1994) that suggest nutrients from runoff contribute to algae that lead to anoxic conditions in the summer. Chlorophyll-a concentrations collected in streams in undeveloped areas are usually below 50 mg/m² and concentrations in developed areas are frequently above 150 mg/m² (Kamer et al., 2002).

There is uncertainty around the factors that control algal abundances in the MCW (Ambrose et al., 1995; Ambrose et al., 2000; Kamer et al., 2003; CH2M HILL, 2000). Total phosphorus was found to explain 70% of the variability in benthic chlorophyll a. The combination of total phosphorus and light could explain 68% of the variability of total chlorophyll a concentration. However, nitrogen to phosphorus (N:P) ratios were inconclusive suggesting that both nitrogen or phosphorus could be limiting or neither nitrogen nor phosphorus were limiting (Kamer et al., 2002). Due to the lack of conclusive information on the limiting factors, the EPA both targeted nitrogen and phosphorus in the summer months in the MCW Nutrients TMDL (EPA, 2003).

More definitive relationships about N:P ratios have been found to determine the limiting nutrients in the Malibu Lagoon. Results averaged over the course of a year found that the upstream area near the Malibu Creek inlet tended to be more phosphorus limited while the central and downstream areas to be more nitrogen limited (Ambrose et al., 1995). Even though the N:P ratios suggest that the lagoon is nitrogen limited, there is only a slight positive relationship between nutrients and algal biomass in the lagoon (CH2M HILL, 2000).

Because chlorophyll-a is a response indicator and not a pollutant in and of itself, assessing data collected from MS4 outfalls as part of the CIMP or as part of the land use monitoring collected within the Los Angeles region does not provide relevant information for determining the potential sources of elevated chlorophyll-a observed in the receiving water.

DISSOLVED OXYGEN

Low dissolved oxygen levels arise when there is insufficient aeration of oxygen into water. Slow-moving, stagnant, and pooled water provides little opportunity for aeration, which can result in low concentrations of dissolved oxygen. Additionally, plants remove oxygen from the water column through respiration, which they use for cell production. The chemical removal of oxygen can occur as ammonia is oxidized to nitrite, and eventually nitrate, thereby removing available oxygen from the water column. The saturation of oxygen in water is lastly a function of temperature and salinity; water with lower temperature and salinity retains more dissolved oxygen, relative to higher temperature and salinity (CCRWQCB, 2006).

A characterization study conducted in Washington found that increased water temperatures likely influence lower dissolved oxygen levels in the water column (SWDE, 2013). Benthic algae cover is also an indicator of low dissolved oxygen. Benthic algae is a natural plant in most stream systems and is a vital component of the stream food web. Under normal conditions, algal density is kept at levels that do not adversely affect dissolved oxygen. Factors limiting algal growth include (but not limited to): 1) nutrients, 2) light, 3) substrate, 4) flowing water, and 5) temperature. The Central Coast Regional Board staff determined that benthic algae cover responds proportionally to light, and to a lesser degree, nutrient availability (CCRWQCB, 2006). The direct impact of urban runoff on dissolved oxygen concentrations in receiving waters is not thought to be substantial; however, the secondary effects on dissolved oxygen balance in receiving waters due to nutrient enrichment, eutrophication, and resulting sediment oxygen demand may be important. Therefore, there may still be an indirect linkage between nutrients discharged from the MS4 and low dissolved oxygen.

Because dissolved oxygen is a response indicator and not a pollutant in and of itself, assessing data collected from MS4 outfalls as part of the CIMP or as part of the land use monitoring collected within the Los Angeles region does not provide relevant information for determining the potential sources of low dissolved oxygen observed in the receiving water.

Common Sources of Non-TMDL Water-Body Pollutant Combinations

The following subsections present common sources of pollutants that are not currently addressed by TMDLs relevant to the NSMBCW EWMP Area, but historically or currently, have been identified as impairing the NSMBCW EWMP Area waterbodies and/or exceeding relevant receiving water quality objectives.

LEAD

The most historically significant source of lead in the NSMBCW is likely linked to leaded gasoline, which was available from the 1920s until 1991 when it was banned in California. The use of leaded gasoline started to decline due to the implementation of catalytic converters in 1975. The sale of lead-based paints was banned in 1977, before most of the development of the watershed occurred (LVMWD, 2012). The data used to establish the lead 303(d) listing for Topanga Canyon Creek are not available on the SWRCB's 303(d) website, as the listing decision was made prior to 2006. The website does state that the source of lead is a nonpoint source within the subwatershed, but no details are provided. There were no exceedances observed in 19 data points collected between 2016 and 2020, indicating that lead is not a problem in the watershed and is expected to meet the 303(d) delisting criteria. A recent study in the adjacent MCW found that "lead no longer appears to present a significant threat to human health or aquatic life in the watershed" (LVMWD, 2012).

Wet weather event mean concentrations (EMCs) for lead, based on the Los Angeles County EMC dataset, show that the highest concentrations are expected from agricultural land uses, followed in order by industrial, commercial, high density single family residential, transportation, multi-family residential,

educational, and open space land uses (Geosyntec Consultants, 2012). Other Los Angeles region land use studies have found that high density single family residential has the highest EMCs, followed by industrial and commercial land uses (Stein et al., 2007). The land use monitoring conducted within the Los Angeles region produced data that showed lead was below applicable water quality objectives (**Table 8** and **Table 9**).

COPPER

The contribution from brake pad wear can be a significant source of copper in the NSMBCW EWMP Area. Debris from brake pad use is deposited on roadways, which can then be transported to local waterways through dry or wet weather runoff (LARWQCB, 2011b). In South San Francisco Bay, a multi-stakeholder effort called the Brake Pad Partnership conducted a study to understand the environmental effects of brake pad wear debris on the water quality in San Francisco Bay. The study found that copper from brake pads accounted for up to half of the anthropogenic copper discharged to San Francisco Bay from highly urbanized areas (Brake Pad Partnership Update, 2007). Additionally, atmospheric deposition of copper in the Los Angeles area has been shown to be a source of copper found in stormwater runoff (Sabin et al., 2005). As shown in **Table 7**, copper was observed within the discharges from MS4 outfalls during the last four years. As detailed in **Table 8** and **Table 9**, copper concentrations vary greatly between differing land use types.

ARSENIC

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Inorganic arsenic occurs naturally in soil and in many kinds of rock, especially in minerals and ores that contain copper or lead. 90% of all arsenic produced is used as a preservative for wood (CCA) to prevent rotting and decay. However, CCA treated wood was phased out by December 31, 2003 for residential uses but is still currently used in industrial applications. Historically, inorganic arsenic compounds were used as pesticides for cotton fields and in orchards. The use of these pesticides is no longer allowed to be used in agriculture. Arsenic can enter the waterways through wind-blown dust, runoff, leaching, and atmospheric deposition (Chou & Harper, 2007). Fertilizers derived from the Monterey/Modelo Formation and other marine phosphatic rock have been shown to have elevated levels of arsenic (USEPA 1999). As detailed in **Table 8** and **Table 9**, arsenic concentrations vary greatly between differing land use types.

MERCURY

Mercury occurs naturally in the environment and exists in three forms: metallic mercury, inorganic mercury, and organic mercury. The organic form of mercury (methylmercury) is toxic and bioavailable. Sources of methylmercury identified in other parts of California include tributary inputs from upstream watersheds, wetland and in-channel sediments, municipal and industrial wastewater, agricultural drainage, and urban runoff (CVRWQCB, 2010). Additionally, mercury is also recognized to be a potential laboratory contaminant. Mercury is found in thermometers, manometers, vacuum pumps, switches, discharge tubes, dental amalgams, and as a component in chemical reactions. Because of its frequent use, it is not unusual for mercury to be spilled, or otherwise contaminate laboratory, storage, or office areas. Contamination of laboratory spaces from historic mercury spills is also common (University of Florida, 2012). Within the nearby MCW, 264 water samples that were collected from 1978–2010 were all undetectable values (LVMWD, 2012). The land use monitoring conducted within the Los Angeles region produced mostly data that were not detected (**Table 8** and **Table 9**).

TOTAL PAHS

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 200 different chemicals. They are naturally found in coal and crude oil and in emissions from the combustion of fossil fuels, forest fires, and volcanoes. Most PAHs are formed during the incomplete burning of coal, oil, wood, gasoline, garbage, tobacco, and other organic material or other industrial processes. Important sources of PAHs in surface waters include deposition of airborne PAHs, municipal wastewater discharge, urban storm water runoff (particularly from roads), runoff from coal storage areas, effluents from wood treatment plants and other industries, oil spills, and petroleum pressing (Mumtaz et al., 1996). Direct and indirect atmospheric deposition of PAHs could be a significant nonpoint source of PAHs in the watershed given forest fires⁷ which have regularly occurred in the Santa Monica Mountains. As mentioned in the Harbor Toxics TMDL, industrial and construction stormwater dischargers are potential point sources of PAHs (LARWQCB, 2011a). The land use monitoring conducted within the Los Angeles region produced mostly data that were not detected (**Table 8** and **Table 9**).

TOTAL CHLORDANE

Chlordane is considered a legacy pollutant that was historically used as a pesticide on agricultural crops, lawns, and gardens, and as a fumigating agent. The USEPA cancelled all uses for chlordane in 1988 because of concerns of human health effects and persistence in the environment (Abadin et al., 1994). Chlordane is not an expected substance in point source discharges. If chlordane were to occur in municipal discharges, it would be through intermittent, illicit, and generally untraceable sources (MDE, 1999). The land use monitoring conducted within the Los Angeles region produced mostly data that were not detected (**Table 8** and **Table 9**).

BIS(2-ETHYLHEXYL)PHTHALATE

Bis(2-ethylhexyl)phthalate is a plasticizer used in the manufacturing of polyvinyl chloride (PVC). It is a common contaminant of sample containers, sampling apparatus, and analytical equipment. As such, detections can possibly be attributable to lab contamination. For example, it has been identified as a common laboratory contaminant during groundwater monitoring data analysis (WI DNR, 2002). The land use monitoring conducted within the Los Angeles region produced data that were not detected (**Table 9**).

CYANIDE

The main sources of cyanide are mainly anthropogenic but can also include some non-point sources. Point sources of cyanide can be attributed to stormwater runoff from industrial facilities, e.g., metal plating and finishing operations may contain cyanide (LACDPW, 2005). Non-point sources of cyanide may include pesticide use, which can be transported to storm drains through dry or wet weather flow. The largest likely source of cyanide in the watershed is atmospheric deposition from motor vehicle emissions (LACDPW, 2005). The amount of cyanide that could be released to the environment from natural sources is comparatively low. Natural sources may include incomplete combustion from forest fires⁸,

⁷ The Malibu Times, "A brief history of Malibu wildfires". Vicky Shere. November 21, 2017. http://www.malibutimes.com/news/article_8797d932-b885-5d84-8dcd-aa7191952730.html

⁸ The Malibu Times, "A brief history of Malibu wildfires". Vicky Shere. November 21, 2017. http://www.malibutimes.com/news/article_8797d932-b885-5d84-8dcd-aa7191952730.html

decomposition of plant material, and fungi (LACDPW, 2005). Additionally, cyanide can be a contaminant in water quality samples. The land use monitoring conducted within the Los Angeles region produced mostly data that were not detected (**Table 9**).

SELENIUM AND SULFATES

The SWRCB's 303(d) website states that sources are unknown with respect to both selenium and sulfate exceedances within Malibu Creek. However, a comprehensive study conducted in 2011 reports that the northern tributaries of Malibu Creek are "clearly the major source" of both sulfates and selenium within the watershed (LVMWD, 2012). The northern tributaries drain the Monterey/Modelo Formation, which is made up of Miocene marine sedimentary rock and is known to contain high levels of sulfur and selenium. Elevated selenium levels have been observed in upper reaches of Cheseboro Creek and Las Virgenes Creek of the adjacent MCW. The median selenium concentration recorded in Las Virgenes Creek of the MCW was 28 mg/L. Additionally, the streams in the Monterey/Modelo formation had specific conductivity values between 2500-4000 $\mu\text{S}/\text{cm}$, which was substantially higher than the coastal streams that had differing geology (LVMWD, 2012). With respect to sulfates, the report states that "no known human sources (aside from coal and shale mining, neither of which occur in the watershed) are capable of yielding sulfate levels equivalent to those recorded" (LVMWD, 2012). Anthropogenic sources of selenium and sulfates within the NSMBCW EWMP jurisdiction are not known at this time. As shown in **Table 7**, sulfate was observed within the discharges from MS4 outfalls during the last four years, while selenium was not detected from MS4 outfalls. The land use monitoring conducted within the Los Angeles region produced mostly data that were not detected for selenium and that commercial and vacant land were the largest contributors to sulfate (**Table 8** and **Table 9**).

INVASIVE SPECIES

The invasive species listings within the MCW were based on the findings of the 2006, 2007 and 2008 New Zealand mudsnail (NZMS) surveys conducted by the Santa Bay Restoration Commission at 56 sites on 19 individual streams throughout the Santa Monica Mountains. Activities such as resource monitoring can be, and in the case of the NZMS in the MCW, probably is, a pathway for the unintentional spread of both aquatic and terrestrial invasive species (Santa Monica Bay Restoration Commission/Santa Monica Baykeeper, 2009). As such, urban runoff is not believed to be a source of the introduction or spread of invasive species in the MCW. Furthermore, invasive species are pollution and not a pollutant.

FISH BARRIERS

The 303(d) listing decision for the fish barriers listing in Malibu Creek was made prior to 2006 and was not held in an assessment database. The decision Fact Sheet for the listing states that, "the original listing was flawed because fish barriers is not a pollutant but rather could fall under the definition of pollution. Because the original basis for the decision cannot be determined and no new information has become available this is being removed from the CWA section 303(d) List and placed into Category 4c until more data and information can be collected and assessed."⁹ State Water Resources Control Board staff concurred with this determination, and it is unclear why this listing was not moved from Category 5 to

⁹ https://www.waterboards.ca.gov/water_issues/programs/tmdl/2014_16state_ir_reports/01053.shtml#34814

Category 4c of the 303(d) list. Given that fish barriers are pollution and not a pollutant, a source assessment for this listing is neither necessary nor appropriate.

TOXICITY

The current 303(d) list indicates that Malibu Creek is impaired for toxicity. The NSMBCW EWMP Group conducts toxicity monitoring within Malibu Creek twice annually during wet weather and annually during dry weather. As per the MS4 Permit, when the survival or sublethal endpoint of a toxicity test demonstrates a Percent Effect value equal to or greater than 50% at the Instream Waste Concentration, Toxicity Identification Evaluation (TIE) procedures must be initiated on the sample. The TIE procedures provide evidence to help identify the cause(s) of toxicity. As such, this information would be the most relevant to consider when determining the potential sources of toxicity. However, the NSMBCW EWMP Group has not observed a Percent Effect value equal to or greater than 50% at the Instream Waste Concentration within Malibu Creek since CIMP monitoring commenced. As such, the source(s) of the low-level toxicity that has been observed cannot be determined and may be an artifact of the test conditions and/or testing procedures.

PH

The SWRCB's 303(d) website states that sources are unknown with respect to pH exceedances within Malibu Lagoon. Additional information regarding specific sources of pH in the lagoon are not known to be available at this time.

Table 7. Summary of Outfall Water Quality Concentrations for Wet and Dry Weather in the North Santa Monica Bay Coastal Watershed (2016-2020)

Constituents	Units	N		# of Detects		% of Detects		Mean of Detects		Median of Detects		Upper 95th Percentile		Lower 95th Percentile	
		Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
4,4'-DDD	ug/L	8	0	3	0	38%	NA	0.00006	NA	0.00006	NA	0.00010	NA	0.00002	NA
4,4'-DDE	ug/L	8	0	5	0	63%	NA	0.00072	NA	0.00013	NA	0.00247	NA	0.00007	NA
4,4'-DDT	ug/L	8	0	4	0	50%	NA	0.00039	NA	0.00005	NA	0.00125	NA	0.00002	NA
Total DDTs	ug/L	11	0	7	0	64%	NA	0.00151	NA	0.00031	NA	0.00482	NA	0.00008	NA
Copper, Dissolved	ug/L	8	0	8	0	100%	NA	10.58	NA	9.83	NA	20.19	NA	4.30	NA
<i>E. coli</i>	MPN/100 mL	11	1	11	1	100%	100%	105915	NA	1600	NA	577000	NA	91	NA
Nitrate + Nitrite as N	mg/L	0	1	0	1	NA	100%	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate as N	mg/L	0	1	0	1	NA	100%	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite as N	mg/L	0	1	0	0	NA	0%	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus as P	mg/L	0	1	0	1	NA	100%	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/L	0	1	0	0	NA	0%	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/L	0	1	0	1	NA	100%	NA	NA	NA	NA	NA	NA	NA	NA
Total Suspended Solids	mg/L	11	1	11	1	100%	100%	223.3	NA	13.0	NA	1159.0	NA	3.7	NA
Total Chlordane	ug/L	4	0	4	0	100%	NA	0.000763	NA	0.000353	NA	0.001971	NA	0.000128	NA
PCB AROCLOR 1016	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	2	0	0	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	ug/L	10	0	8	0	80%	NA	0.000694	NA	0.000203	NA	0.002592	NA	0.000036	NA

Notes

NA = No data available or the number of samples above the detection limit was insufficient to develop summary statistics.

Table 8. Summary of Stormwater Runoff by Land Use Categories Sampled by the Southern California Coastal Water Research Project (SCCWRP) as Part of Technical Report 510 titled “Sources, patterns and mechanisms of stormwater pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA.”

Constituent	Units	High Density Residential							Low Density Residential						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthylene	ug/L	42	11	26%	0.02	0.02	0.04	0.01	27	4	15%	0.01	0.01	0.03	0.01
Ammonia as N	mg/L	62	57	92%	0.56	0.49	1.34	0.09	37	29	78%	0.33	0.34	0.57	0.07
Anthracene	ug/L	42	22	52%	0.06	0.03	0.20	0.01	27	10	37%	0.02	0.02	0.05	0.00
Arsenic	ug/L	66	62	94%	1.79	1.40	3.27	0.93	37	30	81%	2.75	2.25	3.82	1.55
Benz(a)anthracene	ug/L	42	30	71%	0.15	0.06	0.57	0.01	27	15	56%	0.03	0.01	0.12	0.00
Benzo(a)pyrene	ug/L	42	30	71%	0.16	0.08	0.56	0.01	27	13	48%	0.05	0.02	0.19	0.01
Benzo(b)fluoranthene	ug/L	42	32	76%	0.23	0.13	0.72	0.01	27	18	67%	0.04	0.02	0.14	0.01
Benzo(g,h,i)perylene	ug/L	42	22	52%	0.27	0.22	0.70	0.03	27	15	56%	0.07	0.02	0.28	0.01
Benzo(k)fluoranthene	ug/L	42	30	71%	0.14	0.08	0.53	0.02	27	17	63%	0.04	0.01	0.15	0.00
Chrysene	ug/L	42	39	93%	0.21	0.06	0.78	0.01	27	21	78%	0.06	0.03	0.15	0.01
Chlordane, alpha-	ug/L	33	2	6%	0.05	0.05	NA	NA	16	0	0%	NA	NA	NA	NA
Chlordane, gamma-	ug/L	33	2	6%	0.04	0.04	NA	NA	16	0	0%	NA	NA	NA	NA
Copper	ug/L	66	66	100%	24.43	15.85	60.07	5.35	37	37	100%	32.34	20.00	77.26	8.82
DDD(o,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDD(p,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDE(o,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDE(p,p')	ug/L	33	4	12%	0.15	0.16	0.18	0.10	16	1	6%	0.07	0.07	NA	NA
DDT(o,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDT(p,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	1	6%	0.00	0.00	NA	NA
Dibenz(a,h)anthracene	ug/L	42	16	38%	0.06	0.06	0.13	0.01	27	5	19%	0.04	0.01	0.09	0.01
<i>E. coli</i>	MPN /100mL	24	24	100%	5615	3210	23744	699	NA	NA	NA	NA	NA	NA	NA
Enterococcus	MPN/100mL	72	72	100%	24,086	8,527	43,019	1,107	42	42	100%	11,963	6,394	33,415	3,597
Fecal Coliforms	MPN /100mL	47	47	100%	12651	3654	33017	158	42	42	100%	16968	2120	29434	559
Fluorene	ug/L	42	11	26%	0.03	0.03	0.08	0.01	27	8	30%	0.02	0.02	0.03	0.01
Indeno(1,2,3-c,d)pyrene	ug/L	42	24	57%	0.15	0.10	0.50	0.01	27	8	30%	0.10	0.04	0.40	0.01
Lead	ug/L	66	66	100%	17.16	6.85	64.63	1.60	37	37	100%	7.38	3.40	15.44	1.46
Mercury	ug/L	21	1	5%	1.01	1.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite as N	mg/L	29	29	100%	0.52	0.45	1.12	0.07	22	22	100%	0.25	0.24	0.33	0.19
Nitrate as N	mg/L	38	35	92%	0.32	0.27	0.68	0.07	17	16	94%	0.13	0.11	0.24	0.07
Nitrite as N	mg/L	26	7	27%	0.36	0.06	1.38	0.04	7	2	29%	0.04	0.04	NA	NA

Constituent	Units	High Density Residential							Low Density Residential						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Nitrogen, Total Kjeldahl	mg/L	62	62	100%	2.36	1.70	6.00	0.70	37	37	100%	1.86	1.00	4.56	0.30
Nonachlor, trans-	ug/L	33	4	12%	0.05	0.05	0.06	0.03	16	0	0%	NA	NA	NA	NA
Oxychlordane	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 018	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 028	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 031	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 033	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 037	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 044	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 049	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 052	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 066	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 070	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 074	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 077	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 081	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 087	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 095	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 097	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 099	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 101	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 105	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 110	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 114	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 118	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 119	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 123	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 126	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 128	ug/L	7	0	0%	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB 128/167	ug/L	26	0	0%	NA	NA	NA	NA	4	0	0%	NA	NA	NA	NA
PCB 132/168	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 138	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 141	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA

Constituent	Units	High Density Residential							Low Density Residential						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 149	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 151	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 153	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 156	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 157	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 158	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 167	ug/L	7	0	0%	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB 169	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 170	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 177	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 180	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 183	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 187	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 189	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 194	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 200	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 201	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 206	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	ug/L	42	40	95%	0.27	0.08	0.57	0.02	27	27	100%	0.07	0.04	0.17	0.02
Phosphate as P	mg/L	40	32	80%	0.19	0.13	0.43	0.06	22	21	95%	0.09	0.09	0.11	0.06
Phosphorus as P	mg/l	35	17	49%	0.78	0.55	2.22	0.30	17	10	59%	0.71	0.64	0.99	0.57
Pyrene	ug/L	42	41	98%	0.33	0.08	0.98	0.02	27	27	100%	0.09	0.04	0.27	0.01
Selenium	ug/L	21	4	19%	0.55	0.54	0.62	0.50	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	MPN /100mL	72	72	100%	329379	79305	1299700	10860	42	42	100%	115960	50660	594240	15815
Total Suspended Solids	mg/L	62	60	97%	46.6	18.0	162	4.0	38	38	100%	95.2	36.0	221	7.51

Constituent	Units	Commercial							Industrial						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthylene	ug/L	38	2	5%	0.03	0.03	NA	NA	39	14	36%	0.04	0.03	0.09	0.01
Ammonia as N	mg/L	47	44	94%	1.07	0.58	4.72	0.25	55	55	100%	0.76	0.45	2.15	0.23
Anthracene	ug/L	39	14	36%	0.03	0.02	0.07	0.01	39	20	51%	0.03	0.02	0.11	0.00
Arsenic	ug/L	47	34	72%	2.14	1.80	5.18	1.00	55	50	91%	2.91	2.05	4.80	1.05
Benz(a)anthracene	ug/L	39	23	59%	0.06	0.01	0.25	0.00	39	28	72%	0.05	0.01	0.26	0.01
Benzo(a)pyrene	ug/L	38	14	37%	0.14	0.10	0.46	0.01	39	16	41%	0.06	0.03	0.21	0.01
Benzo(b)fluoranthene	ug/L	38	19	50%	0.11	0.06	0.40	0.01	39	18	46%	0.07	0.02	0.26	0.01
Benzo(g,h,i)perylene	ug/L	38	21	55%	0.19	0.08	0.78	0.02	39	21	54%	0.11	0.05	0.29	0.02
Benzo(k)fluoranthene	ug/L	38	16	42%	0.14	0.11	0.43	0.01	39	18	46%	0.04	0.02	0.21	0.01
Chrysene	ug/L	39	28	72%	0.14	0.05	0.51	0.01	39	33	85%	0.13	0.07	0.57	0.02
Chlordane, alpha-	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Chlordane, gamma-	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Copper	ug/L	47	47	100%	41.7	18.0	165	7.5	55	55	100%	72.4	40.5	243	7.90
DDD(o,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDD(p,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDE(o,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDE(p,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDT(o,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDT(p,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Dibenz(a,h)anthracene	ug/L	38	5	13%	0.07	0.04	0.15	0.02	39	4	10%	0.11	0.11	0.18	0.03
<i>E. coli</i>	MPN /100mL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Enterococcus	MPN /100mL	51	51	100%	115880	8600	479150	59.80	66	65	98%	26074	5200	74420	736
Fecal Coliforms	MPN /100mL	51	44	86%	17704	5299	94920	12.35	66	65	98%	4214	1733	15500	322
Fluorene	ug/L	38	7	18%	0.09	0.06	0.18	0.03	39	9	23%	0.04	0.03	0.12	0.01
Indeno(1,2,3-c,d)pyrene	ug/L	38	12	32%	0.16	0.11	0.54	0.02	39	3	8%	0.13	0.16	0.17	0.08
Lead	ug/L	47	47	100%	23.32	4.20	158.90	0.90	55	55	100%	24.48	19.00	62.43	6.91
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite as N	mg/L	33	32	97%	0.35	0.24	0.80	0.05	50	49	98%	0.32	0.29	0.84	0.04
Nitrate as N	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite as N	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	46	46	100%	2.88	1.71	7.92	0.53	55	55	100%	4.32	1.95	13.49	0.51
Nonachlor, trans-	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Oxychlordane	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Constituent	Units	Commercial							Industrial						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 018	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 028	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.07	0.07	NA	NA
PCB 031	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.09	0.09	NA	NA
PCB 033	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.06	0.06	NA	NA
PCB 037	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.03	0.03	NA	NA
PCB 044	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.09	0.09	NA	NA
PCB 049	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 052	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 066	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.05	0.05	NA	NA
PCB 070	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.07	0.07	NA	NA
PCB 074	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.03	0.03	NA	NA
PCB 077	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 081	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 087	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.03	0.03	NA	NA
PCB 095	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.04	0.04	NA	NA
PCB 097	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.07	0.07	NA	NA
PCB 099	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.02	0.02	NA	NA
PCB 101	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.06	0.06	NA	NA
PCB 105	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 110	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 114	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 118	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.07	0.07	NA	NA
PCB 119	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 123	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 126	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 128	ug/L	6	0	0%	NA	NA	NA	NA	9	0	0%	NA	NA	NA	NA
PCB 128/167	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB 132/168	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.01	0.01	NA	NA
PCB 138	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 141	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 149	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.05	0.05	NA	NA
PCB 151	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 153	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.03	0.03	NA	NA

Constituent	Units	Commercial							Industrial						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 156	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 157	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 158	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 167	ug/L	6	0	0%	NA	NA	NA	NA	9	0	0%	NA	NA	NA	NA
PCB 169	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 170	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 177	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 180	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 183	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 187	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 189	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 194	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 200	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 201	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 206	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
Phenanthrene	ug/L	41	32	78%	0.14	0.04	0.57	0.01	39	29	74%	0.21	0.10	0.75	0.02
Phosphate as P	mg/L	20	20	100%	0.08	0.08	0.14	0.05	27	27	100%	0.12	0.09	0.21	0.06
Phosphorus as P	mg/l	27	27	100%	0.99	0.50	2.77	0.22	28	28	100%	3.36	0.77	11.57	0.24
Pyrene	ug/L	42	37	88%	0.18	0.04	0.68	0.01	39	35	90%	0.20	0.10	0.68	0.02
Selenium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	MPN /100mL	51	51	100%	528034	88932	2419200	3558	66	65	98%	185664	88200	876540	4021
Total Suspended Solids	mg/L	47	46	98%	56.9	26.5	276	9.0	57	57	100%	89.6	43.0	249	12.8

Constituent	Units	Recreation							Transportation						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthylene	ug/L	11	2	18%	0.01	0.01	NA	NA	20	0	0%	NA	NA	NA	NA
Ammonia as N	mg/L	20	20	100%	1.07	1.06	1.47	0.71	20	20	100%	0.69	0.49	1.02	0.32
Anthracene	ug/L	11	8	73%	0.01	0.01	0.03	0.01	19	7	37%	0.02	0.01	0.05	0.00
Arsenic	ug/L	20	20	100%	4.44	4.65	5.61	2.86	20	3	15%	3.03	1.20	6.33	1.02
Benz(a)anthracene	ug/L	11	2	18%	0.09	0.09	NA	NA	20	12	60%	0.02	0.02	0.04	0.01
Benzo(a)pyrene	ug/L	11	11	100%	0.03	0.02	0.10	0.01	20	11	55%	0.03	0.02	0.07	0.01
Benzo(b)fluoranthene	ug/L	11	11	100%	0.06	0.04	0.19	0.02	20	11	55%	0.04	0.02	0.09	0.01
Benzo(g,h,i)perylene	ug/L	11	6	55%	0.03	0.02	0.05	0.01	20	12	60%	0.05	0.04	0.10	0.02
Benzo(k)fluoranthene	ug/L	11	11	100%	0.02	0.01	0.06	0.01	20	10	50%	0.03	0.02	0.05	0.01
Chrysene	ug/L	11	11	100%	0.07	0.04	0.18	0.03	20	16	80%	0.05	0.04	0.15	0.01
Chlordane, alpha-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane, gamma-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	20	20	100%	32.85	32.00	43.75	22.00	20	20	100%	20.03	10.50	37.00	5.96
DDD(o,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDD(p,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE(o,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE(p,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT(o,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT(p,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	ug/L	11	1	9%	0.02	0.02	NA	NA	20	0	0%	NA	NA	NA	NA
<i>E. coli</i>	MPN /100mL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Enterococcus	MPN /100mL	24	24	100%	110115	54850	511055	15361	23	22	96%	9022	6107	23976	2051
Fecal Coliforms	MPN /100mL	24	24	100%	387629	448150	920250	813.30	23	23	100%	3091	1000	14525	21.00
Fluorene	ug/L	11	5	45%	0.01	0.01	0.01	0.01	20	5	25%	0.03	0.03	0.04	0.02
Indeno(1,2,3-c,d)pyrene	ug/L	11	7	64%	0.03	0.02	0.08	0.01	20	4	20%	0.02	0.02	0.04	0.01
Lead	ug/L	20	20	100%	13.29	11.65	21.95	7.81	20	20	100%	4.56	3.25	8.23	1.59
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite as N	mg/L	20	20	100%	1.05	1.00	2.09	0.06	21	18	86%	0.25	0.12	0.64	0.02
Nitrate as N	mg/L	23	23	100%	0.99	0.98	1.74	0.02	NA	NA	NA	NA	NA	NA	NA
Nitrite as N	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	20	20	100%	7.11	7.30	9.98	2.37	20	20	100%	2.27	1.20	3.48	0.58
Nonachlor, trans-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxychlordane	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Constituent	Units	Recreation							Transportation						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 018	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 028	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 031	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 033	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 037	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 044	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 049	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 052	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 066	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 070	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 074	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 077	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 081	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 087	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 095	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 097	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 099	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 101	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 105	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 110	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 114	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 118	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 119	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 123	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 126	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 128	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 128/167	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 132/168	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 138	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 141	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 149	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 151	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 153	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Constituent	Units	Recreation							Transportation						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 156	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 157	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 158	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 167	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 169	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 170	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 177	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 180	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 183	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 187	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 189	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 194	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 200	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 201	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 206	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	ug/L	11	11	100%	0.05	0.03	0.10	0.02	20	19	95%	0.07	0.05	0.18	0.02
Phosphate as P	mg/L	44	44	100%	2.45	0.66	6.84	0.02	10	10	100%	0.03	0.03	0.05	0.02
Phosphorus as P	mg/l	NA	NA	NA	NA	NA	NA	NA	10	10	100%	0.71	0.53	1.78	0.31
Pyrene	ug/L	11	11	100%	0.09	0.06	0.22	0.05	20	20	100%	0.07	0.07	0.20	0.02
Selenium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	MPN/100mL	24	24	100%	1206826	701550	1705900	11188	23	23	100%	157852	25000	685060	4377
Total Suspended Solids	mg/L	17	17	100%	361	300	1079	131	20	17	85%	25.3	18.0	69.6	8.4

Constituent	Units	Open Space						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthylene	ug/L	NA	NA	NA	NA	NA	NA	NA
Ammonia as N	mg/L	41	18	44%	0.18	0.15	0.33	0.09
Anthracene	ug/L	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	60	60	100%	2.37	2.20	4.35	1.30
Benz(a)anthracene	ug/L	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	ug/L	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	ug/L	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	ug/L	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	ug/L	NA	NA	NA	NA	NA	NA	NA
Chrysene	ug/L	NA	NA	NA	NA	NA	NA	NA
Chlordane, alpha-	ug/L	22	0	0%	NA	NA	NA	NA
Chlordane, gamma-	ug/L	22	0	0%	NA	NA	NA	NA
Copper	ug/L	52	44	85%	7.31	5.95	14	2.31
DDD(o,p')	ug/L	22	0	0%	NA	NA	NA	NA
DDD(p,p')	ug/L	22	0	0%	NA	NA	NA	NA
DDE(o,p')	ug/L	22	0	0%	NA	NA	NA	NA
DDE(p,p')	ug/L	22	0	0%	NA	NA	NA	NA
DDT(o,p')	ug/L	22	0	0%	NA	NA	NA	NA
DDT(p,p')	ug/L	22	0	0%	NA	NA	NA	NA
Dibenz(a,h)anthracene	ug/L	NA	NA	NA	NA	NA	NA	NA
<i>E. Coli</i>	MPN/100mL	NA	NA	NA	NA	NA	NA	NA
Enterococcus	MPN/100mL	88	88	100%	22293	2090	123935	88
Fecal Coliforms	MPN/100mL	88	88	100%	3861	905	16069	12
Fluorene	ug/L	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	ug/L	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	42	24	57%	2.27	2.35	3.34	1.16
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite as N	mg/L	64	64	100%	0.22	0.15	0.49	0.10
Nitrate as N	mg/L	NA	NA	NA	NA	NA	NA	NA
Nitrite as N	mg/L	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	64	64	100%	0.83	0.58	2.34	0.16
Nonachlor, trans-	ug/L	22	0	0%	NA	NA	NA	NA
Oxychlordane	ug/L	NA	NA	NA	NA	NA	NA	NA

Constituent	Units	Open Space						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 018	ug/L	22	0	0%	NA	NA	NA	NA
PCB 028	ug/L	22	0	0%	NA	NA	NA	NA
PCB 031	ug/L	22	0	0%	NA	NA	NA	NA
PCB 033	ug/L	22	0	0%	NA	NA	NA	NA
PCB 037	ug/L	22	0	0%	NA	NA	NA	NA
PCB 044	ug/L	22	0	0%	NA	NA	NA	NA
PCB 049	ug/L	22	0	0%	NA	NA	NA	NA
PCB 052	ug/L	22	0	0%	NA	NA	NA	NA
PCB 066	ug/L	22	0	0%	NA	NA	NA	NA
PCB 070	ug/L	22	0	0%	NA	NA	NA	NA
PCB 074	ug/L	22	0	0%	NA	NA	NA	NA
PCB 077	ug/L	22	0	0%	NA	NA	NA	NA
PCB 081	ug/L	22	0	0%	NA	NA	NA	NA
PCB 087	ug/L	22	0	0%	NA	NA	NA	NA
PCB 095	ug/L	22	0	0%	NA	NA	NA	NA
PCB 097	ug/L	22	0	0%	NA	NA	NA	NA
PCB 099	ug/L	22	0	0%	NA	NA	NA	NA
PCB 101	ug/L	22	0	0%	NA	NA	NA	NA
PCB 105	ug/L	22	0	0%	NA	NA	NA	NA
PCB 110	ug/L	22	0	0%	NA	NA	NA	NA
PCB 114	ug/L	22	0	0%	NA	NA	NA	NA
PCB 118	ug/L	22	0	0%	NA	NA	NA	NA
PCB 119	ug/L	22	0	0%	NA	NA	NA	NA
PCB 123	ug/L	22	0	0%	NA	NA	NA	NA
PCB 126	ug/L	22	0	0%	NA	NA	NA	NA
PCB 128	ug/L	NA	NA	NA	NA	NA	NA	NA
PCB 128/167	ug/L	22	0	0%	NA	NA	NA	NA
PCB 132/168	ug/L	22	0	0%	NA	NA	NA	NA
PCB 138	ug/L	22	0	0%	NA	NA	NA	NA
PCB 141	ug/L	22	0	0%	NA	NA	NA	NA
PCB 149	ug/L	22	0	0%	NA	NA	NA	NA
PCB 151	ug/L	22	0	0%	NA	NA	NA	NA
PCB 153	ug/L	22	0	0%	NA	NA	NA	NA

Constituent	Units	Open Space						
		No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
PCB 156	ug/L	22	0	0%	NA	NA	NA	NA
PCB 157	ug/L	22	0	0%	NA	NA	NA	NA
PCB 158	ug/L	22	0	0%	NA	NA	NA	NA
PCB 167	ug/L	NA	NA	NA	NA	NA	NA	NA
PCB 169	ug/L	22	0	0%	NA	NA	NA	NA
PCB 170	ug/L	22	0	0%	NA	NA	NA	NA
PCB 177	ug/L	22	0	0%	NA	NA	NA	NA
PCB 180	ug/L	22	0	0%	NA	NA	NA	NA
PCB 183	ug/L	22	0	0%	NA	NA	NA	NA
PCB 187	ug/L	22	0	0%	NA	NA	NA	NA
PCB 189	ug/L	22	0	0%	NA	NA	NA	NA
PCB 194	ug/L	22	0	0%	NA	NA	NA	NA
PCB 200	ug/L	22	0	0%	NA	NA	NA	NA
PCB 201	ug/L	22	0	0%	NA	NA	NA	NA
PCB 206	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	22	0	0%	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	22	0	0%	NA	NA	NA	NA
Phenanthrene	ug/L	NA	NA	NA	NA	NA	NA	NA
Phosphate as P	mg/L	20	20	100%	0.02	0.02	0.02	0.01
Phosphorus as P	mg/L	44	44	100%	0.31	0.28	0.49	0.23
Pyrene	ug/L	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/L	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	MPN/100mL	88	88	100%	34272	3758	72885	50
Total Suspended Solids	mg/L	61	58	95%	99	30	302	5.00

Notes

NA = Not enough data above detection limit collected to develop summary statistics.

Table 9. Summary of Stormwater Runoff by Land Use Categories Sampled by Los Angeles County Department of Public Works and Presented in the 2000 report titled “Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report”

Constituents	DL ^(a)	Units	Commercial						Vacant					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Total Coliform	20	MPN/100ml	8	0	100	1,140,000	1,250,000	0.71	21	1	95	9,187	2,200	1.25
Fecal Coliform	20	MPN/100ml	8	0	100	528,750	90,000	1.35	21	2	90	1,397	500	2.6
Ratio Fecal Coliform/ Total Coliform			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	0	100	52%	64%	0.79
Fecal Enterococcus	20	MPN/100ml	8	0	100	86,250	40,000	1.18	21	1	95	679	500	0.98
Ammonia	0.1	mg/l	33	7	79	1.26	0.3	2.11	41	27	34	0.13	0.05	2.48
Nitrate	0.1	mg/l	33	1	97	2.6	2	0.63	43	0	100	5.2	4.6	0.56
Sulfate	0.1	mg/l	33	0	100	35	11	1.18	43	0	100	17	15	0.4
Total Suspended Solids	2	mg/l	29	0	100	66	53	0.65	39	1	97	186	18	3.27
Cyanide	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	15	15	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Phosphorus	0.05	mg/l	33	1	97	0.3	0.19	0.86	37	21	43	0.11	0.03	3.38
Total Phosphorus	0.05	mg/l	32	1	97	0.39	0.28	0.77	39	16	59	0.16	0.05	2.63
NH3-N	0.1	mg/l	33	8	76	1.04	0.25	2.11	41	30	27	0.11	0.05	2.41
Nitrate-N	0.1	mg/l	31	7	77	0.48	0.43	0.82	40	1	98	1.05	0.94	0.53
Nitrite-N	0.1	mg/l	34	7	79	0.16	0.07	1.74	43	30	30	0.05	0.05	0.2
TKN	0.1	mg/l	32	0	100	3.4	2.2	0.94	40	0	100	0.79	0.68	0.6
pH	0-14		33	0	100	7	6.8	0.07	42	0	100	8.1	8.1	0.03
Dissolved Arsenic	5	ug/L	24	23	4	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	5	ug/L	24	22	8	S.I.D.	S.I.D.	S.I.D.	34	32	6	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	5	ug/L	24	3	88	14	11	0.84	34	31	9	S.I.D.	S.I.D.	S.I.D.
Total Copper	5	ug/L	24	0	100	39	22	1.57	34	15	56	15	5.5	3.14
Dissolved Lead	5	ug/L	24	20	17	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Lead	5	ug/L	24	15	38	18	2.5	2.8	34	31	9	S.I.D.	S.I.D.	S.I.D.
Total Mercury	1	ug/L	37	35	5	S.I.D.	S.I.D.	S.I.D.	43	42	2	S.I.D.	S.I.D.	S.I.D.
Total Selenium	5	ug/L	40	35	13	S.I.D.	S.I.D.	S.I.D.	45	44	2	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	0.05-1.0	ug/L	19	19	0	S.I.D.	S.I.D.	S.I.D.	38	38	0	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	Commercial						Vacant					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Acenaphthylene	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Anthracene	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)pyrene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Chrysene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Dibenz(a,h)anthracene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Fluorene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Pyrene	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Bis(2-ethylhexyl)phthalate	1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	Transportation						Light Industrial					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Total Coliform	20	MPN/100ml	4	0	100	692,500	600,000	0.82	5	0	100	454,000	160,000	1.42
Fecal Coliform	20	MPN/100ml	4	0	100	328,750	205,000	1.22	5	0	100	338,220	30,000	2.09
Ratio Fecal Coliform/ Total Coliform			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Enterococcus	20	MPN/100ml	4	0	100	32,000	32,000	0.65	5	0	100	98,200	130,000	0.73
Ammonia	0.1	mg/l	62	16	74	0.29	0.16	1.52	47	7	85	0.59	0.32	1.35
Nitrate	0.1	mg/l	64	2	97	2.9	1.8	1.27	47	0	100	4.1	2.4	1.09
Sulfate	0.1	mg/l	64	0	100	9.5	6.4	1.07	47	0	100	12.6	9.2	1.02
Total Suspended Solids	2	mg/l	61	0	100	78	50	1.3	41	0	100	240	129	1.36
Cyanide	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Dissolved Phosphorus	0.05	mg/l	59	3	95	0.34	0.28	0.79	46	4	91	0.27	0.2	1.01
Total Phosphorus	0.05	mg/l	59	1	98	0.44	0.32	0.84	45	2	96	0.41	0.3	0.92
NH3-N	0.1	mg/l	62	19	69	0.24	0.14	1.51	48	9	81	0.48	0.26	1.36
Nitrate-N	0.1	mg/l	61	15	75	0.7	0.4	1.68	43	2	95	0.87	0.52	1.32
Nitrite-N	0.1	mg/l	64	10	84	0.09	0.06	0.72	47	9	81	0.09	0.06	0.73
TKN	0.1	mg/l	61	0	100	1.9	1.3	0.93	45	0	100	3	2.3	0.72
pH	0-14		63	0	100	6.7	6.6	0.05	47	0	100	6.8	6.8	0.06
Dissolved Arsenic	5	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	5	ug/L	54	52	4	S.I.D.	S.I.D.	S.I.D.	37	34	8	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	5	ug/L	54	0	100	33	27	0.63	37	5	86	20	14	1.07
Total Copper	5	ug/L	54	0	100	56	39	1.15	37	0	100	32	21	1.03
Dissolved Lead	5	ug/L	54	48	11	S.I.D.	S.I.D.	S.I.D.	37	32	14	S.I.D.	S.I.D.	S.I.D.
Total Lead	5	ug/L	54	29	46	10	2.5	1.57	37	18	51	17	5.1	1.88
Total Mercury	1	ug/L	63	62	2	S.I.D.	S.I.D.	S.I.D.	48	45	6	S.I.D.	S.I.D.	S.I.D.
Total Selenium	5	ug/L	65	61	6	S.I.D.	S.I.D.	S.I.D.	51	48	6	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	0.05-1.0	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	20	20	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Anthracene	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	Transportation						Light Industrial					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Benzo(a)pyrene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Chrysene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Dibenz(a,h)anthracene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Fluorene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Pyrene	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Bis(2-ethylhexyl)phthalate	1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	Multifamily Residential						Mixed Residential					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Total Coliform	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Fecal Coliform	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Ratio Fecal Coliform/ Total Coliform			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Enterococcus	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Ammonia	0.1	mg/l	38	9	76	0.47	0.29	1.44	42	4	90	0.67	0.39	1.13
Nitrate	0.1	mg/l	37	1	97	5.3	3.6	0.87	38	3	92	6.8	2.3	3.74
Sulfate	0.1	mg/l	37	0	100	15	4.1	1.52	38	0	100	7.4	5	0.94
Total Suspended Solids	2	mg/l	36	1	97	46	24	1.41	38	0	100	63	40	1.19
Cyanide	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Dissolved Phosphorus	0.05	mg/l	30	1	97	0.16	0.1	1.04	39	2	95	0.2	0.14	0.87
Total Phosphorus	0.05	mg/l	30	1	97	0.19	0.14	1	39	1	97	0.26	0.18	0.99
NH3-N	0.1	mg/l	38	9	76	0.39	0.24	1.43	42	5	88	0.56	0.33	1.13
Nitrate-N	0.1	mg/l	37	12	68	1.1	0.8	1.01	38	13	66	0.55	0.44	0.91
Nitrite-N	0.1	mg/l	37	10	73	0.1	0.05	1.65	38	7	82	0.12	0.06	1.47
TKN	0.1	mg/l	41	0	100	2	1.5	1.11	43	1	98	2.5	1.7	0.95
pH	0-14		39	0	100	6.9	6.6	0.1	40	0	100	6.5	6.4	0.05
Dissolved Arsenic	5	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	5	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	5	ug/L	45	20	56	6.9	5	0.91	45	17	62	12	8	1.42
Total Copper	5	ug/L	45	4	91	12	12	0.54	45	1	98	19	13	1.29
Dissolved Lead	5	ug/L	45	41	9	S.I.D.	S.I.D.	S.I.D.	45	40	11	S.I.D.	S.I.D.	S.I.D.
Total Lead	5	ug/L	45	31	31	5.8	2.5	1.48	45	23	49	11	2.5	2.6
Total Mercury	1	ug/L	40	40	0	S.I.D.	S.I.D.	S.I.D.	44	44	0	S.I.D.	S.I.D.	S.I.D.
Total Selenium	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	44	2	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	0.05-1.0	ug/L	36	36	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	0.05	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Anthracene	0.05	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	Multifamily Residential						Mixed Residential					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Benzo(a)pyrene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	4	43	0.38	0.05	1.7
Benzo(b)fluoranthene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Chrysene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	2	71	0.62	0.3	1.32
Dibenz(a,h)anthracene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Fluorene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	0.05	ug/L	6	4	33	0.21	0.025	2.08	7	2	71	0.5	0.24	1.43
Pyrene	0.05	ug/L	6	4	33	0.2	0.025	1.95	7	2	71	0.35	0.3	1.03
Bis(2-ethylhexyl)phthalate	1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	High Density Single Family Residential						Educational					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Total Coliform	20	MPN/100ml	3	0	100	1,366,667	1,600,000	0.3	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Coliform	20	MPN/100ml	3	0	100	933,333	900,000	0.7	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Ratio Fecal Coliform/ Total Coliform			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Enterococcus	20	MPN/100ml	3	0	100	610,000	140,000	1.41	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Ammonia	0.1	mg/l	34	6	82	0.41	0.3	1.05	40	12	70	0.33	0.18	1.62
Nitrate	0.1	mg/l	33	1	97	3.9	2.1	1.38	40	2	95	2.6	2.2	0.73
Sulfate	0.1	mg/l	33	0	100	6.9	3.8	1.05	40	0	100	17.3	9.3	1.23
Total Suspended Solids	2	mg/l	30	0	100	95	61	1.16	39	0	100	95	61	1.05
Cyanide	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Dissolved Phosphorus	0.05	mg/l	32	0	100	0.29	0.25	0.57	37	1	97	0.27	0.2	0.86
Total Phosphorus	0.05	mg/l	32	0	100	0.39	0.32	0.77	37	0	100	0.31	0.23	0.65
NH3-N	0.1	mg/l	34	7	79	0.34	0.25	1.04	40	12	70	0.28	0.15	1.58
Nitrate-N	0.1	mg/l	32	11	66	0.86	0.46	1.51	39	12	69	0.51	0.48	0.86
Nitrite-N	0.1	mg/l	33	12	64	0.1	0.05	1.01	39	13	67	0.09	0.05	1.41
TKN	0.1	mg/l	35	0	100	2.9	2	1.04	39	0	100	1.6	1.3	0.73
pH	0-14		35	0	100	6.5	6.5	0.06	40	0	100	7	6.9	0.07
Dissolved Arsenic	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	39	7	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	5	mg/l	32	29	9	S.I.D.	S.I.D.	S.I.D.	42	39	7	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	5	mg/l	32	15	53	8.5	6.7	0.95	42	8	81	13	9.9	0.94
Total Copper	5	mg/l	32	2	94	15	11	0.57	42	0	100	24	15	1.49
Dissolved Lead	5	mg/l	32	28	13	S.I.D.	S.I.D.	S.I.D.	42	40	5	S.I.D.	S.I.D.	S.I.D.
Total Lead	5	mg/l	32	14	56	10	5.4	1.03	42	30	29	4.9	2.5	1.09
Total Mercury	1	mg/l	35	34	3	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Total Selenium	5	mg/l	38	38	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	0.05-1.0	mg/l	31	31	0	S.I.D.	S.I.D.	S.I.D.	22	22	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	0.05	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Anthracene	0.05	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.

Constituents	DL ^(a)	Units	High Density Single Family Residential						Educational					
			No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Benzo(a)pyrene	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.24	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.29	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.18	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Chrysene	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.18	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Dibenz(a,h)anthracene	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fluorene	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	0.05	mg/l	5	3	40	0.13	0.025	1.66	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Pyrene	0.05	mg/l	5	1	80	0.83	0.37	1.44	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Bis(2-ethylhexyl)phthalate	1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.

Notes

CV = Coefficient of variation DL = Detection Limit S.I.D. = Statistically Invalid Data, not enough data above detection limit collected
(a) Detection limits have changed throughout the monitoring process. Only data matching the current detection limit is displayed in this table.

Land Use Specific Modeling Results

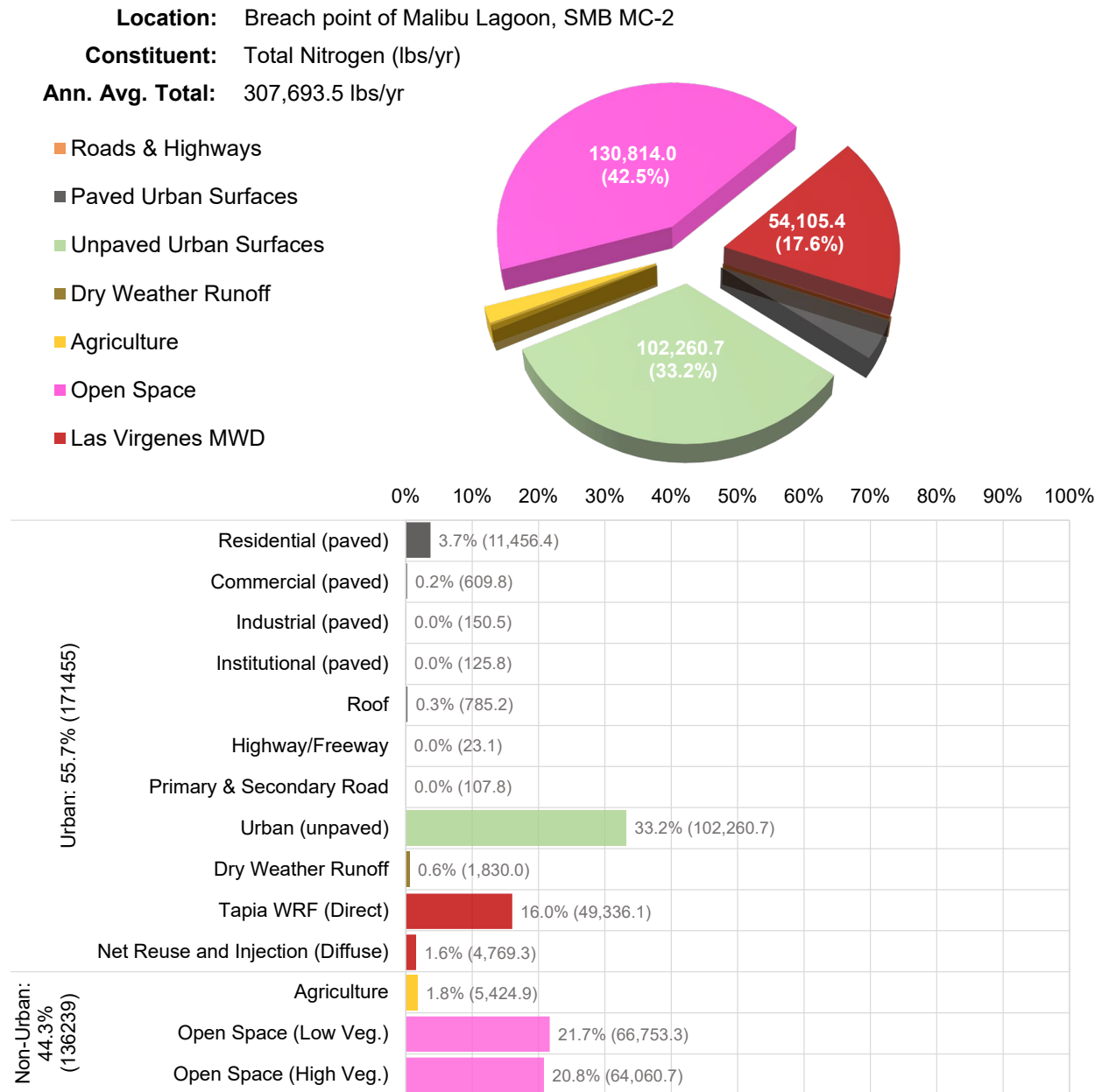


Figure 2. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Breach point of Malibu Lagoon, SMB MC-2 (SWSID = 3001).

Location: Topanga Canyon at Topanga State Beach, SMB 1-18

Constituent: Total Nitrogen (lbs/yr)

Ann. Avg. Total: 7,730.3 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

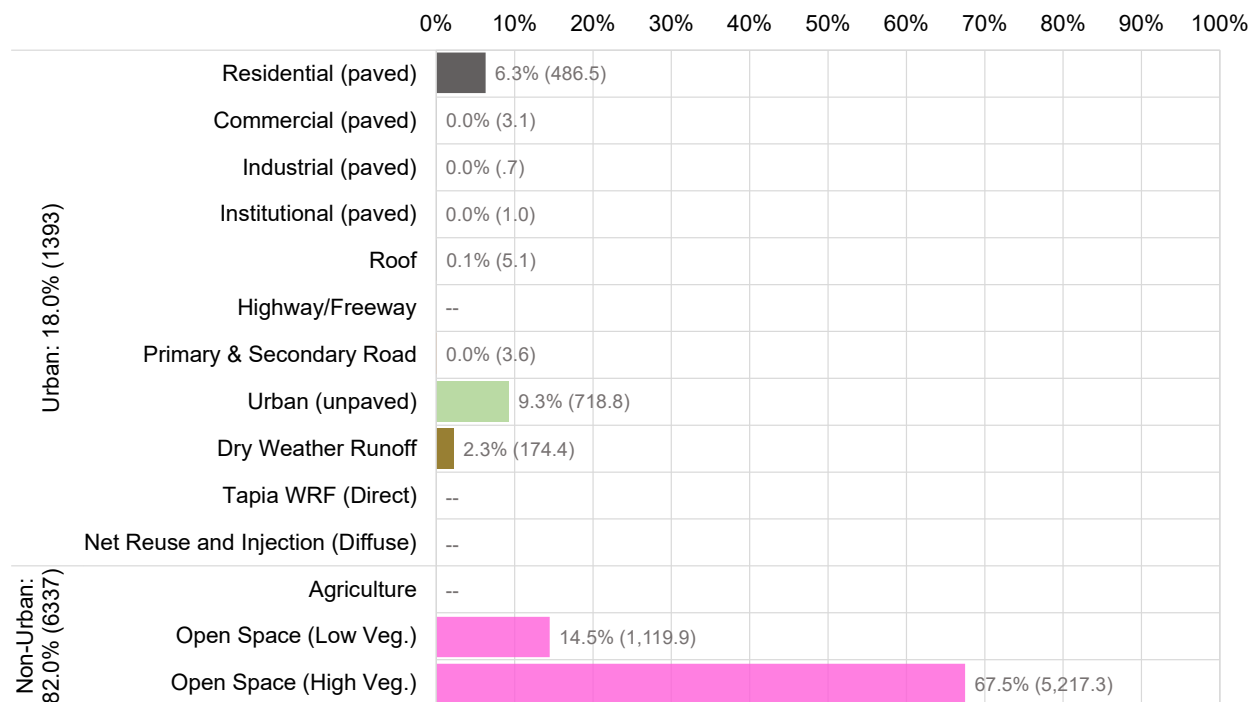
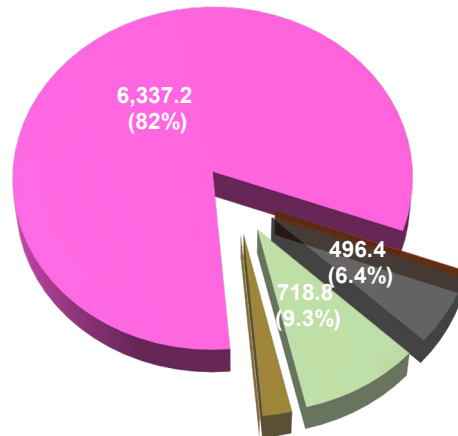


Figure 3. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Topanga Canyon at Topanga State Beach, SMB 1-18 (SWSID = 3057).

Location: Trancas Creek at Broad Beach, SMB 1-4

Constituent: Total Nitrogen (lbs/yr)

Ann. Avg. Total: 3,124.4 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

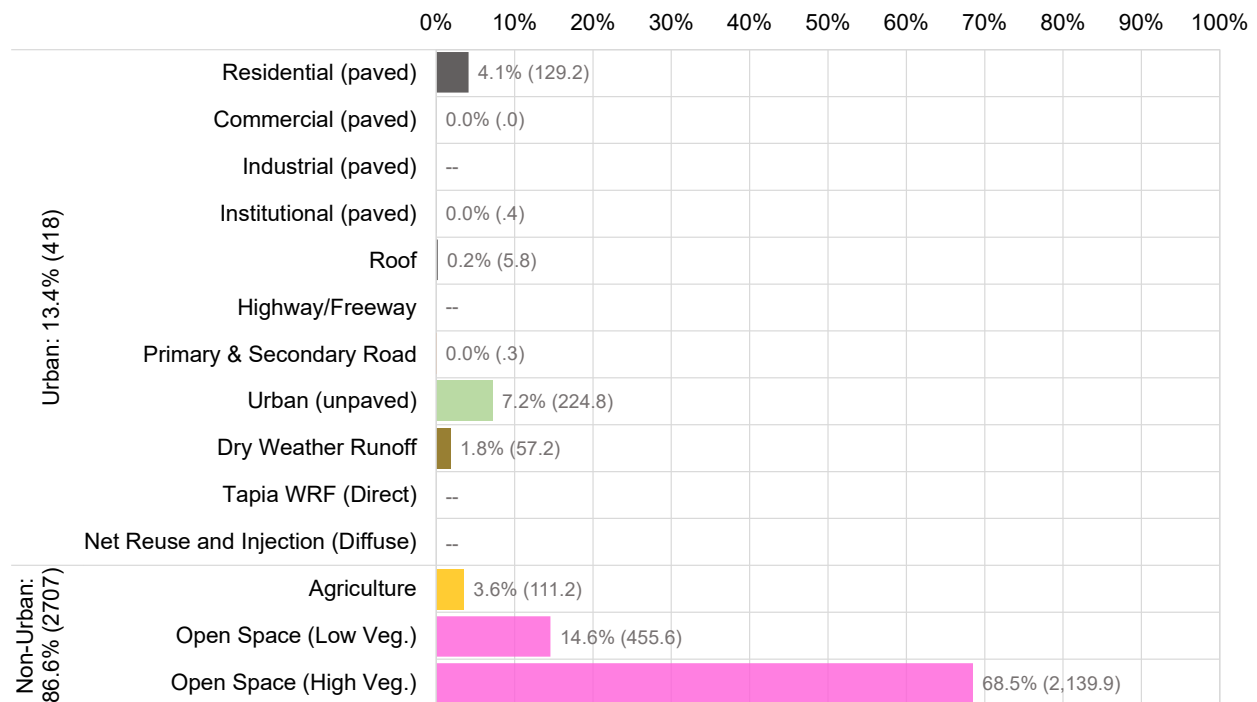
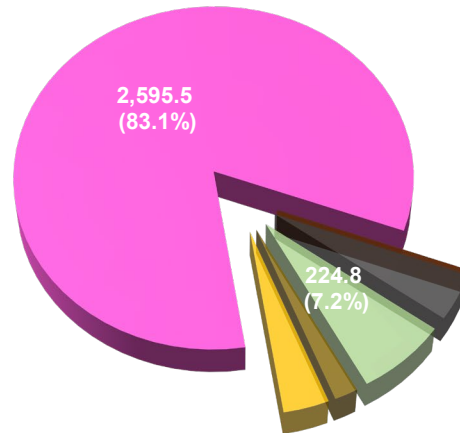


Figure 4. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Trancas Creek at Broad Beach, SMB 1-4 (SWSID = 3074).

Location: Marie Canyon storm drain at Puerco Beach, SMB 1-12
Constituent: Total Nitrogen (lbs/yr)
Ann. Avg. Total: 473.8 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

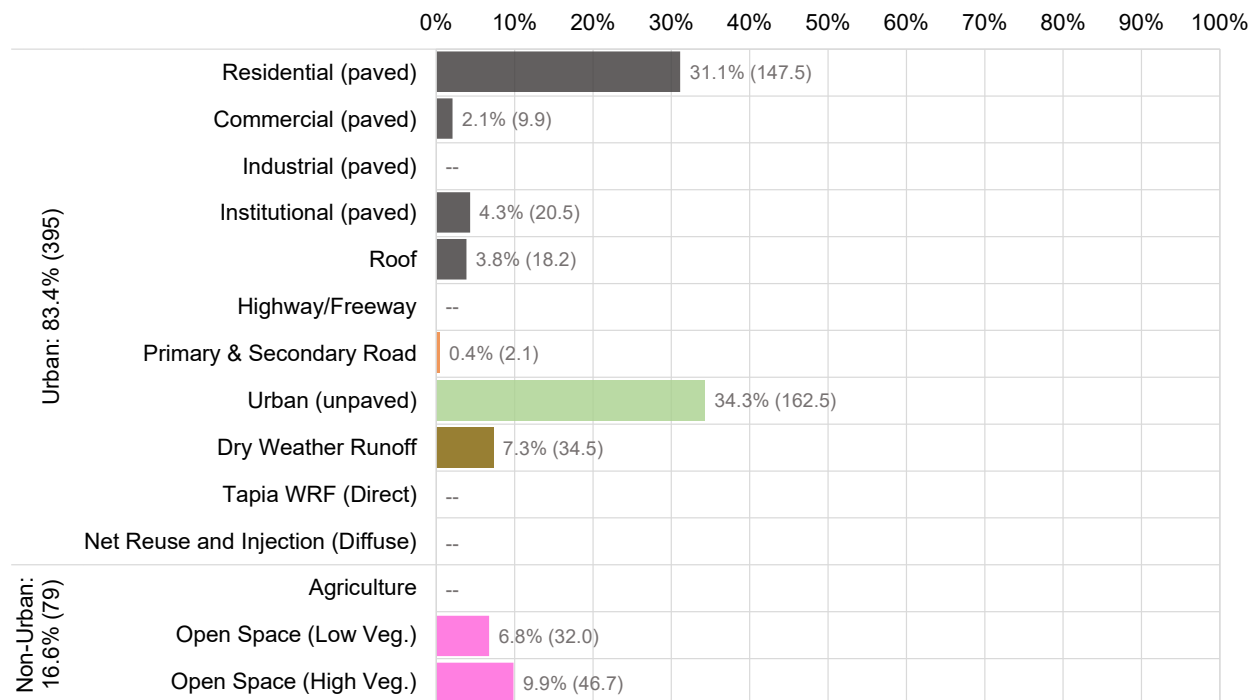
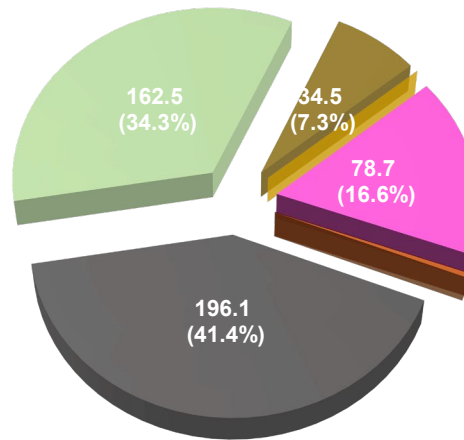


Figure 5. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Marie Canyon storm drain at Puerco Beach, SMB 1-12 (SWSID = 3080).

Location: Ramirez Canyon at Paradise Cove Pier, SMB 1-7

Constituent: Total Nitrogen (lbs/yr)

Ann. Avg. Total: 751.1 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

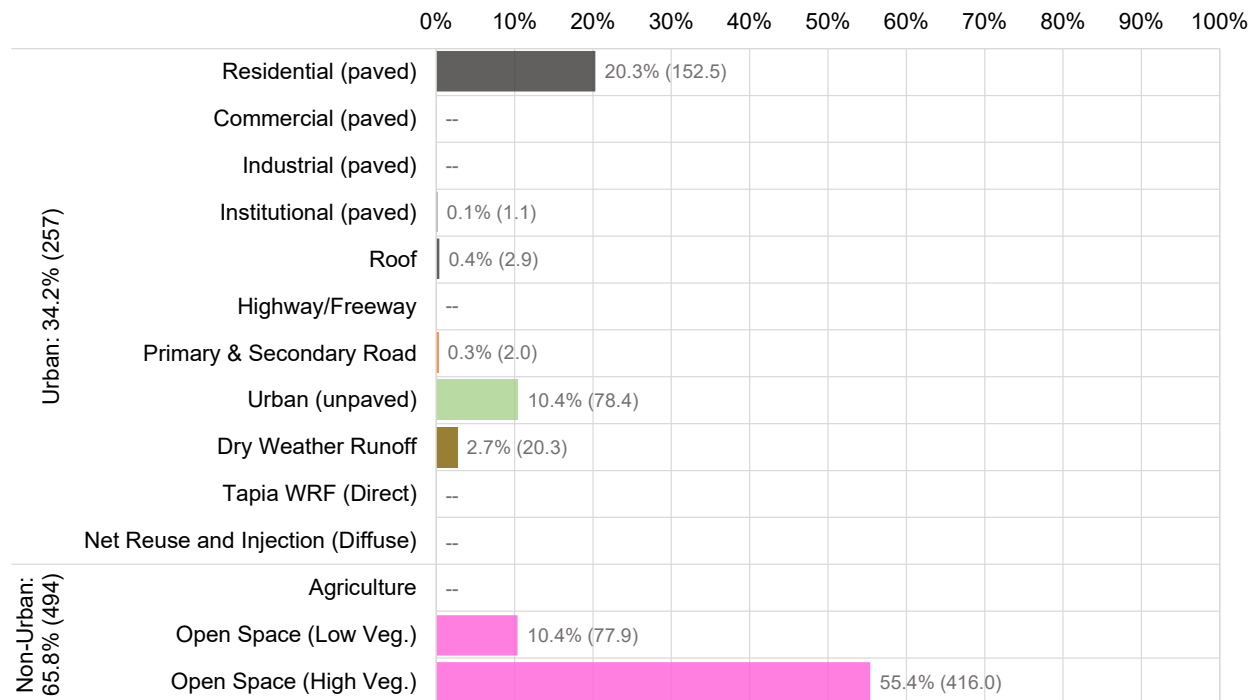
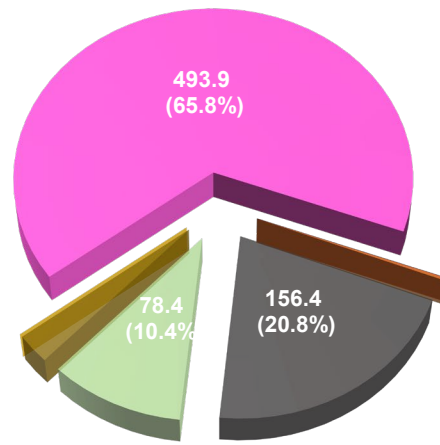


Figure 6. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Ramirez Canyon at Paradise Cove Pier, SMB 1-7 (SWSID = 3085).

Location: Unnamed Waterbody, SMB O-1
Constituent: Total Nitrogen (lbs/yr)
Ann. Avg. Total: 2,976.6 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

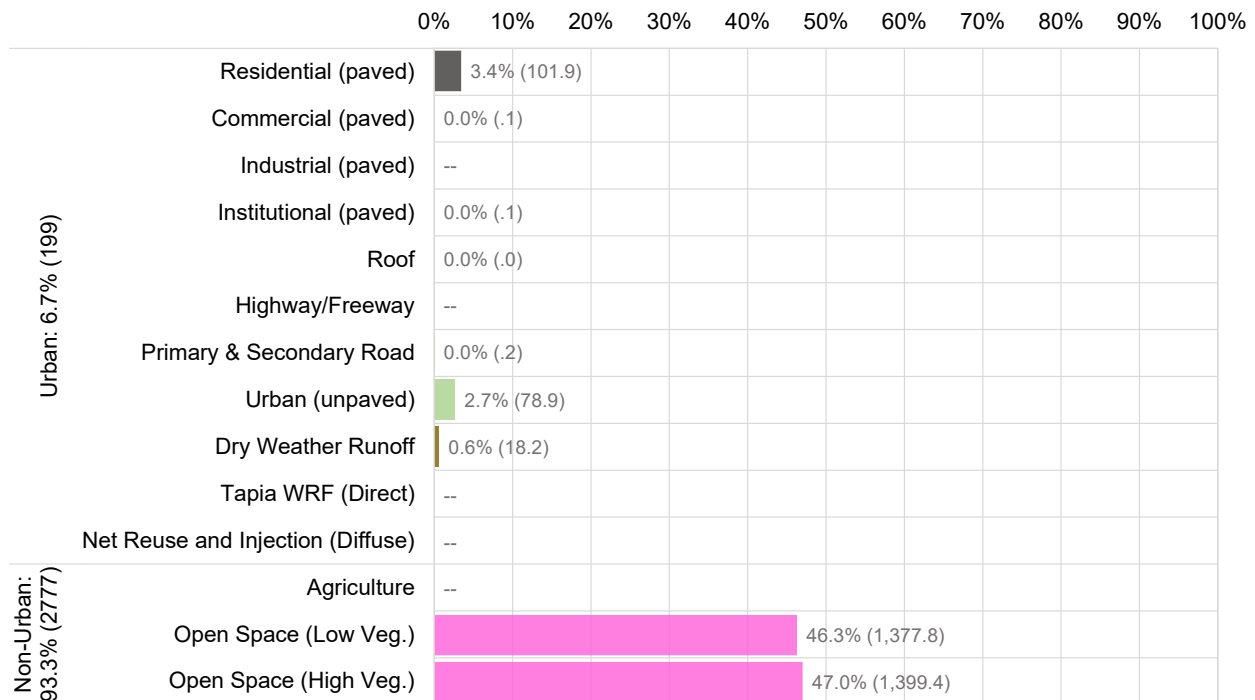
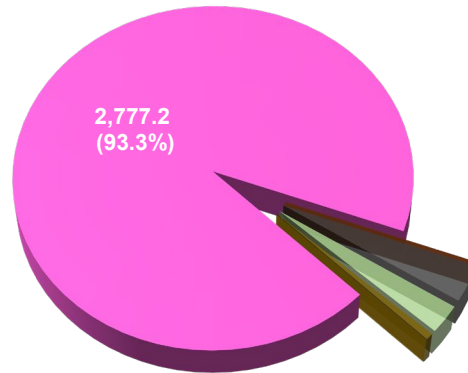


Figure 7. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Unnamed Waterbody, SMB O-1 (SWSID = 3103).

Location: Unnamed Waterbody, SMB O-2
Constituent: Total Nitrogen (lbs/yr)
Ann. Avg. Total: 186.8 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

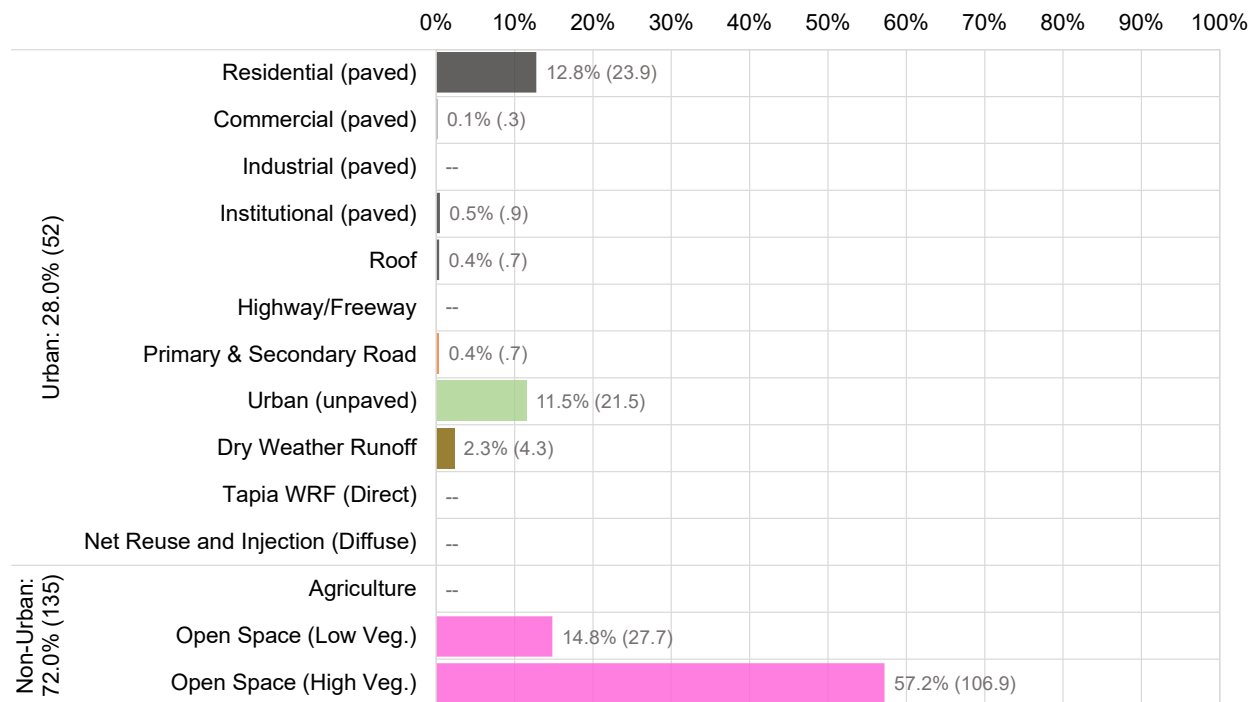
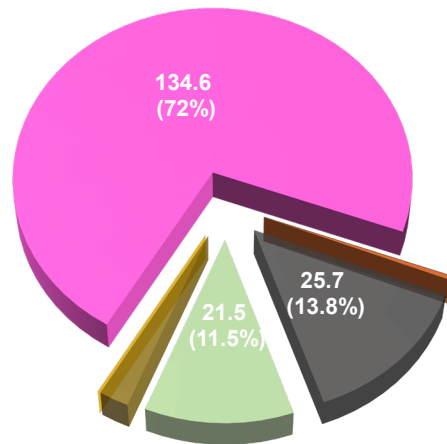


Figure 8. Annual Average Total Nitrogen (lbs/yr) source assessment analysis for Unnamed Waterbody, SMB O-2 (SWSID = 3112).

Location: Breach point of Malibu Lagoon, SMB MC-2
Constituent: Total Phosphorus (lbs/yr)
Ann. Avg. Total: 31,424.2 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

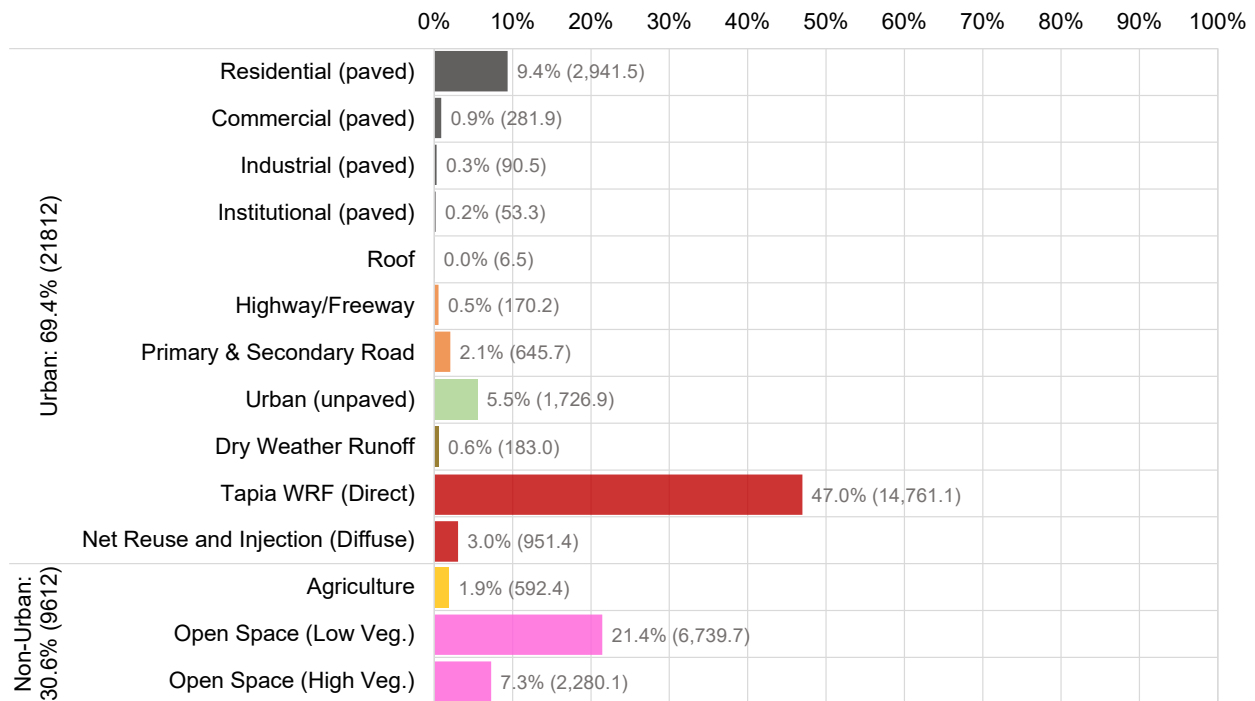
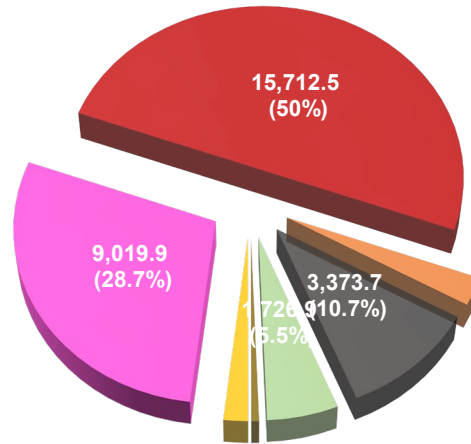


Figure 9. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Breach point of Malibu Lagoon, SMB MC-2 (SWSID = 3001).

Location: Topanga Canyon at Topanga State Beach, SMB 1-18
Constituent: Total Phosphorus (lbs/yr)
Ann. Avg. Total: 2,362.2 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

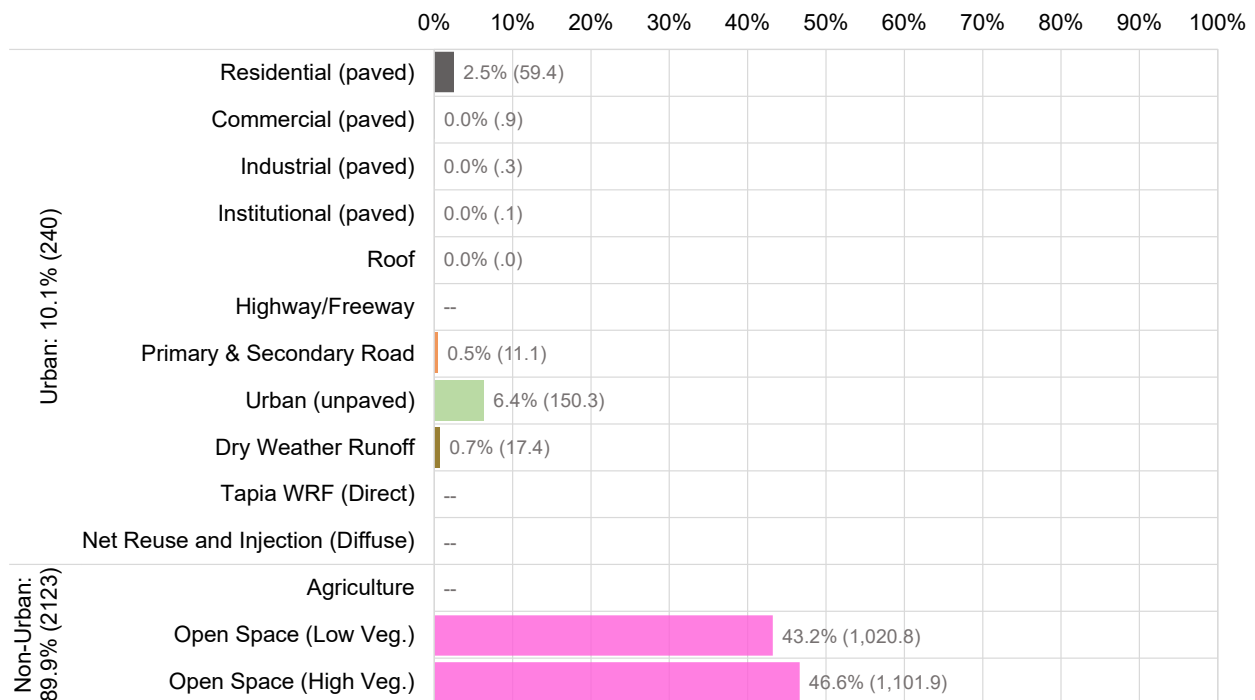
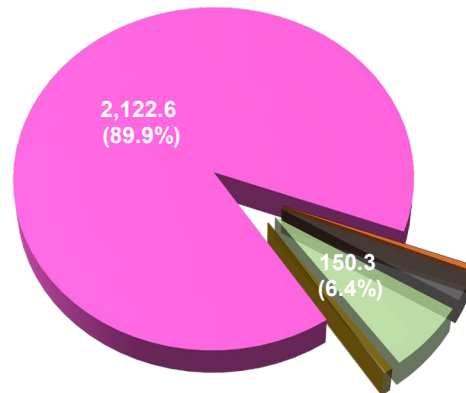


Figure 10. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Topanga Canyon at Topanga State Beach, SMB 1-18 (SWSID = 3057).

Location: Trancas Creek at Broad Beach, SMB 1-4
Constituent: Total Phosphorus (lbs/yr)
Ann. Avg. Total: 945.5 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

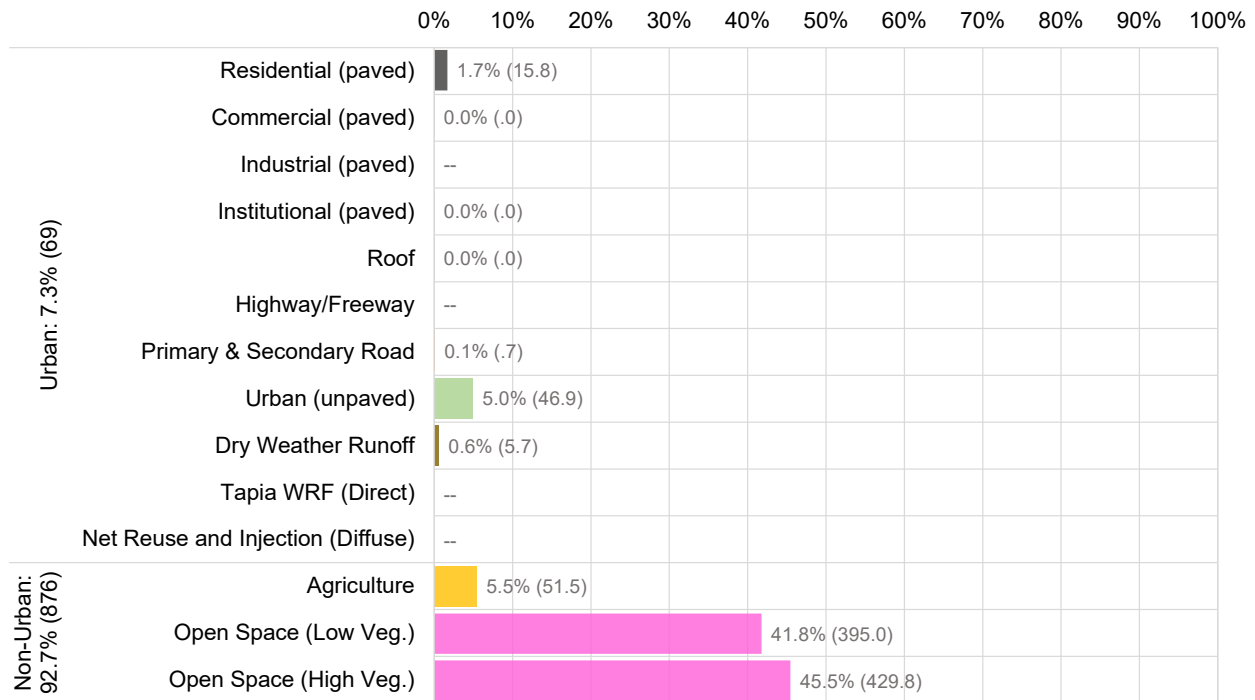
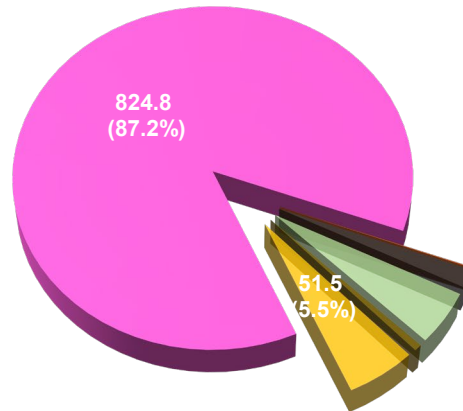


Figure 11. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Trancas Creek at Broad Beach, SMB 1-4 (SWSID = 3074).

Location: Marie Canyon storm drain at Puerco Beach, SMB 1-12

Constituent: Total Phosphorus (lbs/yr)

Ann. Avg. Total: 89.9 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

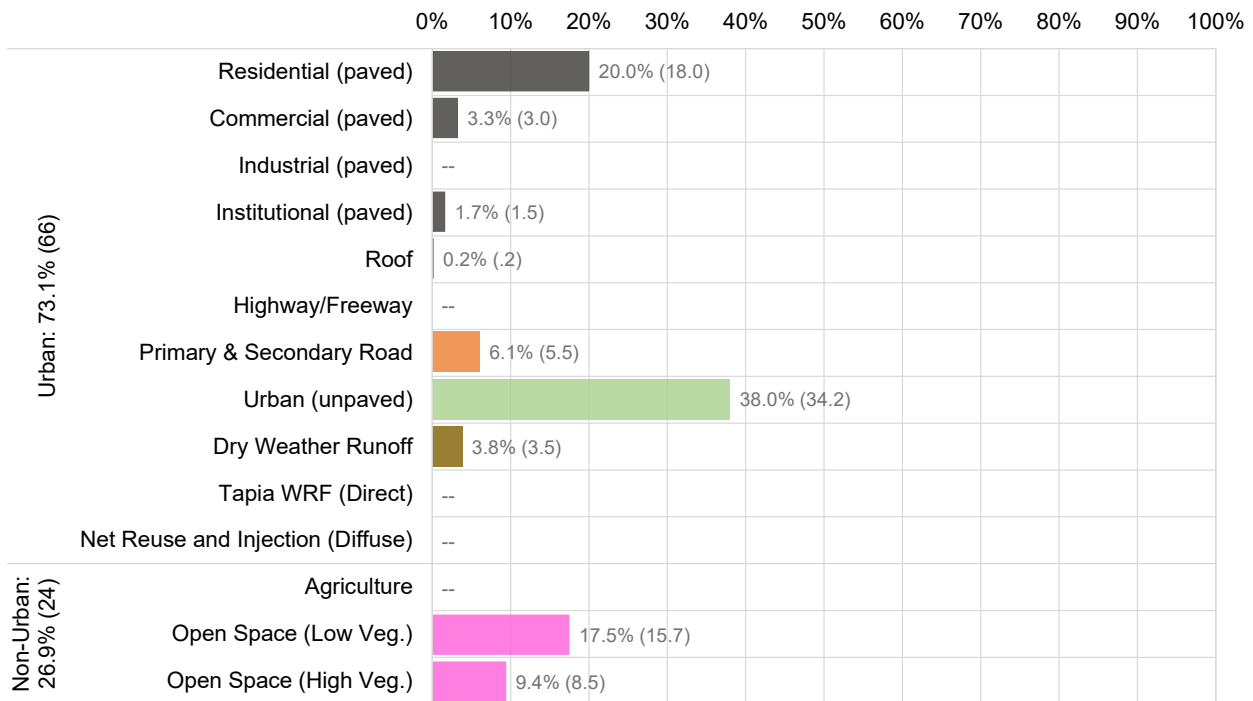
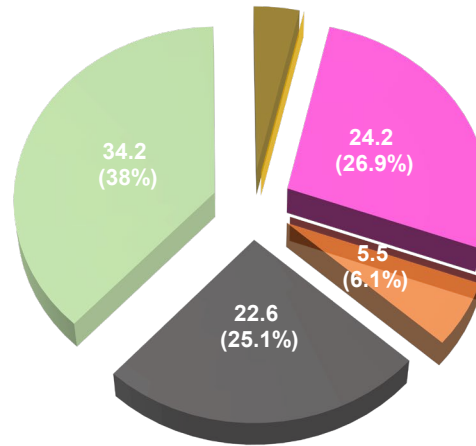


Figure 12. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Marie Canyon storm drain at Puerco Beach, SMB 1-12 (SWSID = 3080).

Location: Ramirez Canyon at Paradise Cove Pier, SMB 1-7

Constituent: Total Phosphorus (lbs/yr)

Ann. Avg. Total: 178.7 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

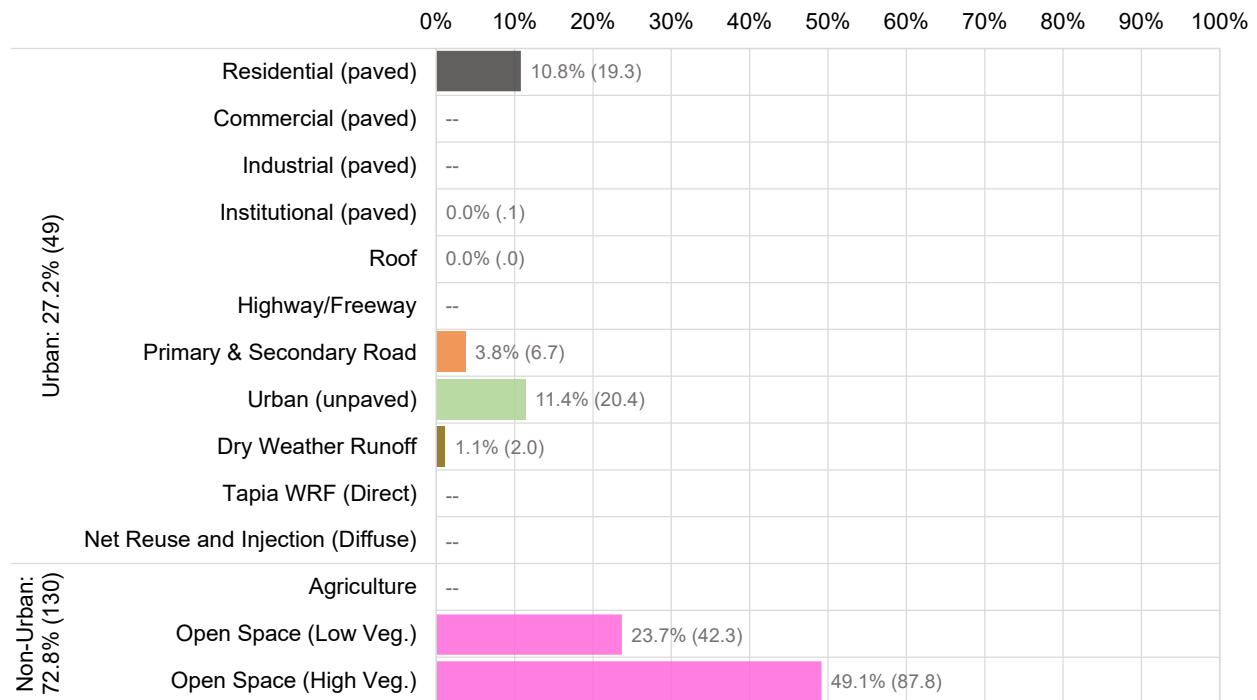
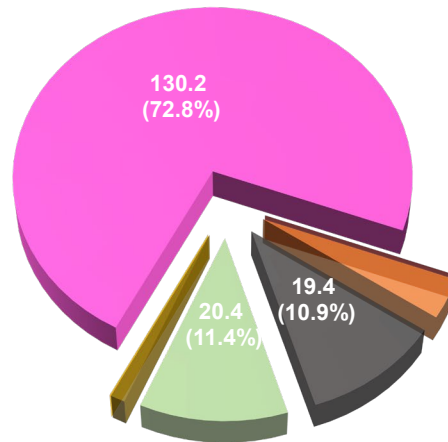


Figure 13. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Ramirez Canyon at Paradise Cove Pier, SMB 1-7 (SWSID = 3085).

Location: Unnamed Waterbody, SMB O-1
Constituent: Total Phosphorus (lbs/yr)
Ann. Avg. Total: 1,285.8 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

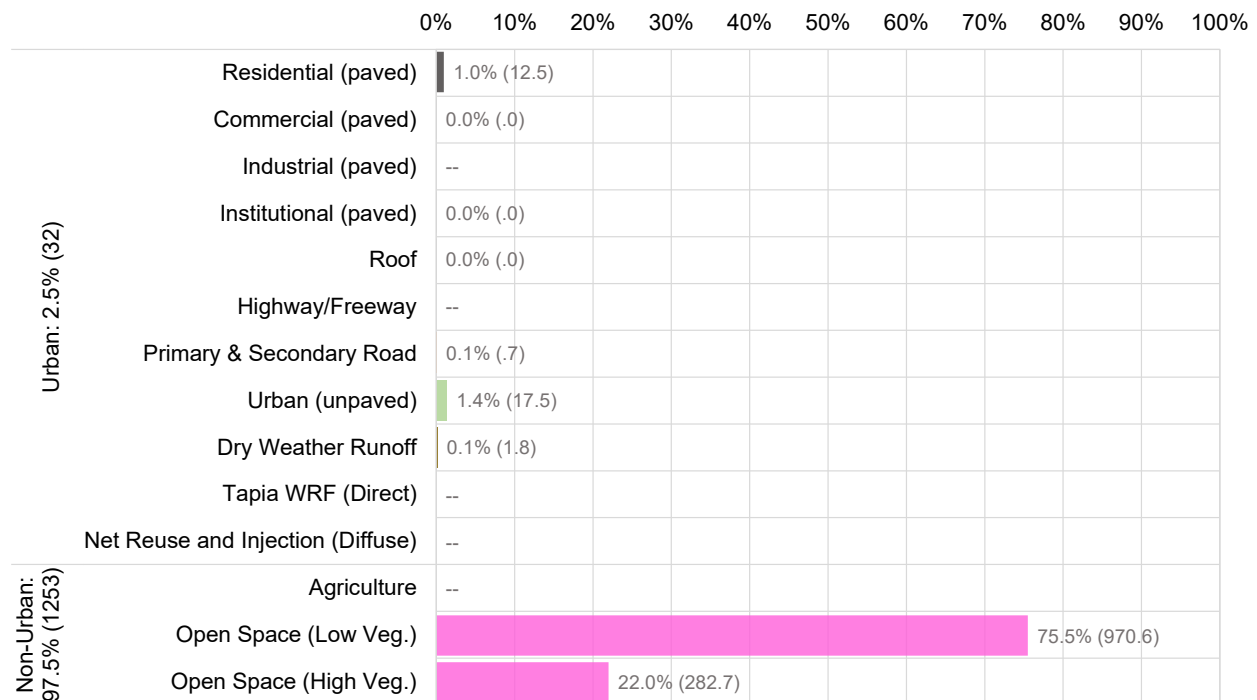
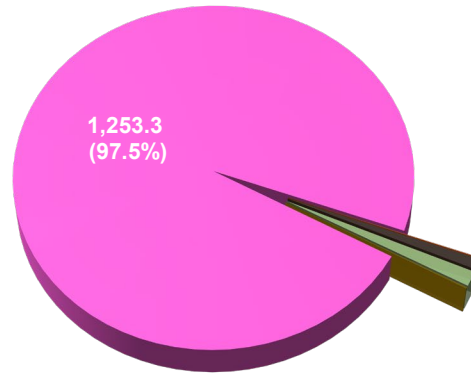


Figure 14. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Unnamed Waterbody, SMB O-1 (SWSID = 3103).

Location: Unnamed Waterbody, SMB O-2
Constituent: Total Phosphorus (lbs/yr)
Ann. Avg. Total: 44.5 lbs/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

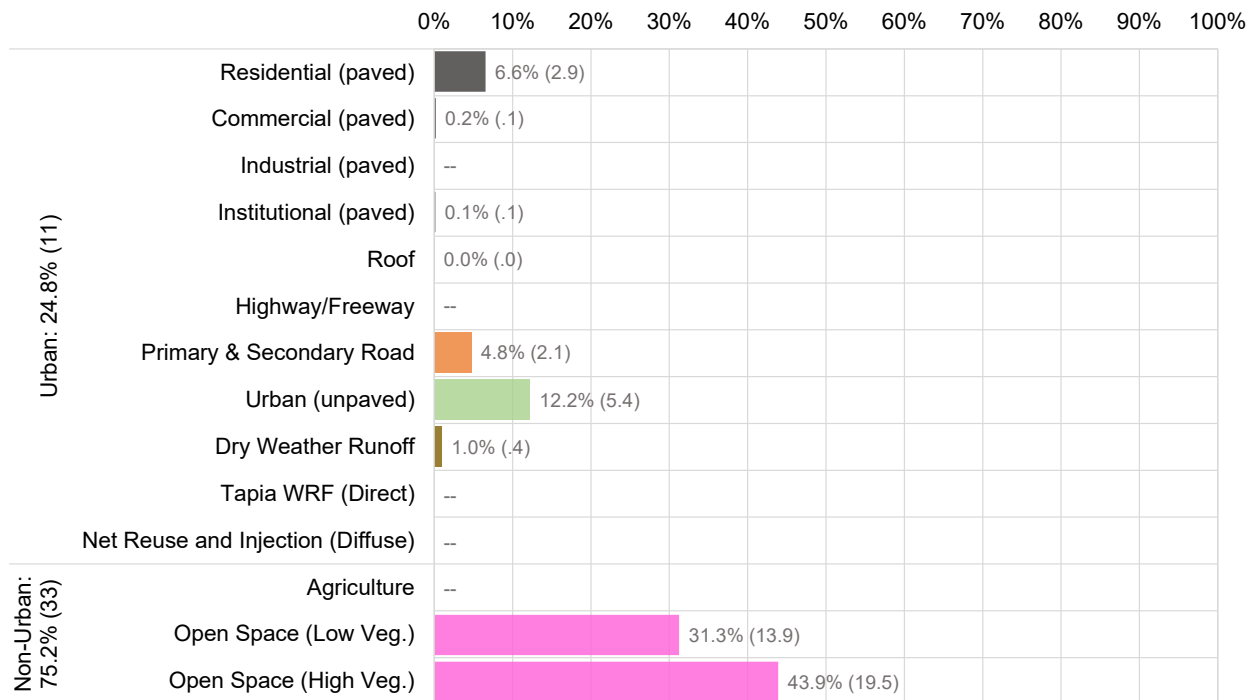
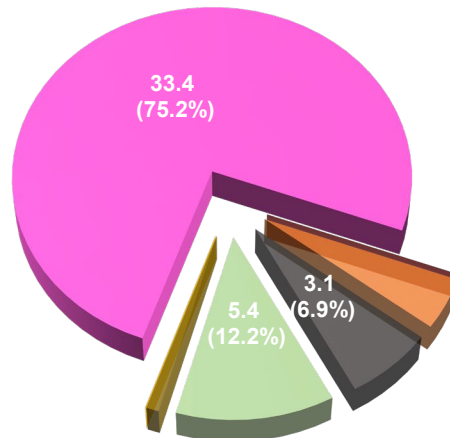


Figure 15. Annual Average Total Phosphorus (lbs/yr) source assessment analysis for Unnamed Waterbody, SMB O-2 (SWSID = 3112).

Location: Breach point of Malibu Lagoon, SMB MC-2

Constituent: Total Sediment (t/yr)

Ann. Avg. Total: 3,455.5 t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

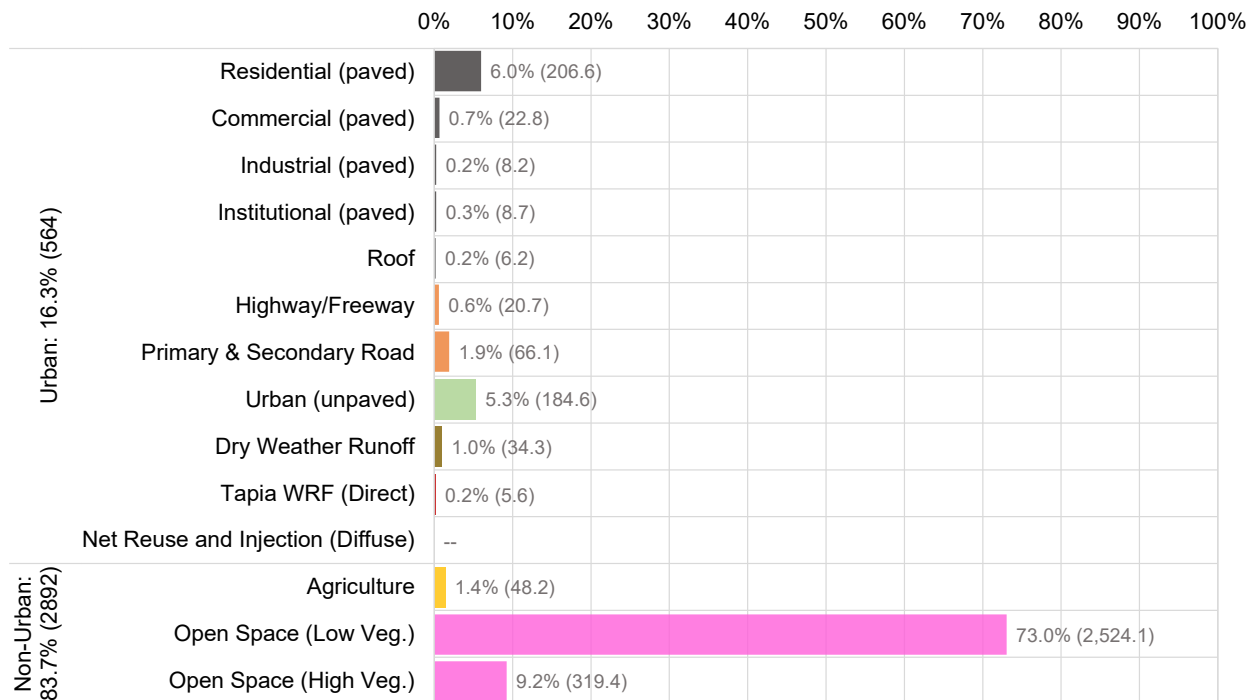
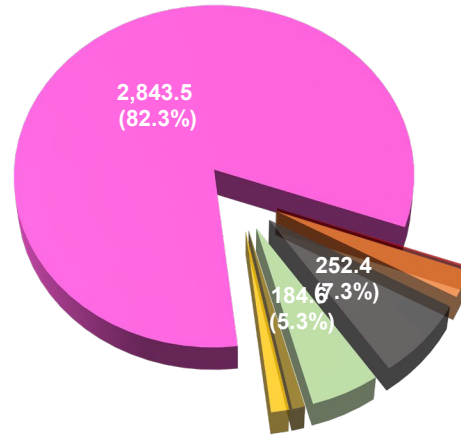


Figure 16. Annual Average Total Sediment (t/yr) source assessment analysis for Breach point of Malibu Lagoon, SMB MC-2 (SWSID = 3001).

Location: Topanga Canyon at Topanga State Beach, SMB 1-18

Constituent: Total Sediment (t/yr)

Ann. Avg. Total: 620.9 t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

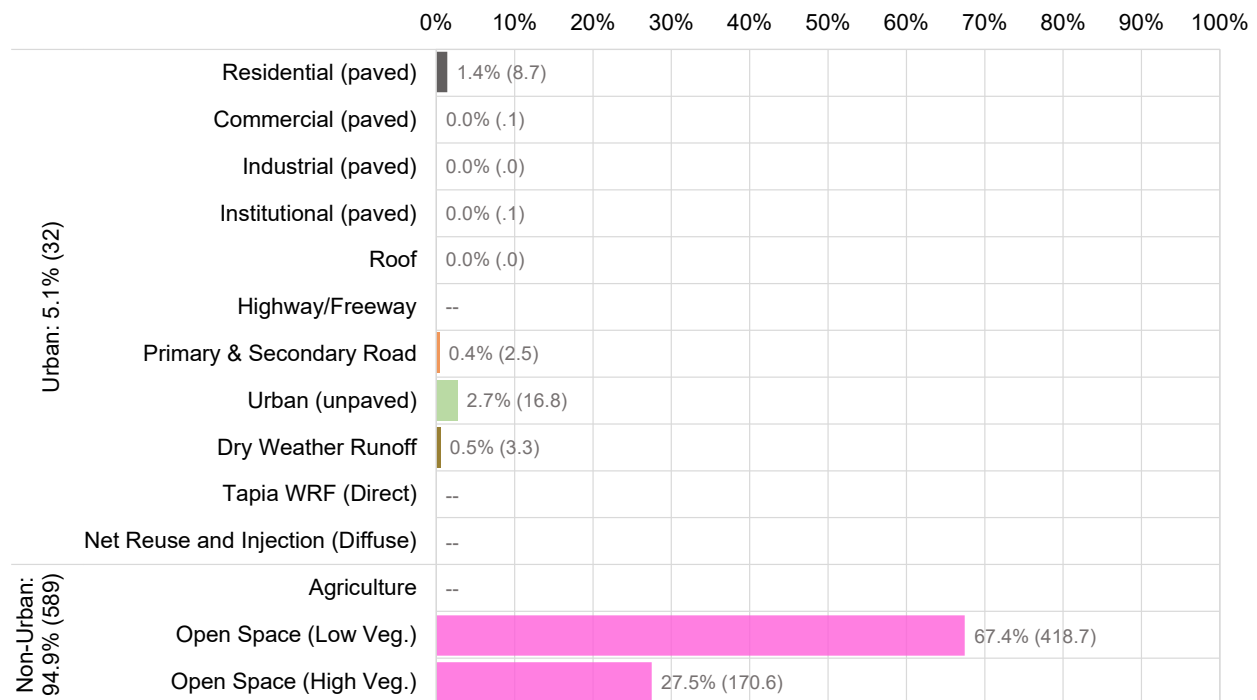
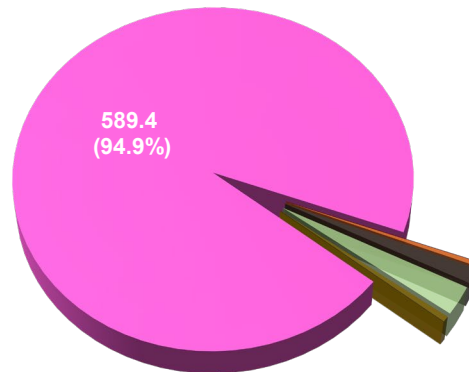


Figure 17. Annual Average Total Sediment (t/yr) source assessment analysis for Topanga Canyon at Topanga State Beach, SMB 1-18 (SWSID = 3057).

Location: Trancas Creek at Broad Beach, SMB 1-4
Constituent: Total Sediment (t/yr)
Ann. Avg. Total: 220.2 t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

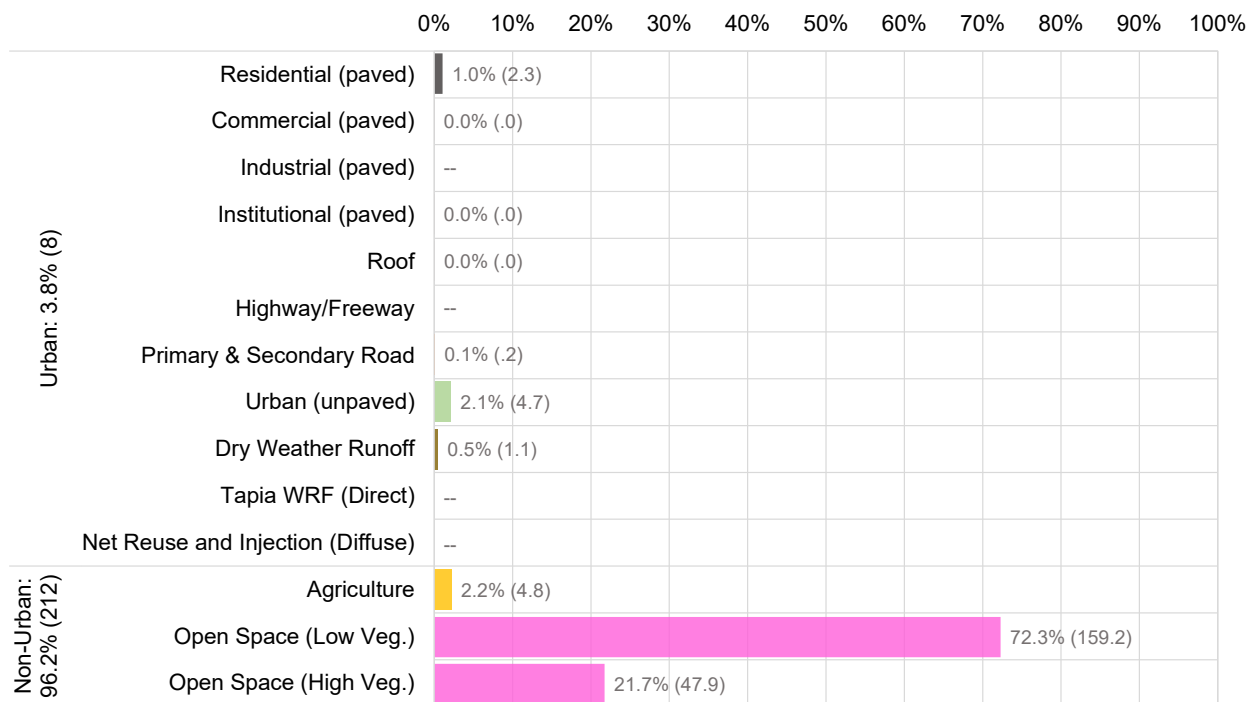
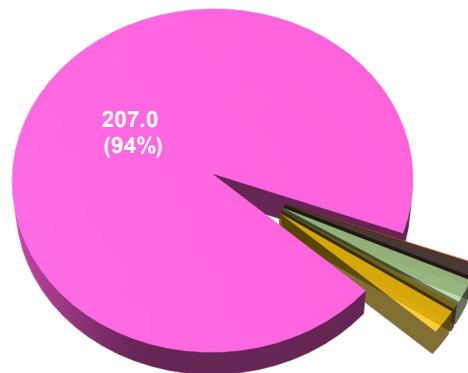


Figure 18. Annual Average Total Sediment (t/yr) source assessment analysis for Trancas Creek at Broad Beach, SMB 1-4 (SWSID = 3074).

Source Assessment for North Santa Monica Bay Watershed

Location: Marie Canyon storm drain at Puerco Beach, SMB 1-12

Constituent: Total Sediment (t/yr)

Ann. Avg. Total: 15.1 t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

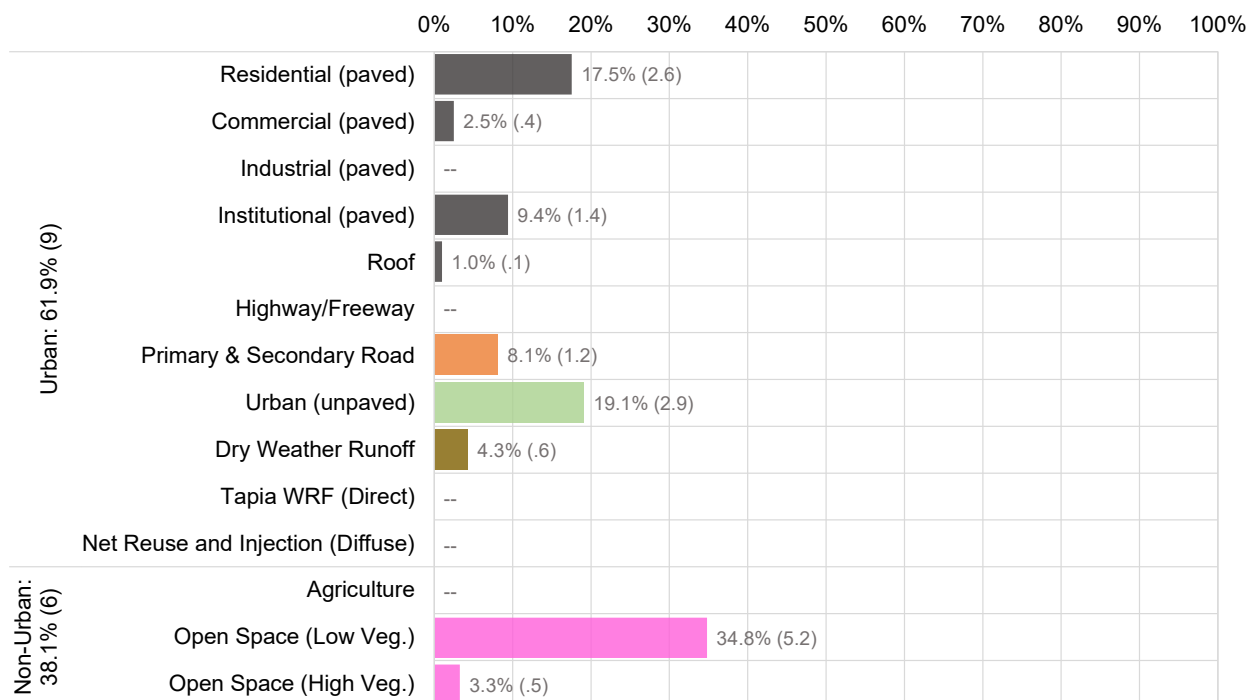
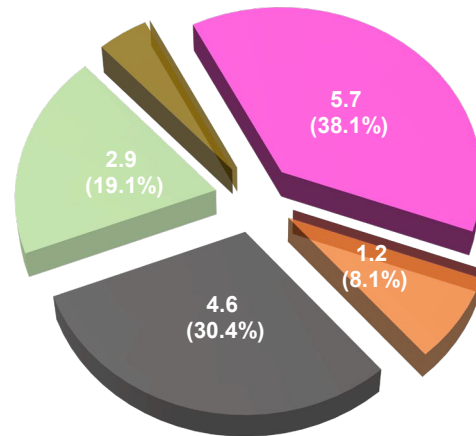


Figure 19. Annual Average Total Sediment (t/yr) source assessment analysis for Marie Canyon storm drain at Puerco Beach, SMB 1-12 (SWSID = 3080).

Location: Ramirez Canyon at Paradise Cove Pier, SMB 1-7

Constituent: Total Sediment (t/yr)

Ann. Avg. Total: 24. t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

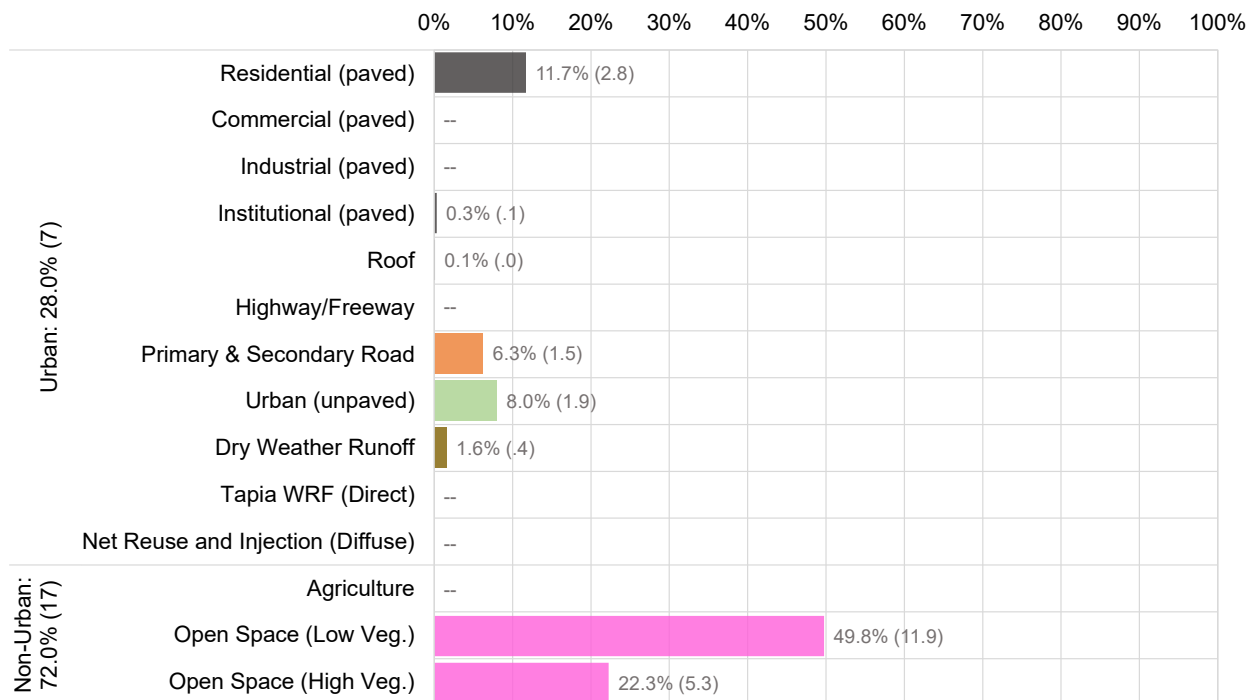
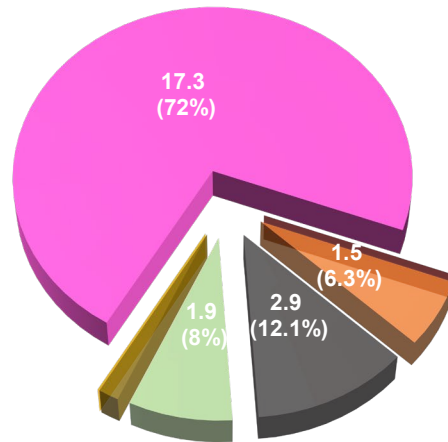


Figure 20. Annual Average Total Sediment (t/yr) source assessment analysis for Ramirez Canyon at Paradise Cove Pier, SMB 1-7 (SWSID = 3085).

Location: Unnamed Waterbody, SMB O-1
Constituent: Total Sediment (t/yr)
Ann. Avg. Total: 407.4 t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

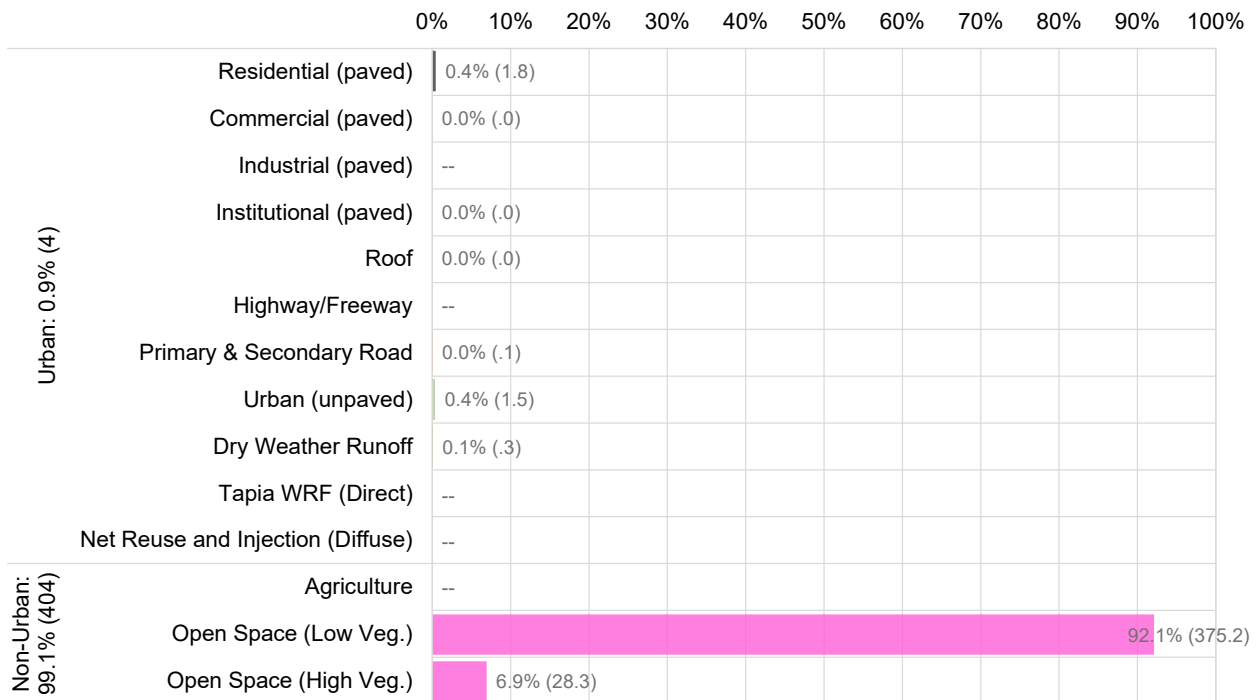
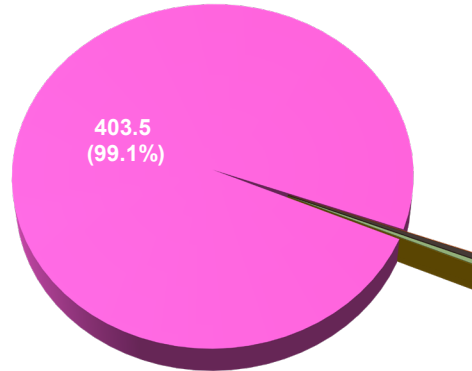


Figure 21. Annual Average Total Sediment (t/yr) source assessment analysis for Unnamed Waterbody, SMB O-1 (SWSID = 3103).

Location: Unnamed Waterbody, SMB O-2

Constituent: Total Sediment (t/yr)

Ann. Avg. Total: 7.1 t/yr

- Roads & Highways
- Paved Urban Surfaces
- Unpaved Urban Surfaces
- Dry Weather Runoff
- Agriculture
- Open Space
- Las Virgenes MWD

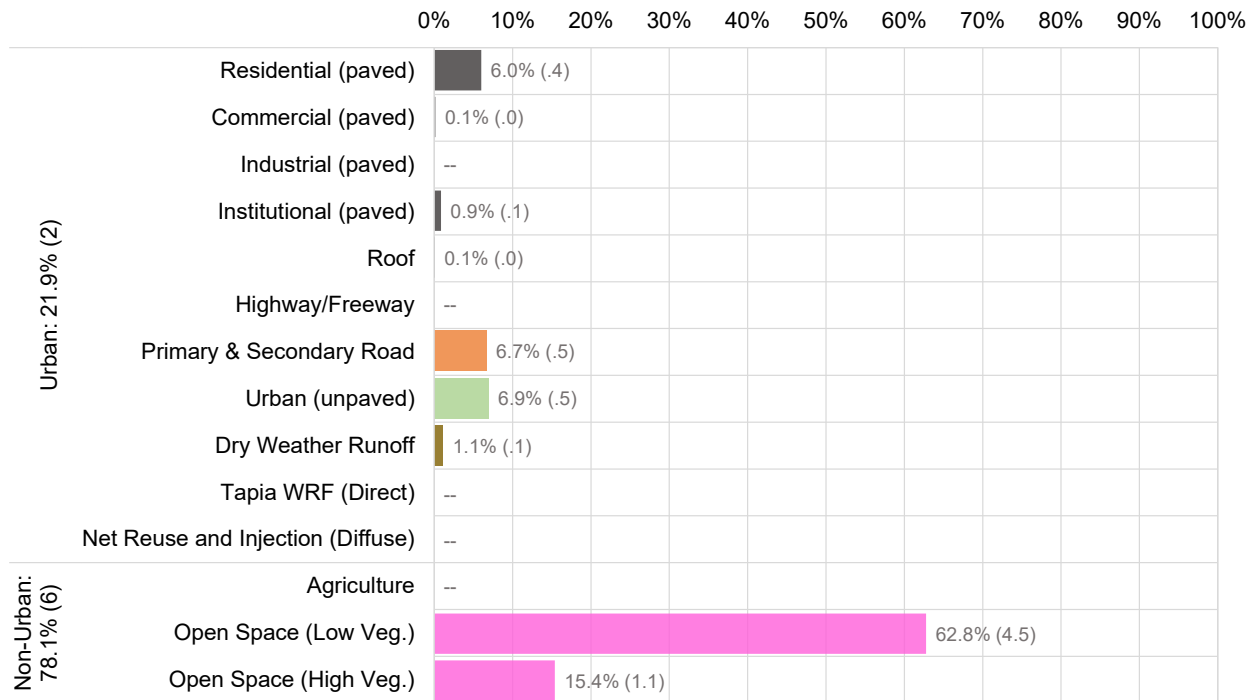
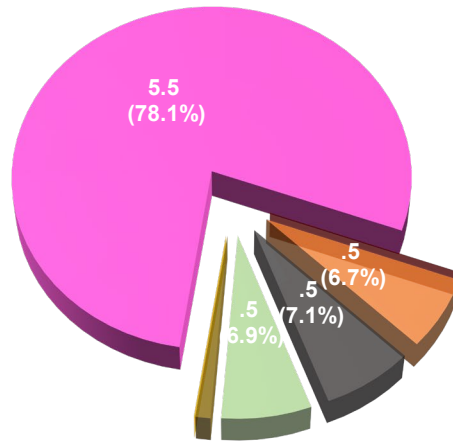


Figure 22. Annual Average Total Sediment (t/yr) source assessment analysis for Unnamed Waterbody, SMB O-2 (SWSID = 3112).

References

Abadin, H., Baynes, R. and Goetchius, P.F., 1994. Toxicological profile for chlordane.

Brake Pad Partnership. Modeling the Contribution of Copper from Brake Pad Wear Debris to the San Francisco Bay, October 2, 2007.

<http://www.suscon.org/bpp/pdfs/WatershedModelingFinalReport100207.pdf>

Brown, J.V., 2011. "Final Project Certification for the Paradise Cove Stormwater Treatment System Project." Prepared for State Water Resources Control Board State Revolving Fund Project No. C-06-6869-110, Agreement No. 08-354-550 (Previously Agreement No. 06-298-550-0).

Central Coast Regional Water Quality Control Board (CCRWQB). 2006. Chorro Creek Nutrients and Dissolved Oxygen TMDL.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2010. Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury Staff Report. April.

Chou, C. H., & Harper, C. (2007). Toxicological profile for arsenic.

City of Malibu, 2012. Comment Letter – Bacteria TMDL Revisions for Santa Monica Bay Beaches. May 7, 2012.

City of Malibu, Los Angeles County Department of Public Works (LACDPW), 2015. Area of Biological Significance 24: Compliance Plan for the County of Los Angeles and City of Malibu. September 20, 2015.

City of Malibu, 2016. Area of Biological Significance: Special Protections Monitoring. Monitoring Report 2015 – 2016 Season. December 2016.

Curren J., S. Bush, S. Ha, M.K. Stenstrom, S. Lau, I.H. Suffet. 2011. Identification of subwatershed sources for chlorinated pesticides and polychlorinated biphenyls in the Ballona Creek watershed. Science of the Total Environment 409: 2525–2533.

Dagit, R., Krug, J., Adamek, K., Montgomery, E., Garcia, C., Albers, S. 2014. Topanga Source ID Study Final Report Dec 2012- August 2014.

Geosyntec Consultants, 2012. San Luis Rey River Watershed Comprehensive Load Reduction Plan. October.

Griffith, J.F., 2012. "San Diego County Enterococcus Regrowth Study." SCCWRP Technical Report.

Hibbs, B. J., Hu, W., & Ridgway, R. 2012. Origin of stream flows at the wildlands-urban interface, Santa Monica Mountains, California, USA. Environmental & Engineering Geoscience, 18(1), 51-64.

Los Angeles County Department of Public Works (LACDPW), 2000. Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report. July 31.

Los Angeles County Department of Public Works. 2005. Los Angeles County 1994-2005 Integrated Receiving Water Impacts Report – Report. August.

Los Angeles County Department of Public Works and Los Angeles County Flood Control District, 2016. Los Angeles County Flood Control District and Los Angeles County Unincorporated Areas: Area of Special Biological Significance. Special Protections Monitoring. 2015-2016 Season Monitoring Report. August 2016

Los Angeles Regional Water Quality Control Board (Regional Board), 2002. Draft Santa Monica Bay Beaches Bacteria TMDL, Revised Staff Report (Dry Weather Only). January 14, 2002. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2002-004/02_0114_tmdl%20Dry%20Weather%20Only_web.pdf

Los Angeles Regional Water Quality Control Board. 2007. Trash Total Maximum Daily Load for Revolon Slough and Beardsley Wash in the Calleguas Creek Watershed Staff Report.

Los Angeles Regional Water Quality Control Board (Regional Board), 2008. Proposed Amendments to the Water Quality Control Plan – Los Angeles Region for the Malibu Creek Watershed Trash TMDL, Resolution R4-2008-007. http://63.199.216.6/larwqcb_new/bpa/docs/2008-007/2008-007_RB_BPA.pdf

Los Angeles Regional Water Quality Control Board. 2011a. Final Staff Report for the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL.

Los Angeles Regional Water Quality Control Board. 2011b. Final Staff Report for the Implementation Plans and Schedules for the Los Cerritos Channel and San Gabriel River Metals TMDLs.

Los Angeles Regional Water Quality Control Board (Regional Board), 2012. Regional Board Basin Plan Amendment for the Santa Monica Bay Beaches Bacteria TMDL. June 7, 2012. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/90_New/Jan2013/Final%20BPA%20Attach%20A%20SMBB%20Dry&Wet%2007Jun12.pdf

Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority (LVMWD). 2012. Water Quality in the Malibu Creek Watershed, 1971-2010. LVMWD Report No. 2475.00. Revised on June 13, 2012.

Maryland Department of the Environment. 1999. Total Maximum Daily Load (TMDL) Documentation for Chlordane in Back River.

Mumtaz, M.M., George, J.D., Gold, K.W., Cibulas, W. and DeRosa, C.T., 1996. ATSDR evaluation of health effects of chemicals. IV. Polycyclic aromatic hydrocarbons (PAHs): understanding a complex problem. *Toxicology and industrial health*, 12(6), pp.742-971.

Sabin, L. D., Lim, J. H., Stolzenbach, K. D., & Schiff, K. C. 2005. Contribution of trace metals from atmospheric deposition to stormwater runoff in a small impervious urban catchment. *Water research*, 39(16), 3929-3937.

State of Washington, Department of Ecology (SWDE). 2013. Salmon Creek Watershed Low Dissolved Oxygen and pH Characterization Study. March.

Stein, E.D., K. Ackerman, and K. Schiff. 2003. Watershed-based Sources of Contaminants to San Pedro Bay and Marina del Rey: Patterns and Trends. Technical Report #413. Prepared for the Los Angeles Contaminated Sediments Task Force. Southern California Coastal Water Research Project, Westminster, California.

Stein, E.D., Tiefenthaler, L.L. and Schiff, K.C., 2007. Sources, patterns and mechanisms of stormwater pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA. Southern California Coastal Water Research Project Technical Report, 510.

Suffet, I.H. and M.K. Stenstrom. 1997. A Study of Pollutants from the Ballona Creek Watershed and Marina del Rey During Wet Weather Flow. Report prepared for the Santa Monica Bay Restoration Commission.

Tetra Tech, 2002. Nutrient and Coliform Modeling for the Malibu Creek Watershed TMDL Studies. Prepared for USEPA Region 9 and the Los Angeles Regional Water Quality Control Board by Tetra Tech, Inc. Lafayette, CA.

Tiefenthaler, L., Stein, E.D., and Schiff, K.C., 2011. "Levels and patterns of fecal indicator bacteria in stormwater runoff from homogenous land use sites and urban watersheds." *Journal of Water and Health* 9:279-290.

University of Florida. 2012. Mercury Spills. Available at: <http://www.ehs.ufl.edu/programs/ih/mercury/>

U.S. Environmental Protection Agency (USEPA). 1999. Background report on fertilizer use, contaminants and regulations. EPA 747-R-98-003

USEPA. 2003. Total Maximum Daily Loads for Nutrients Malibu Creek Watershed. USEPA Region 9.

USEPA. 2012. Santa Monica Bay Total Maximum Daily Loads for DDTs and PCBs. USEPA Region 9.

USEPA. 2013. Malibu Creek and Lagoon TMDL for Sedimentation and Nutrients to Address Benthic Community Impairments. USEPA Region 9.

USEPA and California RWQCB. 2005. Total Maximum Daily Loads for Toxic Pollutants in Ballona Creek Estuary.

United States Geological Survey (USGS) in cooperation with the City of Malibu, 2011. Distribution of Fecal Indicator Bacteria along the Malibu, California, Coastline. Open File Report 2011-101. May.

Ventura County Flood Control District, 2003. Stormwater monitoring report, 1997-2003.

Wisconsin Department of Natural Resources (DNR). (2002). Problems Associated with bis(2-ethylhexyl)phthalate Detections in Groundwater Monitoring Wells. Publication WA 1011. Rev. 2002. Available at: <http://dnr.wi.gov/files/pdf/pubs/wa/wa1011.pdf>

Young, D.R., D.J. McDermott and T.H. Heesen. 1973. Aerial fallout of DDT in southern California. Bulletin of Environmental Contamination and Toxicology 16:604-611.

Appendix 2: Summary of Non-Structural BMPs

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
VI.D.2 Progressive Enforcement (Applies D.6, D.7, D.8, and D.10)								
Develop and maintain a Progressive Enforcement Policy	X			X	X	X	X	
Conduct follow-up inspection within 4 weeks of date of initial inspection	X			X	X	X	X	
Take progressive enforcement actions, as necessary and appropriate	X			X	X	X	X	
Retain records	X			X	X	X	X	
Refer violations to Regional Board	X			X	X	X	X	
Investigate complaints from Regional Board (RB)	X			X	X	X	X	
Assist RB with Enforcement Actions	X			X	X	X	X	
VI.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	X	X	X	
Maintain reporting hotline, with hotline information published and point-of-contact identified	X			X	X	X	X	
Organize events (e.g., clean ups)	X			X	X	X		
Residential Outreach (Individually or with group)	X							
Public Service Announcements	X			X	X	X	X	
Develop and distribute public education materials on: vehicle fluids; household waste; construction waste; pesticides, fertilizers, and integrated pest management (IPM); green wastes; and animal wastes		X		X	X	X	X	PIPP enhancements including: <ul style="list-style-type: none">“Living Lightly in Our Watersheds – A Guide for Residents of the SMB Watershed.” Copies of this guide are regularly distributed at public counters and events. A partnership project with the Resource Conservation District of the Santa Monica Mountains and other local agencies, this guide is currently being updated for print production, and a new website for
Distribute public education materials at points of purchase including automotive parts stores, home		X		X	X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
improvement centers, landscaping/garden centers, and pet shops/feed stores.								<p>presenting the information was launched in 2015. It can be found at www.livinglightlyguide.org.</p> <ul style="list-style-type: none"> Malibu is founding member and facilitator of the Malibu Area Conservation Coalition (MACC). MACC is a partnership of local government agencies, utilities, resource districts, and community stakeholders working within Malibu and the North Santa Monica Mountains that share the common goal of empowering local communities to conserve and protect natural and economic resources and habitat. Recognizing that watersheds, oceans, water and power generation and delivery systems do not stop at jurisdictional boundaries, the coalition is dedicated to providing effective programs, environmental education and outreach. The MACC does this by providing resources to the community to improve resource conservation, and eliminate non-point source pollution. Programs have included promoting the Surfrider Foundation's Ocean Friendly Gardens program, providing rebates and incentives for conservation devices and landscape retrofits, hosting workshops and training, and installing demonstration gardens. Malibu actively participates in the Malibu Chamber of Commerce environmental Committee which provides education/outreach and recognition to local businesses and the community through events, awards, workshops, and outreach campaigns. Malibu will continue to offer special focused outreach directly to the equestrian community in neighborhoods known to have increased equestrian uses or facilities on a request basis or if a problem is identified. Including direct contact with properties, offers to conduct site evaluations, education and outreach to property owner associations, and educational materials. A new equestrian facilities BMP guidelines was developed in 2017.

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
								<ul style="list-style-type: none"> Malibu has conducted landscaper/gardener training and certification programs multiple times in both Spanish and English. Malibu will assess the feasibility and effectiveness of additional program enhancements that are detailed in Appendix E Section 6.1 (ASBS 24 Compliance Plan). This includes an Enhanced Collaborative Environmentally Friendly Alternative Services Program and ASBS Signage at Beaches. Final implementation of programs determined to be feasible and effective will be subject to City Council approval.
Maintain stormwater website	X			X	X	X	X	
Provide schools with materials to educate children (K-12); using state-produced materials is allowed.	X			X	X	X	X	
VI.D.6 Industrial/ Commercial								
Track Critical Sources - maintain inventory (watershed based or Latitude/Longitude recorded)	X			X	X	X	X	
Educate - notify critical sources of BMP requirements		X		X	X	X	X	<p>Outreach material content and distribution will be focused on industrial/commercial facilities with the potential to contribute to pollutants identified as water quality priorities, specifically bacteria. For example, BMPs related to trash management will be highlighted in outreach material, and additional recommendations that exceed the minimum requirements for these BMPs will be encouraged.</p> <p>Additionally, Malibu is implementing an Enhanced Dumpster Enforcement Program. City staff work with property owners to ensure trash storage areas are in a clean sanitary condition with the lids closed and locked at all times. This enhancement prevents trash generated from illegal scavenging assists with compliance with the SMB Marine Debris TMDL and reduces the use of rodenticides.</p>
Implement a Business Assistance Program for select sectors or small	X			X	X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
businesses - technical assistance, and distribute materials to specific sectors								
Inspect critical commercial/industrial facilities twice during the 5 year permit term. For facilities with a No Exposure Certification, evaluate and conduct 2nd inspection at 25% of facilities to verify the continuity of the no exposure status		X		X	X	X	X	The NSMBCW EWMP Group conducts inspections of commercial facilities within the EWMP Area annually rather than 2x/five years as required in the Permit. This includes annual inspections of all food service establishments including restaurants, grocery stores, and coffee shops to reduce this type of business' impact on water quality due to stormwater and dry weather runoff. Malibu is a partner in the Santa Monica Bay Restoration Foundation's Clean Bay Restaurant Certification program that far exceeds the minimum requirements of the previous MS4 Permit. Inspections include a comprehensive 30+ point stormwater inspection checklist requiring 100% compliance in order for the facility to be awarded a Clean Bay Restaurant Certification.
Conduct Progressive Enforcement follow-up inspections (see D.2), as needed.	X			X	X	X	X	
VI.D.7 Planning and Land Development								
Update ordinance/design standards to conform with new requirements (LID and Hydromod)		X			X	X	X	The City of Malibu exceeds the Permit's LID requirements by requiring LID implementation on more projects than otherwise required by the Permit. In addition, the City of Malibu implements a Local Coastal Program, which is certified by the California Coastal Commission, including a Land Use Plan (LUP) and Local Implementation Plan (LIP) that detail many environmental quality and protection standards, objectives, and implementation measures for new development and redevelopment projects. These include requirements for water conservation, protection of native vegetation, and landscaping with native vegetation. All landscape plans are reviewed by Malibu's contract biologist. A water quality mitigation plan is required for all planning priority projects along with additional projects, including: beachfront development that creates, adds, or replaces 2,500 sf or more of impervious area; projects that result in the creation, addition, or replacement of 2,500 sf that discharge directly to or adjacent to an ASBS or are

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
								tributary to an ASBS; and single family residential projects that create, add, or replace 5,000 sf of impervious surface area.
Optional: Establish alternative compliance for technical infeasibility, e.g., allow onsite biofiltration or offsite infiltration or groundwater replenishment or retrofit	X				X	X	X	
Optional if allowing offsite mitigation: Develop a prioritized list of offsite mitigation projects	X				X	X	X	
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)	X				X	X	X	
Optional if allowing offsite mitigation: Develop a list of mitigation projects descriptions, and estimated pollutant and flow reductions	X				X	X	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				X	X	X	
Plan Review process - check LID and BMP sizing, etc.,	X				X	X	X	
Establish internal agreements with structure for communication and authority for departments overseeing plan approval and project construction	X				X	X	X	
Require project proponents to prepare Operation & Maintenance plan for LID, treatment, and hydromod BMPs	X				X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
Implement tracking and enforcement program for LID, treatment, and hydromod BMPs	X				X	X	X	
Inspect all development sites upon completion and prior to occupancy certificates	X				X	X	X	
Verify Operation & Maintenance program is implemented on Permittee-operated BMPs through inspection	X				X	X	X	
Develop maintenance inspection checklist for Permittee-operated BMPs	X				X	X	X	
Require private parties that operate BMPs, except for simple LID BMPs implemented on single family residences, to document proper Operation & Maintenance; enforce as needed	X				X	X	X	
Conduct Progressive Enforcement follow-up inspections (see D.2), as needed.	X				X	X	X	
VI.D.8 Construction								
Update erosion and sediment control ordinance/procedures to conform with new requirements	X					X	X	
Sites < 1 acre; inspect based upon water quality threat	X			X		X	X	
Establish priority inspection process	X					X	X	
Site < 1 acre; Require sites with soil disturbing activities to implement minimum BMPs	X			X		X	X	
Sites >= 1 acre: Require construction sites to prepare erosion sediment control plan (ESCP); review and approve	X			X		X	X	
Verify construction sites coverage under the CGP and 401 cert	X			X		X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
Develop/implement ESCP review checklist	X			X		X	X	
Implement technical standards for the selection, installation, and maintenance of construction BMPs for all construction sites within the Permittee's jurisdiction	X			X		X	X	
Conduct inspections at public and private sites >= 1 acre in size in accordance with Table 17 of the MS4 Permit.	X			X		X	X	
Develop/implement Standard Operating Procedure (SOP)/inspection checklist	X			X		X	X	
Track number of inspections for inventoried sites and verify minimum inspections are completed	X			X		X	X	
Conduct Progressive Enforcement follow-up inspections (see D.2), as needed.	X			X		X	X	
Train plan review staff and inspectors	X			X		X	X	
VI.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		X	X	
Maintain inventory of Permittee owned facilities (including parks and recreation facilities); Update inventory as required	X			X	X	X	X	
Develop retrofit opportunity inventory (within public ROW or in coordination			X	X	X	X	X	EWMP regional and distributed project selection process was utilized to meet these requirements for public projects rather than implementing separate evaluations for retrofit

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
with TMDL implementation plan); evaluate and rank								opportunities. The Group will continue to encourage private retrofit projects through the following: <ul style="list-style-type: none"> • Retrofit projects on public land that treat runoff from private property; • Education and outreach; • Development plan review process; • Ordinance enforcement.
Cooperate with private land owners to encourage site specific retrofitting; includes pilot projects and outreach	X			X	X	X	X	
Obtain IGP coverage for public facilities where appropriate	X							
Develop procedures to assess impact of flood management projects on water quality of receiving waters; evaluate to determine if retrofitting is feasible			X	X	X	X	X	EWMP regional and distributed project selection process was utilized to meet these requirements for public projects rather than implementing separate evaluations for retrofit opportunities. The Group will continue to encourage private retrofit projects through the following: <ul style="list-style-type: none"> • Retrofit projects on public land that treat runoff from private property; • Education and outreach; • Development plan review process; • Ordinance enforcement.
Evaluate existing structural flood control facilities to determine if retrofitting facility to provide additional pollutant removal is feasible			X	X	X	X	X	EWMP regional and distributed project selection process was utilized to meet these requirements for public projects rather than implementing separate evaluations for retrofit opportunities. The Group will continue to encourage private retrofit projects through the following: <ul style="list-style-type: none"> • Retrofit projects on public land that treat runoff from private property; • Education and outreach; • Development plan review process; • Ordinance enforcement.
Implement source control BMPs at Permittee owned facilities/activities	X			X	X	X	X	
Require city-hired contractors to implement source control BMPs	X			X	X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
Prevent vehicle/equipment washing discharges to the MS4, including firefighting and emergency response vehicles	X				X	X	X	
Ensure new/redeveloped/replaced wash facilities are plumbed to the sanitary sewer or self contained.	X							
Implement Integrated Pest Management (IPM) program	X							
Ordinances, policies, and procedures reflect IPM techniques and include commitments and schedules to reduce the use of pesticides that cause impairments	X							Malibu has banned the use of pesticides at publicly owned facilities and has adopted an Earth Friendly Management (EFM) Policy. The City is in the process of amending the Land Use Plan portion of the Local Coastal Plan to prohibit the use of pesticides City wide except when used in the eradication of invasive plant species or habitat restoration and will be considered by the California Coastal Commission.
Update an inventory of pesticides used by agency annually; quantify pesticides used by staff and contractors; demonstrate IPM alternatives to reduce pesticide use	X							
Use SOPs for pesticide application	X							Malibu has adopted a EFM Policy and assigned an EFM Coordinator to implement the EMP policy.
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	X							
Ensure staff applying pesticides are certified or working under supervision of a certified applicator in the appropriate category	X							Pesticide use in Malibu is overseen by the EFM Coordinator and use of natural or non-toxic materials is the preferred method of treatment.
Update catch basin map add GPS locations and update priority	X			X	X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
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			X		X		Malibu will assess the feasibility and effectiveness of additional program enhancements that are detailed in Appendix E Section 6.1 (ASBS 24 Compliance Plan). This includes an Infrastructure Priority Re-Evaluation Program to determine if increased cleaning may be appropriate to meet the requirements of the ASBS Special Protections and General Exception or to provide a streamlined, efficient and effective implementation program for ASBS 24. Final implementation of programs determined to be feasible and effective will be subject to City Council approval.
Require trash management at public events	X			X		X		
Place and maintain trash receptacles/capture devices at newly identified high trash generating areas	X			X		X		
Label storm drains	X			X				
Inspect storm drain labels prior to each wet season	X			X				
Record and re-label illegible storm drain labels within 180 days of inspection	X			X				
Post signs at access points to water bodies (open channels, creeks; lakes)	X			X	X	X	X	
Install trash excluders on catch basins or outfalls in areas defined as Priority A, or implement substantially equivalent BMPs in areas not otherwise subject to the SMB/MCW Trash TMDL.	X			X			X	
Inspect and Remove trash and debris from open channels and other drainage structures 1x/yr before rainy season.	X			X		X	X	
Eliminate discharge of contaminants during MS4 maintenance	X			X	X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
Implement controls to limit infiltration of seepage from sanitary sewers to the storm drains			X					Due to lack of municipal sanitary sewer in the majority of the NSMBCW EWMP Area, the MCM will be implemented where applicable; otherwise, controls will be implemented to limit sewage discharges from OWTS to the MS4 by maintaining a Septic System Management Plan and Comprehensive Onsite Wastewater Treatment System Inspection and Operating Permit Program.
Implement routine preventative maintenance for both systems, survey sanitary sewer and MS4. May use SSO General WDR to fulfill this requirement.			X	X	X	X	X	
Implement inspection and maintenance program for Permittee owned BMPs	X			X	X	X	X	
Manage residual water in treatment control BMPs removed during maintenance	X				X	X	X	
Street sweeping - Priority A: 2x/mo; B: 1x/mo; C: as needed, not less than 1x/yr		X		X	X	X	X	The current street sweeping program in the City of Malibu includes sweeping of all City streets monthly (even Priority C streets) and PCH weekly. Vacuum trucks will be used, where feasible. Malibu will assess the feasibility and effectiveness of additional program enhancements that are detailed in Appendix E Section 6.1 (ASBS 24 Compliance Plan). This includes Equipment Upgrades, Increased Sweeping Frequency, and an Infrastructure Priority Re- Evaluation Program to determine if increased cleaning may be appropriate. Final implementation of programs determined to be feasible and effective will be subject to City Council approval.
Implement road construction maintenance BMPs (e.g., restrict paving activity to exclude periods of rain)	X				X	X	X	
Inspect and/or clean Permittee owned parking lots 2x/mo		X		X		X	X	The County has implemented an aggressive street sweeping program at County Beach parking lots by sweeping three to four times per week with enhanced sweeping equipment.
Train employees and contractors on stormwater requirements	X			X	X	X	X	

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
Train employees and contractors on pesticide use	X							
VI.D.10 Illicit Connections and Illicit Discharges (IC/ID) Elimination								
Continue to implement IC/ID program	X			X	X	X	X	
Develop written procedures for conducting investigations and eliminations	X			X	X	X	X	
Initiate investigations within 72 hours from becoming aware of the discharge	X			X	X	X	X	
Implement solutions to eliminate discharge; conduct follow-up investigation to verify elimination; follow Progressive Enforcement Plan (see D.2)	X			X	X	X	X	
When discharge originates upstream of jurisdiction, notify the upstream jurisdiction and Regional Board within 30 days	X			X	X	X	X	
Initiate investigations within 21 days of reported or discovered illicit connections	X			X	X	X	X	
Eliminate illicit connections within 180 days of completion of source investigation. If an illicit connection is determined to only discharge allowed stormwater or non stormwater discharges, document the connection.	X			X	X	X	X	
Establish a hotline to facilitate public reporting of IC/ID	X			X	X	X	X	
Install signage adjacent to open channels providing public information on how to report IC/ID			X	X	X	X	X	Signage will be implemented in prioritized areas where the NSMBCW EWMP Group has local jurisdiction or land control. This will allow the program to be focused on water quality priorities, and to limit signage requirements to enforceable locations.

Minimum Control Measure / 2012 Permit Requirement	Implementation			Water Quality Priority Pollutants				Comments
	As-is	Enhanced	Modified	Trash	Nutrients	Bacteria	Sediment-Bound Pollutants (e.g. Metals)	
Document calls and actions associated with hotline	X			X	X	X	X	
Implement procedures for responding to complaints; evaluate and update procedures, as needed	X			X	X	X	X	
Implement a spill response plan	X			X	X	X	X	
Train staff and contractors on IC/ID	X			X	X	X	X	
Create a list of positions and contractors that require ID/IC training	X			X	X	X	X	

Appendix 3: ASBS Compliance Plan

Area of Special Biological Significance 24 Compliance Plan For The County of Los Angeles and City of Malibu

Submitted to:

State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, California 95812-0100

Submitted by:



County of Los Angeles
Chief Executive Office
Kenneth Hahn Hall of Administration
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City of Malibu
23825 Stuart Ranch Road
Malibu, California 90265-4861

September 20, 2015



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EXECUTIVE SUMMARY

Background

The Laguna Point to Latigo Point Area of Special Biological Significance (ASBS), also referred to as ASBS 24, was established in 1974 by the State Board to preserve sensitive marine habitat (SWRCB, 1979). It stretches 24 miles, contains 11,842 marine acres, and is the largest ASBS along the mainland of Southern California. A wide range of sandy substrate, rocky reef, and coastal pelagic species can be found within ASBS 24. Figure ES-1-1 shows a small portion of ASBS 24 east of Point Dume.



Figure ES-1-1. ASBS 24 Looking East Across Dume Cove

Since 1983, the California Ocean Plan (Ocean Plan) has prohibited the discharge of waste into ASBS along the California Coast, unless the State Water Resources Control Board (State Board) grants an exception to dischargers. The southern and central portions of ASBS 24 that are located in Los Angeles County (County) are subject to direct discharges from roads, urban landscape runoff, homes, and small businesses. In general, the near-coast storm water runoff along ASBS 24 within the County is conveyed through storm drain systems and / or natural drainage courses before it is discharged at multiple locations along the beach. In 2004, the City of Malibu (City), County of Los Angeles, and the Los Angeles County Flood Control District (District) requested exceptions for storm water discharges to ASBS 24 from the State Board. The State Board received requests from numerous other applicants for an exception to the Ocean Plan. In 2012, the State Board adopted a General Exception.

The General Exception includes Special Protections which specify prohibited discharges and other requirements that dischargers covered under the General Exception must comply with. The County, the District, and the City were included in the list of responsible entities required to prepare a Draft and Final ASBS Compliance Plan for point source discharges of storm water in ASBS 24. This Compliance Plan has been prepared by the County, District, and City (collectively the Parties) in accordance with the General Exception

Point Source Discharge Locations (Outfalls Equal to and Greater Than 18 Inches)

Los Angeles County Department of Public Works (LACDPW) has identified 12 storm drain outfalls having a diameter equal to or greater than 18 inches that drain to ASBS 24 and are owned and maintained by the County. Nine storm drain outfalls that have a diameter greater than

or equal to 18 inches and drain to ASBS 24 are owned and maintained by the District. These nine outfalls occur along Broad Beach and Escondido Beach and convey runoff from upstream neighborhoods. The City identified eight storm drain outfalls that are privately owned and maintained and have diameters equal to or greater than 18 inches. These storm drains convey runoff from City owned and maintained inlets on Broad Beach Road and Wildlife Road to the storm drain outfalls located along Broad Beach and the seaside cliffs of Point Dume. An additional 10 storm drain outfalls are currently of undetermined ownership. These storm drains with undetermined ownership convey flow from the Pacific Coast Highway, and upstream neighborhoods. These 39 storm drain outfalls are considered point source discharges of storm water to ASBS 24. Figure ES-1-2 shows the locations of point source discharges along the County shoreline of ASBS-24. The Compliance Plan Map is included in the Appendix A.

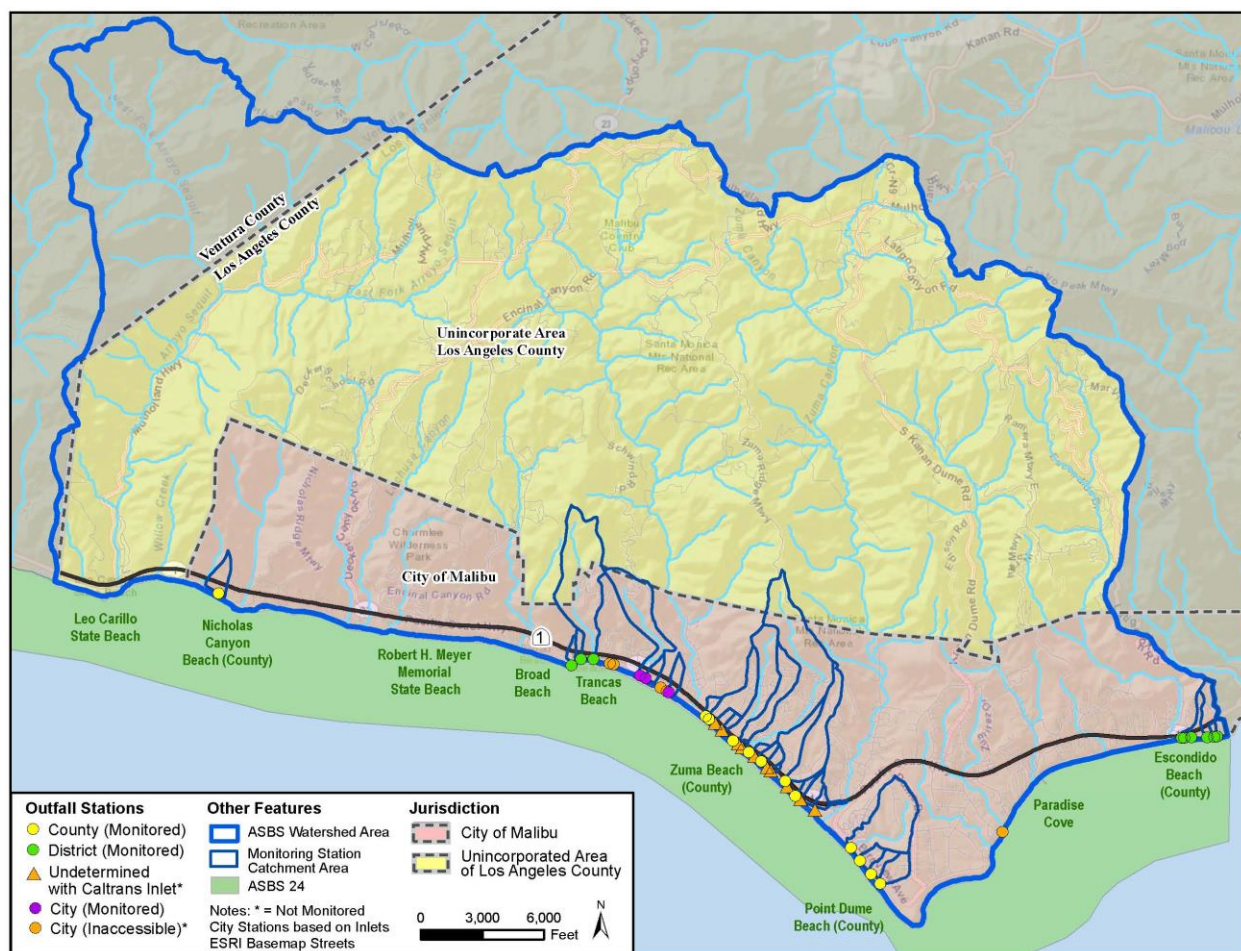


Figure ES-1-2. ASBS-24 Point Source Discharge Locations



Compliance Plan Map

A Compliance Plan Map for the ASBS 24 watershed area has been created and can be updated using Environmental Systems Research Institute (ESRI) ArcMap 10 and is provided in Appendix A. This map shows storm water conveyances and other storm drain features associated with surface drainage of storm water runoff, including catch basins, inlets/outlets, outfalls, storm drain lines, channels, and creeks. The map identifies core monitoring stations and shows the location of other outfalls equal to or greater than 18 inches that are private, state, or federal and not monitored by the Parties. Drainage areas for the core monitoring stations, watershed sub-basins and flow directions within these sub-basins are depicted, as well as the overall ASBS 24 watershed area. The map includes the locations of waste and hazardous material storage areas, sewage conveyances and treatment facilities, landslide zones, and roads. Jurisdictional boundaries for the unincorporated area of the County, the City, and state and federal lands within these areas are shown. This Plan provides information regarding the Compliance Plan Map datasets and the procedures for updating applicable GIS files and the map.

Dry Weather Requirement

The General Exception prohibits all non-authorized non-storm water (dry weather) discharges into the ASBS. Dry weather runoff is any runoff that is not the result of a precipitation event. This is also referred to as “non-storm water discharges” (SWRCB, 2012a). The Parties have implemented nonstructural measures that are designed to eliminate non-authorized, non-storm water runoff. These measures include public information and participation programs (PIPPs), operations and maintenance (O&M) programs, and enforcement programs. A discussion of these activities is provided in Section 3, and a list of existing programs with brief descriptions is provided in Appendix B.

Dry weather monitoring of outfalls has been performed to ensure compliance with the requirements of the General Exception. A summary of these outfall inspections for 2012 and 2013 is provided within the main body of the Plan on Table 3-3 and Table 3-4, respectively. Of the inspected outfalls, only ASBS-002 had flow reaching the surf, and this occurred only once out of the 13 times in 2012 and once out of the three times in 2013. Subsequent inspections performed in March and May, 2013, at ASBS-002 indicated that flow was not present. Some other outfalls were observed with flows or ponded water; however, due to the distances between the outfalls and the surf zones, these flows did not reach the surf zones. Inspections will continue to ensure that discharges of non-storm, non-authorized runoff do not occur.

Receiving Water Assessment

In 2008, a study was conducted as part of Bight 2008 to assess water quality in southern California ASBS (Schiff et al., 2011). The study was designed to evaluate the range of natural water quality near reference drainage locations and to compare water quality near ASBS discharges to these natural water quality conditions. The 2008 study provided initial estimates of reference thresholds, set at 85th percentile, based on data collected at reference sites. As part of the Bight 2013 Regional Monitoring Program, additional reference monitoring was performed under the Regional Monitoring Program, and the 85th percentile reference thresholds were revised.



Wet weather monitoring was performed by LACDPW at two receiving water locations: 1) S01, located off Zuma Beach directly out from ASBS-016, a 60-inch storm drain; and 2) S02, located off Escondido Beach directly out from ASBS-028, a 36-inch storm drain. The City performed monitoring at receiving water Site 24-BB-03R. The assessment of compliance with natural water quality was primarily performed for receiving water station S02, which was the only site that had samples collected during three wet weather events. Receiving water station S02 is associated with ASBS-028, which is a 36-inch outfall that drains a mixture of developed and vacant land. Receiving water station S02 is considered to be representative of the typical to worst case scenario of the potential impact that storm water runoff may have on the water quality within the ASBS. The receiving water quality assessment is presented in Section 4.0, and a summary of the assessment is presented below.

In samples collected in the receiving water (Site S02), selenium, mercury, and total polynuclear aromatic hydrocarbons (PAHs) concentrations were above the 85th percentile reference threshold and had post-storm concentrations that exceeded those of the pre-storm samples collected during two consecutive monitored storm events. Based on the guidance found in Attachment 1 of the General Exception, this indicates an exceedance of natural water quality in the ASBS for these constituents.

Receiving water samples collected (Site S02) during one event, but not in subsequent events, that had concentrations above both the 85th percentile threshold and pre-storm concentrations include pyrethroids, nitrate as N, copper, lead, and zinc. These constituents do not meet the guidance criteria and are not considered an exceedance of the natural water quality in the ASBS.

During the three monitored events flow from ASBS-016 only reach the receiving water once at Site S01 and thus, receiving water chemistry data was only obtained once at S01 as part of the General Exception monitoring. Mercury, silver, zinc, and total PAHs concentrations in the receiving water were greater than both the 85th percentile threshold and pre-storm concentrations for Site S01. Receiving water concentrations above both the 85th percentile thresholds and pre-storm concentrations occurring during only one event is not considered to be an exceedance of natural water quality.

Pre-storm and post-storm samples were collected and analyzed at Site 24-BB-03R for two events. The post-storm selenium concentration in the receiving water was greater than both the 85th percentile threshold and pre-storm concentrations for only the first event (see Table 4-3). The post-storm ammonia as N, silver, and total PAHs concentrations in the receiving water were greater than both the 85th percentile threshold and pre-storm concentrations for only the second event. The concentration of selenium, ammonia, silver, and PAHs being above the 85th percentile threshold and pre-storm concentrations in one event is not considered an exceedance of natural water quality at Site 24-BB-03R. However, the selenium result at Site 24-BB-03R is consistent with the results at Site S02 where selenium is considered to be an exceedance of natural water quality based on first and second event results.

Pollution Loading Reduction Assessment

The General Exception states that the ASBS Compliance Plan shall describe how the necessary pollutant reductions in storm water runoff will be achieved through prioritization of outfalls and implementation of BMPs to achieve end-of-pipe pollutant concentrations targets during a design



storm to below either the Table 1 Instantaneous Maximum Water Quality Objectives (WQOs) in Chapter II of the Ocean Plan or a 90% reduction in pollutant loading during storm events for the applicant's total discharge. Constituents that are currently in exceedance of the natural water quality threshold of the ASBS, and that also have an associated Ocean Plan Table 1 Instantaneous Maximum WQO value (mercury and selenium), were compared with the Table 1 Instantaneous Maximum WQOs in order to determine the appropriate pollutant load reduction in accordance with the General Exception.

Monitoring Results

Chemistry results obtained from monitoring outfall discharges to ASBS 24 are presented in the main body of the Plan in Table 5-1 through Table 5-4 respectively. The Ocean Plan Table 1 Instantaneous Maximum WQOs for mercury and selenium are 0.4 µg/L and 150 µg/L, respectively. The Ocean Plan Table 1 does not list Instantaneous Maximum WQOs for PAHs. During the three monitored events the sampling results were all below these Ocean Plan Table 1 Instantaneous Maximum values. A summary of the highest measured values in comparison with the Ocean Plan Table 1 Instantaneous Maximum values as well as other Ocean Plan Table 1 WQOs is provided on Table ES-1-1.

Table ES-1-1. Summary of Ocean Plan WQOs Comparison to Maximum Outfall Results

Parameter	Ocean Plan Table 1 Values (Receiving Water Mixing Zone)			Maximum Measured Value (in Outfall Prior to Mixing Zone)		
	6-Month Median	Daily Maximum	Instantaneous Maximum	February 2013, Event 1	March 2013, Event 2	February 2014, Event 3
Mercury	0.04	0.16	0.4	0.16	0.06	<0.0012
Selenium	15	60	150	0.79	1.0	5.1

Outfall Assessment Conclusions

Following the guidance found in the Special Protections an assessment of outfalls was performed to determine where structural controls may be required to achieve the specified pollutant loading limitations on point source discharges into ASBS 24. The outfall assessment included comparing the mercury and selenium monitoring data results obtained to Ocean Plan Table 1 Instantaneous Maximum WQOs. The Ocean Plan Table 1 does list Instantaneous Maximum values for the protection of marine aquatic life for total PAHs. (The Ocean Plan Table 1 only lists a 30-day Average PAHs WQO for the protection of human health.) As shown in Table ES-1 the results of the comparison indicated the discharges to the ASBS from point sources (outfalls) are currently achieving, and significantly below, the target levels. Therefore, based on available data, and in accordance with the Special Protections of the General Exception, the outfalls being evaluated in this Plan do not require additional controls (e.g., BMPs) to achieve pollutant load reductions in the drainage areas tributary to the Parties' outfalls. However, due to the identified exceedance of natural water quality, outfall ASBS-28 is currently considered a priority outfall.

Anthropogenic Sedimentation Assessment

In accordance with the requirements of the General Exception, the natural habitat conditions in the ASBS shall not be altered as a result of anthropogenic sedimentation (SWRCB, 2012a). An



assessment of the potential areas prone to anthropogenic sedimentation was performed as part of this Compliance Plan for the purpose of identifying areas where sediment control BMPs may be required. The general assessment process included first performing a desktop analysis of geological conditions, topography, land use, and aerial imagery for the applicable area. Next, a reconnaissance of the area was performed to verify desktop findings and further analyze the drainage areas. Finally, the desktop and reconnaissance data collected were then compiled into this Plan.

Geologic processes, beginning as far back as 80 million years, created the sedimentary formations predominantly found along the coast shoreline and Point Dume upland mesa area, which include siltstone and sandstone. Approximately 16 million years ago, seismic activity began and continued for 3 million years to form the Santa Monica Mountains, which are composed of a combination of sedimentary and igneous rock formations (City, 1995). Land use zoning and development have occurred predominantly along the coast within the flatter areas at lower elevations. Some development has occurred inland within the Santa Monica Mountains, but for the most part, development in the mountainous areas of the ASBS 24 watershed has been restricted due to the conservation of the area at the federal, state, and local levels.

The desktop analysis included determining the general sediment risk for the area based on the procedures outlined in the Construction General Permit. These procedures included determining the rainfall erosivity (R factor), which is based on data collected over several years to determine the annual storm kinetic energy, on average, for the area. That factor, combined with properties of common soils and various slopes (up to 50%) and heights (up to 50 ft.), were used to determine the potential annual disturbed loose soil areas within the watershed. Calculation results indicated that the potential for soil loss within disturbed areas increases rapidly for areas having slopes greater than 10% and heights greater than a few feet. These results were used during the field reconnaissance to aid in determining if areas have the potential to contribute anthropogenic sedimentation to ASBS 24.

Field reconnaissance was performed with a focus on the areas that drain to the identified outfalls that discharge to ASBS 24. In general, the drainage areas primarily consisted of larger lots (0.25 to approximately 1 acre) with existing residential structures, hardscape improvements, and landscaping. Landscape vegetation of sloped areas within developed areas, including residential properties and roadway rights-of-way, were observed to have fairly good cover. No signs of erosion as a result of manmade improvements (e.g., rills, gullies caused by runoff from impervious surfaces) were observed in sloped areas, alongside secondary roads, or the PCH.

The sedimentation assessment indicates that currently there are no areas prone to anthropogenic sedimentation within the drainage areas to the identified outfalls that discharge to ASBS 24. Land use in the drainage areas consists predominantly of residential and vacant (open space) designations with associated roadway connections. The sloped areas associated with residential properties were observed to have good vegetation cover and appeared to be regularly maintained by landscaping professionals (see Figure 7-9). Areas where cuts (excavation) were made during the construction of roadways were observed to have either good vegetation cover that has been maintained by responsible property owners or consist of hard coastal bluff materials resistant to erosive forces (e.g., large bluff along the southeast portion of Zuma County Beach, as shown on Figure 7-11). Therefore, at this time, no additional sediment BMPs are required by this plan.



Conclusions

The assessments performed in the preparation of this Compliance Plan indicate that no additional structural controls (BMPs) are required based on the guidance presented within the Special Protections. However, the Parties recognize that the ASBS 24 is one of most valued resources in the region and that wherever possible and feasible additional reductions in pollutant loading should be achieved. Accordingly, various existing nonstructural programs will continue to be implemented in order to maintain compliance with the requirements of the Special Protections and possibly achieve further reductions in pollutant loading. The Parties are considering implementing additional nonstructural controls and enhancements to existing controls for the purpose of further reducing pollutant loading to the ASBS. Additionally, in July 2015, the City deemed construction complete for structural BMPs for the areas of Broad Beach Road and Wildlife Road where City inlets drain to private outlets in the ASBS area.

Cost Estimate

The Parties have implemented numerous nonstructural controls and related programs in order to eliminate non-storm water, non-authorized discharges to ASBS 24. The Parties continue to maintain these measures, and the annual estimated costs associated with the key programs, which are detailed in Section 3.0, are provided on Table ES-1-2. Appendix B contains a list along with brief descriptions of various existing nonstructural measures implemented by the Parties.

Structural controls are being proposed and currently in the planning and permitting phase for the areas of Broad Beach Road and Wildlife Road. These structural controls will provide additional reduction of pollutant loading into the ASBS but are not directly connected to the Compliance Plan (i.e., not a result of the assessments performed for this document and not a requirement of this document). The costs for these structural controls are not included on Table ES-1-2. More information on these structural controls, included estimated costs, is included in Appendix C.

Table ES-1-2. Annual Nonstructural Programs Costs

Program Type	Approximate Cost (\$/year)
PIPP Subtotal	\$228,407
O&M Subtotal	\$1,182,500
Enforcement Subtotal	\$111,752
Total	\$1,522,659



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LIST OF ABBREVIATIONS AND ACRONYMS

Ag	Silver
AMSL	above mean sea level
As	arsenic
ASBS	Areas of Special Biological Significance
Bight	Southern California Bight Regional Monitoring Program
Bight 2008	Southern California Bight 2008 Regional Monitoring Program
Bight 2013	Southern California Bight 2013 Regional Monitoring Program
BMP	best management practice
CA	California
Caltrans	California Department of Transportation
Cd	cadmium
City	City of Malibu
Committee	Bight 2013 ASBS Planning Committee
County	County of Los Angeles
CPS	Coastal Preservation Specialist
Cr	chromium
Cu	copper
District	Los Angeles County Flood Control District
EI	Erosivity Index
EMAP	Monitoring & Assessment Program
EPPP	Environmentally Preferable Purchases and Practices Policy
ESRI	Environmental Systems Research Institute
ft.	feet
GIS	Geographic Information System
Hg	mercury
HSPF	Hydrologic Simulation Program–FORTRAN
Hydrology Manual	Los Angeles County Hydrology Manual
IC/ID	Illicit Connection/Illicit Discharge
in.	inches
LACDPW	Los Angeles County Department of Public Works
LACoMAX	Los Angeles County Materials Exchange
LAWQCB	Los Angeles Regional Water Quality Control Board
LIEP	Landscape Irrigation Efficiency Program
LSPC	Loading Simulation Program C++
LSWPPP	Local Storm Water Pollution Prevention Plan
LUP	Land Use Plan
m	meter
MACC	Malibu Area Conservation Coalition
mg/L	milligram per liter
MS4	municipal separate storm sewer system
N	nitrogen
Ni	nickel
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance



Ocean Plan	California Ocean Plan
OFG	Ocean Friendly Garden
P	phosphorus
PAH	polynuclear aromatic hydrocarbons
Parties	LACDPW, District, and City
Pb	lead
PCH	Pacific Coast Highway
PIPP	public information and participation program
Plan	Compliance Plan
POTFW	wash-off potency factor
RCPP	Recycled Products Purchasing Policy
RGO	retail gasoline outlets
RMD	Road Maintenance Division
ROW	Right-of-way
SCAG	Southern California Association of Governments
SCCWRP	Southern California Coastal Water Research Project
Se	selenium
State Board	State Water Resources Control Board
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
T.H.	townhouse
Tc	time of concentration
TMDL	total maximum daily load
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
USLE	Universal Soil Loss Equation
WDID	Waste Discharge Identification Number
Weston	Weston Solutions, Inc.
WMMS	Watershed Management Modeling System
WQOs	water quality objectives
WWECP	Wet Weather Erosion Control Plan
Zn	zinc
µg/L	microgram per liter



1.0 INTRODUCTION

In 1974 and 1975, the California State Water Resources Control Board (SWRCB) designated 34 coastal areas in California as Areas of Biological Significance (ASBS). The ASBSs are ocean areas requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable. One of these ASBS, known as ASBS 24, is located along 24 miles of the Ventura and Los Angeles County coastline, from Laguna Point to Latigo Point (SWRCB, 1979).

The California Ocean Plan (Ocean Plan) prohibition on discharges of waste to ASBS has been in place since 1983. The SWRCB may grant exceptions to this prohibition if the exception will not compromise the protection of ocean waters for beneficial uses and the public interest will be served (SWRCB, 2012a). On March 20, 2012, the SWRCB adopted a General Exception to the Ocean Plan ASBS waste discharge prohibition. The General Exception was amended and adopted as Resolution 2012-0031 on June 19, 2012 (SWRCB, 2012b).

The General Exception includes Special Protections that dischargers covered under the General Exception must comply with. For ASBS 24, the County of Los Angeles (County), the Los Angeles County Flood Control District (District), and the City of Malibu (City) were included in the list of responsible entities required to prepare an ASBS Compliance Plan for point source discharges of storm water and a Pollution Prevention Plan for non-point source waste discharges by September 30, 2013. An extension of one year was granted due to the lack of rainfall and water quality monitoring opportunities. This Compliance Plan has been prepared by the County, District, and City (the Parties) as specified in the General Exception. The Pollution Prevention Plan has been prepared under a separate cover.

1.1 Compliance Plan Objective and Scope

This Compliance Plan (Plan) documents the existing ASBS and ASBS watershed conditions and policies within the Parties' jurisdiction for the purpose of demonstrating either compliance with the point source discharges of storm water requirements specified in the General Exception Attachment B – *Special Protection for Areas of Special Biological Significance, Governing Point Source Discharges of Storm Water and Nonpoint Source Waste Discharge* (Special Protections), or describing the steps necessary to achieve compliance within the time frame allotted. This Plan focuses on point source discharges, which by this document are defined as outfalls that have associated storm networks that drain significant areas and that are entirely or partially maintained by an agency. Using this definition, point sources identified in this document coincide with conveyances that are equal to or greater than 18 inches in size (diameter or width) that discharge directly to the ASBS shoreline and the Parties maintain the outfall and/or inlets. Potential discharges from smaller pipes and conveyances (not defined as point sources) are defined in the Special Protections as nonpoint sources, and discussed in the Pollution Prevention Plan.

The following tasks associated with point source discharge locations and drainage areas were performed as part of the process to prepare this Plan:



- Preparing a map of the ASBS watershed showing surface drainage of storm water runoff and outfall locations (18 inches or greater in size).
- Preparing procedures to allow for future updates to the Compliance Plan map.
- Evaluations of compliance with the permitted point source discharges of storm water, which includes the prohibition of non-storm water discharges (i.e., discharges not composed entirely of storm water and not specifically allowed in accordance with Special Protections Section I.A.1.e).
- Assessment of the Parties' inspection policies.
- Collection and analysis of water quality samples in accordance with Section IV of the Special Protections.
- Assessment, using water quality sample results, of whether the storm water discharges are altering the natural water quality of the ASBS.
- Assessment of pollutant load reduction targets and outfall prioritization.
- Assessment of potential sources of anthropogenic sedimentation.
- Compilation of assessment and data into this Compliance Plan.
- Description of the nonstructural controls currently employed and planned in the future and implementation schedule

1.2 ASBS 24 Watershed Responsible Agencies

The Laguna Point to Latigo Point ASBS, also referred to as ASBS 24, stretches 24 miles, contains 11,842 marine acres, and is the largest ASBS along the mainland of Southern California. The boundary of ASBS 24 extends out from the mean high tide line at Laguna Point in Ventura County to either 1,000 ft. from shore or to the 100-ft isobath (whichever is greater) in a southwesterly direction to Latigo Point in Malibu, Los Angeles County.

This Plan includes the applicable drainage areas and point discharges that are the Parties' purview (i.e., drainage area is within either the jurisdiction of the City or Unincorporated County and/or the outfall ownership is either the County's or District's). These include the areas of the unincorporated County and City of Malibu along the coast south the Los Angeles County boundary and west of Latigo Point. Figure 1-1 shows the overall ASBS watershed within Los Angeles County, along with jurisdictional boundaries. Properties within the ASBS watershed in which the Parties do not have jurisdictional authority and thus are excluded from this Plan include, but are not limited to, federal lands, state parks, and state rights-of-way (see Section 2.1.2 for more information on these excluded properties).

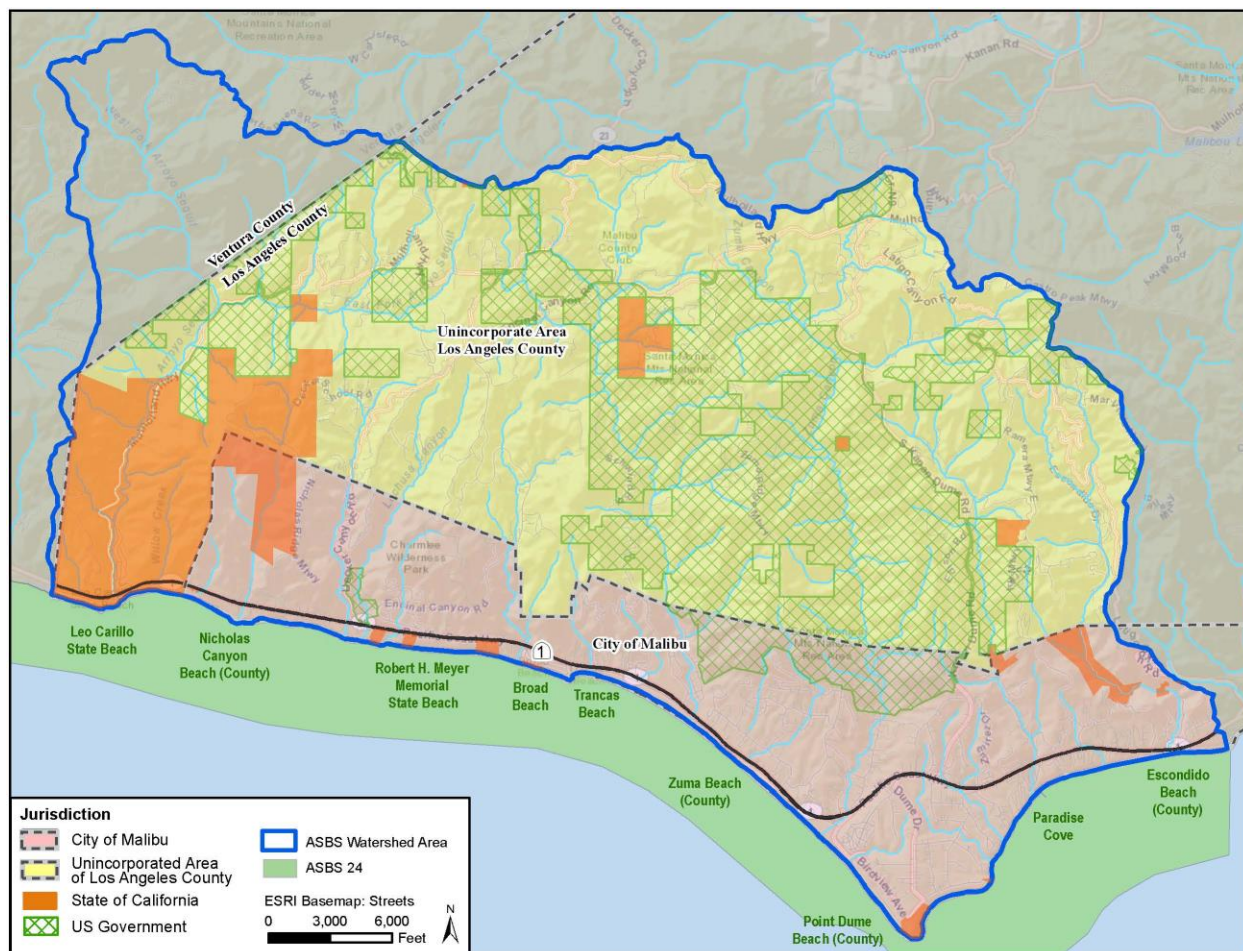


Figure 1-1. ASBS 24 Watershed and Jurisdictional Boundaries



2.0 ASBS 24 WATERSHED

2.1 General Site Conditions and Land Use

2.1.1 Topography

In general, the elevations within the ASBS 24 drainage area vary from sea level to 1,700 ft. above mean sea level (AMSL). Areas within the Santa Monica Mountains, typically north of the Pacific Coast Highway (PCH), contain steep hills, canyons, and valleys that drain to ASBS 24. These mountains consist of steep slopes with a 20% or greater gradient (SWRCB, 1979). Most of the developed areas along the coast lie below 100 ft., with the exception of the Point Dume and Malibu Park areas, which reach an elevation of approximately 500 ft. The hillsides and coastal mesas, such as Big Rock and Las Flores (both on the eastern end of town well outside of the ASBS), have elevations ranging from 300 to 400 ft. AMSL (City, 1995).

North of Broad Beach, extending to the County jurisdictional boundary, the coastal topography consists of narrow beaches adjacent to near-vertical natural bluffs that extend between 50 ft. to 200 ft. above mean sea level (alms). The mesas above the bluffs slope towards the coast at approximately 2% to 10%. The mesas extend inland and merge with the Santa Monica Mountains, which as previously stated are characterized by steep and rugged hillsides and valleys and canyons. The mesas have various valleys and canyons that coincide with the mountain valleys and canyons that provide the area with natural drainage to the ocean.

The area of Broad Beach south to Zuma County Beach is characterized, in general, by gentle seaward sloping natural topography (approximately 2 to 4%) with some near-vertical bluffs located further inland at varying distances from the ocean between approximately 1,000 ft. to 3,500 ft. and similar to those bluffs previously described.

The Point Dume area consists of narrow beaches followed by near vertical bluffs that extend from approximately 200 ft. northwest of the point to approximately 500 ft. northeast of the point. The mesa area above the beach is large and consists of sloping terrain which has formed high and low areas as well as valley and canyons that drain the area to the ocean. This topography continues northeast to approximately Escondido Beach, where the area has an approximately 10% gradient towards Escondido Creek.

South of Escondido Creek, the topography is similar to that of Broad Beach, with an area of gentle seaward sloping terrain along the ocean followed by relatively small inland bluffs and upland sloped areas.

2.1.2 Current Land Use

Land use data within the drainage area to the portion of ASBS 24 located south of the LA-Ventura County jurisdictional boundary were compiled and analyzed using GIS software and available land use data sources, including data provided by the City (2010 data for the City portion) and LACDPW (2008 data for the County portion). Both of these sources use Southern California Association of Governments (SCAG) land use codes. The SCAG classifications were



generalized for inclusion into this document and for mapping purposes. Roads were not included in the land use; however, data were filled in with the mapping and analysis software.

Along the coast, the location of the County jurisdictional boundary coincides with a natural high point in the topography, and thus, the drainage area boundary follows the County jurisdiction boundary fairly well for a couple of miles inland. The land use analysis indicated that the overall drainage area to ASBS 24 includes approximately 31,400 acres, of which approximately 28,480 acres are located within the County jurisdictional boundary, and 2,900 acres are located in Ventura County.

The portion of the drainage area located within Ventura County is composed primarily of natural open space, mountainous terrain. The drainage area within the LA County portion is under the jurisdiction of multiple entities, including national parks, state parks, Unincorporated County, City of Malibu and Caltrans. The properties located south of the jurisdictional boundary are within the Unincorporated County and City's jurisdiction. However, several parcels have federal, state, or conservation authority ownership and are designated as National or State Parks. Table 2-1 summarizes land areas associated with the County and City and includes information on federal- and state-owned properties.

Table 2-1. Property Ownership Summary

Ownership	Unincorporated County Area (acres)	City of Malibu Area (acres)	Total (acres)
Federal	7,490	740	8,230
State	2,330	520	2,850
Conservation Authority/Conservancy	300	10	310
Remainder (Non-specified)	10,140	6,950	17,090
Total	20,260	8,220	28,480

The general land use within the drainage area is approximately 86.1% open space public lands; 4.9% low-density residential; 4.8% very-low-density residential; 2.6% medium-density residential; and about 1.6% either low-density commercial, industrial, high-density residential, planned development, high-density commercial, water, urban reserve, and mixed use (SWRCB, 2012c).

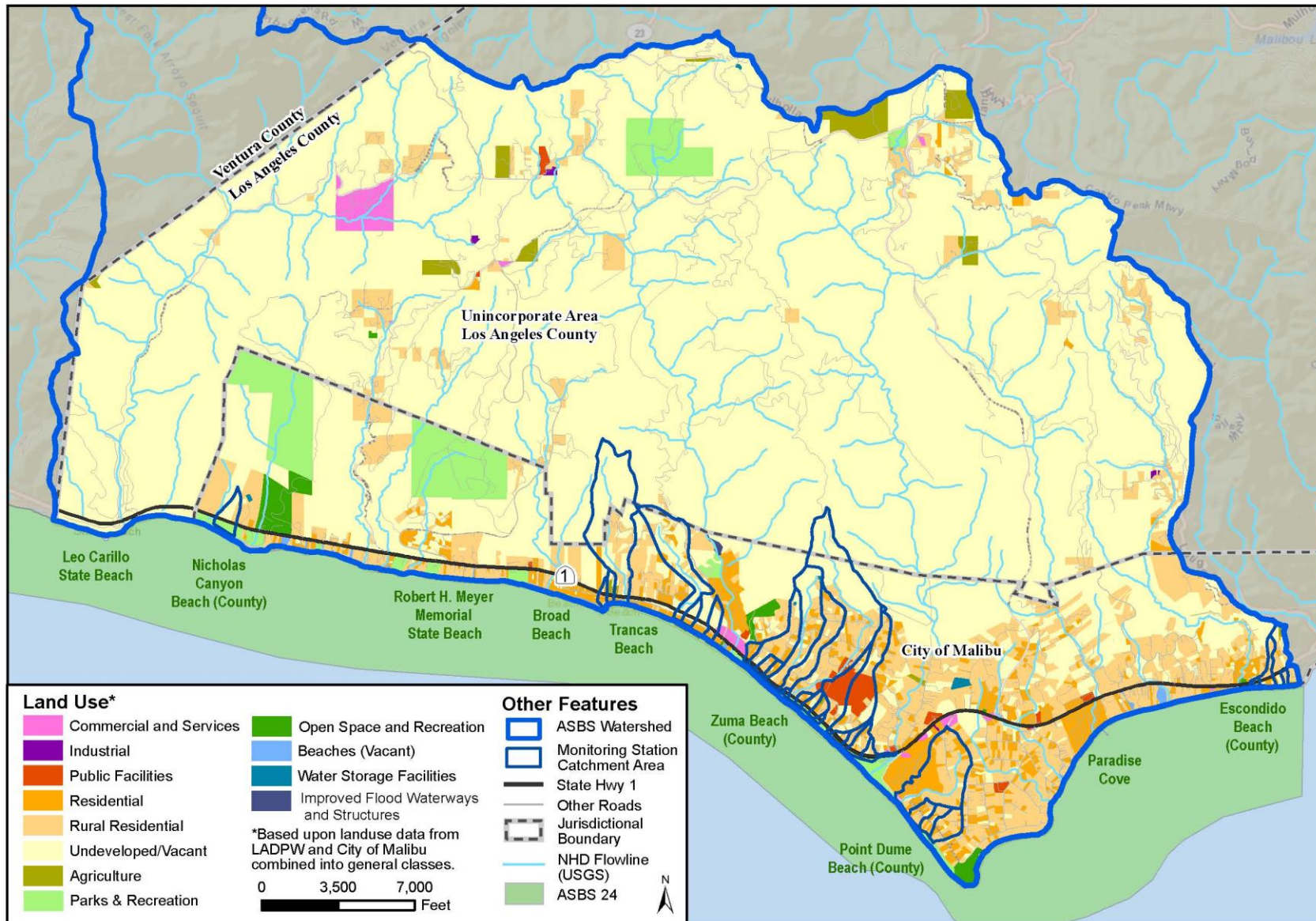


Figure 2-1. ASBS 24 Drainage Area Land Use Map



2.2 Geological Setting

2.2.1 Regional Geology

The ASBS 24 coastal drainage area is composed of an extremely complex geology that has resulted from the geologic uplift which formed the Santa Monica Mountains. The area is located within the northwestern corner of the Los Angeles basin, which lies at the boundary or juncture between two major geomorphic or structural provinces of southern California: 1) the Peninsular Ranges province, consisting primarily of a northwest-oriented structural grain; and 2) the Transverse Ranges structural province, which features a predominantly east-west-oriented structural grain. The Los Angeles structural basin originated roughly 16 million years ago in what is designated the Miocene geologic epoch. However, the Los Angeles basin area, in general, has been a site of continuous sedimentary deposition for at least the past 80 million years. The sedimentary rocks underlying the Santa Monica Mountains in the ASBS 24 drainage area are generally highly folded and complexly faulted (City, 1995).

2.2.2 ASBS 24 Geology

The Malibu Coast fault runs in an east-west alignment within the ASBS 24 drainage area. The fault is a boundary between two very different geologic terranes: to the south, Catalina Schist is overlain by Miocene and younger deposits; and to the north, Santa Monica Slate and plutonic granodiorite is overlain by Upper Cretaceous through upper Miocene deposits (i.e., Santa Monica Mountains) (Yerkes and Campbell, 1979). The fault is aligned in a near east-west direction following the coast line from the County's north jurisdictional boundary east to Lechuza Point. East of Lechuza Point the fault continues in a near east-west alignment to Corral Beach (east of ASBS 24). The fault continues east along the coastline (NPS, 2007). North of the Malibu Coast fault, the local bedrock structure of the Santa Monica Mountains can be modeled as an asymmetric, south-vergent, westward-plunging anticline, including sandstone and siltstone bedrock (e.g., Tuna Canyon Formation, Sespe Formation, Vaqueros Formation, and Topanga Group). South of the Malibu Coast fault, the ductile bedrock units, Trancas and Monterey Formations, contain a high percentage of shales, mudstones, and diatomaceous rocks that exhibit complex folding and pervasive shearing (City, 1995).

The majority of the area along the Malibu coast comprises the Santa Monica Mountains. The portion of the ASBS 24 and uplands areas between Point Mugu, which is north of the County's jurisdictional boundary and La Piedra State Beach, comprise the Santa Monica Mountains formations. North of Point Mugu, the coastal area consists of low-lying land that comprises the Ventura-Oxnard Alluvial Plain. The Malibu Coast fault separates the Santa Monica Mountains from the coastal formations between La Piedra State Beach and Corral Beach. The portion of ASBS 24 between La Piedra State Beach area and the south extents of Broad Beach, south of the Malibu Coast Fault, consists of Malibu Bluff Coast Trancas Formation. The Trancas Formation consists chiefly of sandstone, mudstone, silty shale, and claystone. This formation extends north (upland from the ocean), varying distances between a few hundred feet to a few thousand feet. Southeast of Broad Beach, the ASBS and entire upland coastal area, bound to the north by the Malibu Coast Fault, comprise the Malibu Bluff Coast Monterey/Modelo Formation (SWRCB, 1979). The Monterey Formation consists of marine clay shale and laminated to platy siltstone



that are variably diatomaceous, bituminous, phosphatic, siliceous, or cherty, and interbedded altered vitric tuffs and fine- to medium-grained sandstone that locally is schist bearing.

The Malibu bluff coast is triangular with its widest point at Point Dume. This region is structurally the most complex within the ASBS. The rocks are highly folded and steeply dipping so that very different rock types lie next to each other. The western part of this bluff coast from little Sycamore Canyon to Trancas Beach is made up of older Tertiary (Miocene) erosion-resistant rocks of the Trancas Formation. The white cliffs of Paradise Cove are outcrops of the Miocene age Modelo Formation which forms steep inclined bids from Zuma Beach eastward to Corral Beach. This formation is predominantly siliceous shale and was probably formed in the deep sea. The headland at Point Dume is highly resistant igneous breccia which has protected the softer sedimentary shale behind it from erosion. In addition to the Miocene deposits, there is an irregular veneer of Pleistocene marine terrace deposits on the bluff between the ocean and the mountains adjacent to the eastern section of the ASBS. This is a reddish, poorly stratified, and sorted material, which is soft and easily dissected. It tends to form steep-sided stream gullies and sea cliffs (SWRCB, 2008).

The geologic features within the ASBS 24 drainage area are shown in Figure 2-2. Map symbols used along the coastal area were defined using the National Geologic Map Database. Pleistocene marine terrace deposits along the shoreline include the Trancas and Monterey Formations. The symbols used to depict general costal geologic features in Figure 2-2 include the following:

- Qa – Alluvial gravel, sand, and clay of flood plains.
- Qaf – Artificial cut and fill.
- Qao – Older dissected alluvial gravel, sand and clay; on coastal area deposited in part on a wave-cut platform, forms several terraces.
- Qg – Gravel and sand of major stream channels.
- Qls – Landslide debris.
- Qos – Old dune sand at Point Dume.
- Qs – Beach Sand.
- Tr – Trancas Formation composed of marine sandstone, mudstone, silty shale, and claystone.
- Tmt – Modelo/Monterey Formation composed of marine clay shale and laminated to platy siltstone with sandstone.

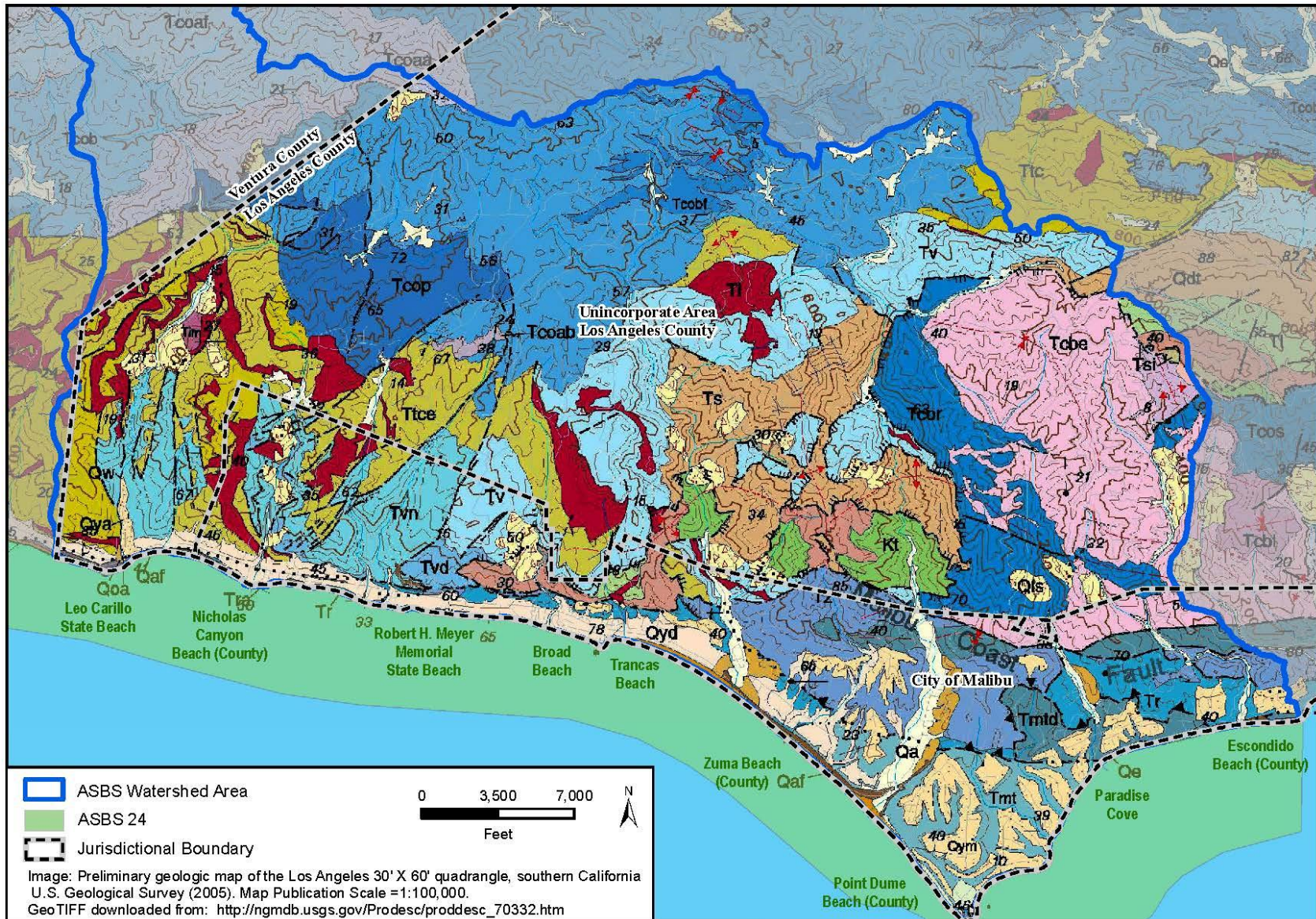


Figure 2-2. Geology Map of Overall ASBS 24 Drainage Area



2.3 Site Hydrology

The Santa Monica Mountains within the ASBS watershed generally slope towards the south to southwest. Except for the lower laying and relatively flat portion of the coast north of Point Dume extending to Broad Beach, the coast is lined with a steep bluff area that varies in height. Slopes along the coast above the bluff are gentle to moderate, with gradients typically between 2% and 20%. Inland, the watershed consists of much steeper terrain (typically 3:1 or steeper) covered with native coastal vegetation.

The Santa Monica Mountains have formed various peaks and valleys that collect runoff into 21 natural streams and gullies that drain to ASBS 24. Outside of this network of natural streams, 39 storm drain outfalls 18 inches in diameter or larger fall under the Parties' responsibility. Typically, the drainage areas to these outfalls consist of open space and/or development. The areas of development primarily include residential properties occupied by single-family dwellings surrounded by maintained landscaping along with associated roadways. The state-maintained PCH with various associated storm drain inlets extends across the length of the watershed near the coastline.

2.4 Monitoring Activities

2.4.1 2013 Regional Monitoring Program

As part of the exception process, LACDPW and the City participated in the Bight 2008 and Bight 2013 ASBS Planning Committee (Committee) with the State Board, the Southern California Coastal Water Research Project (SCCWRP), and other ASBS dischargers in Southern California. Together, the Committee developed a Regional ASBS Work Plan that is based on the Special Protections document. The Regional ASBS Work Plan is intended to provide compliance guidance to applicants of the General Exception in Southern California that wish to participate in the Southern California Bight 2013 Regional Monitoring Program (Bight 2013).

All outfalls that are equal to or greater than 18 inches in diameter are required to be monitored for oil and grease, total suspended solids (TSS), and toxicity, while outfalls that are equal to or greater than 36 inches in diameter are required to be monitored for metals, polynuclear aromatic hydrocarbons (PAHs), pyrethroids, organophosphorus pesticides, and nutrients (ammonia, nitrate, and phosphates) in addition to oil and grease, TSS, and toxicity. Furthermore, each discharger participating in the Regional Monitoring Program is required to monitor one ocean receiving water station which is representative of worst-case discharge conditions (i.e., co-located at a large drain greater than 36 inches, if possible).

As participants in the Bight 2013, LACDPW monitored 21 storm drains along ASBS 24, nine of which are operated by LACFCD, and 12 of which are operated by the County. Additionally, the City of Malibu, which owns storm drain inlets that drain to ASBS 24 via outfalls that are privately owned, monitor three outfalls located along Broad Beach; other private outfalls with City maintained inlets were not proposed to be monitored due to being inaccessible.

The ASBS Special Protections monitoring data used in this document were collected and analyzed during the 2012-2013 and 2013-2014 wet seasons. The monitoring performed complies



with the monitoring requirements of the Regional Monitoring Program through the identification of water quality impacts to ASBS 24 during storm events. The Special Protections document describes the following two types of monitoring programs:

1. **Core Discharge Monitoring** – collecting and analyzing wet weather runoff from the discharge of outfalls during a storm event.
2. **Ocean Receiving Water Monitoring** – collecting and analyzing samples from the ocean before and after a storm event at two locations (i.e., directly in front of the discharge and at a reference site removed from the discharge). For the monitoring performed during the 2012-2014 wet weather season, ocean receiving water monitoring at the discharge site was the responsibility of the discharger, while reference station monitoring was performed by SCCWRP.

2.5 ASBS 24 OUTFALL DESCRIPTIONS

A description of the point source outfalls is provided that includes the location, size, ownership, and tributary general land use. LACDPW identified 11 storm drain outfalls having a diameter equal to or greater than 18 inches that drain to ASBS 24 and are owned and maintained by the County. Nine storm drain outfalls that have a diameter greater than or equal to 18 inches and drain to ASBS 24 are owned and maintained by the District. These nine outfalls occur along Broad Beach and Escondido Beach and convey runoff from upstream neighborhoods and PCH. The City identified eight privately owned storm drain outfalls with City maintained inlets that have diameters equal to or greater than 18 inches. These storm drains convey runoff from Broad Beach Road and Wildlife Road to the storm drain outfalls located along Broad Beach and the seaside cliffs of Little Dume Cove. An additional 10 storm drain outfalls are currently of undetermined ownership. These storm drains with undetermined ownership convey flow from PCH and upstream neighborhoods. These 39 storm drain outfalls are considered point source discharges of storm water to ASBS 24 and are described in the following section. Figure 2-3 shows the outfall locations.

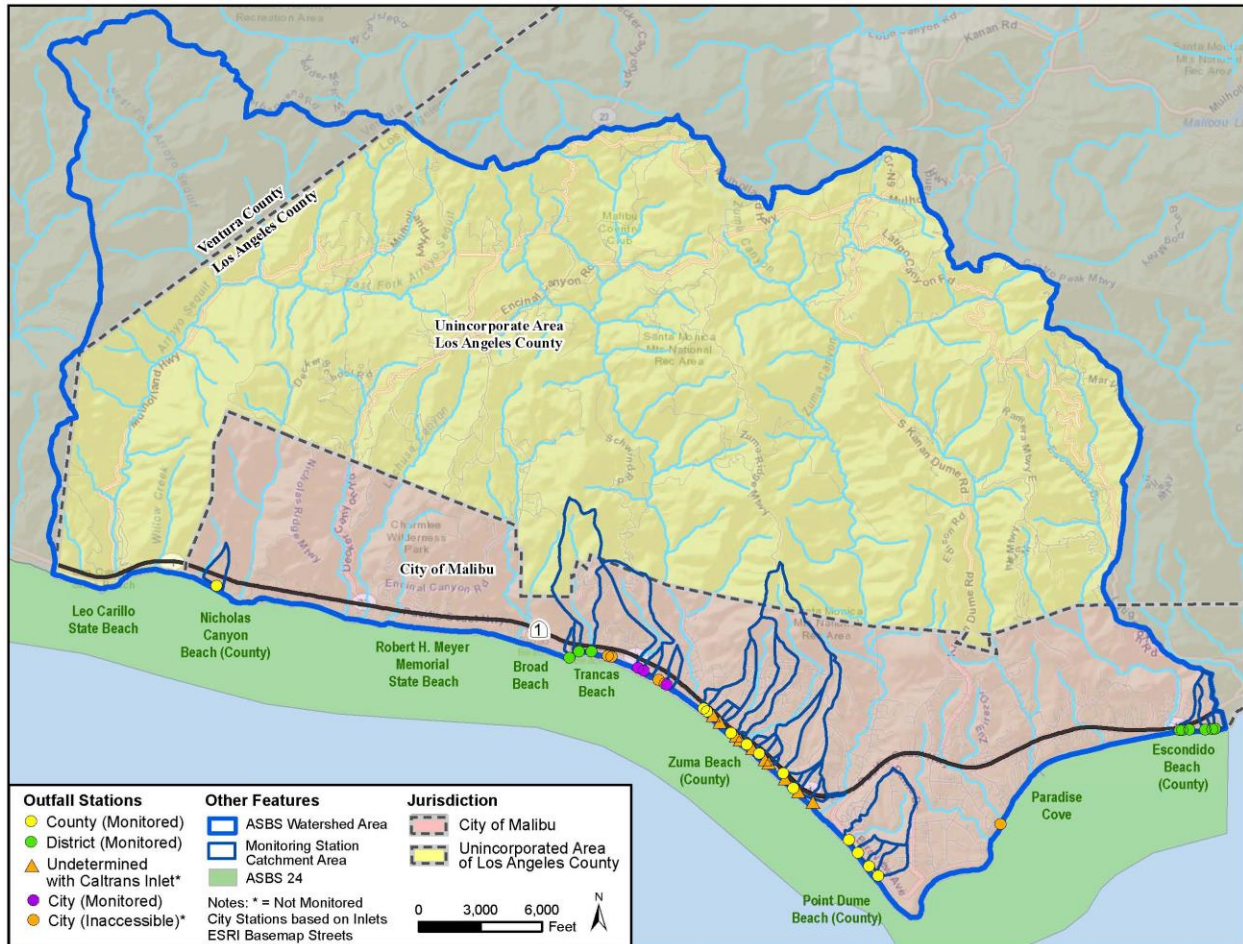


Figure 2-3. ASBS Outfall Location Map

2.5.1 County Outfalls

The 11 outfalls that fall under the jurisdiction of the County are located along Zuma Beach (six outfalls), Westward Beach (four outfalls) and Nicholas Beach (one outfall). The location of each County outfall is provided on Table 2-2 and show in Figure 2-4. A summary, including the diameter, monitoring data collected at each outfall pipe, and the observed flow connection (or absence), is provided on Table 2-3. A description of each outfall is provided in the text following Figure 2-4.



Table 2-2. County Outfall Locations and Diameters

Beach Location	Site Name	Latitude	Longitude	Pipe Diameter (inches)
Zuma Beach	ASBS-004	34.028038	-118.840179	24
	ASBS-005	34.027683	-118.839637	36
	ASBS-008	34.024833	-118.835784	24
	ASBS-011	34.023258	-118.833213	24
	ASBS-013	34.022087	-118.83123	18
	ASBS-016	34.019493	-118.827316	60
	ASBS-018	34.01749	-118.825668	24
Westward Beach	ASBS-021	34.010665	-118.816688	48
	ASBS-022	34.00893	-118.815261	36
	ASBS-023	34.007139	-118.81343	42
	ASBS-024	34.005847	-118.811958	24
Nicholas Beach	ASBS-031	34.043883	-118.918621	22

Table 2-3. County Outfall Diameters, Collected Monitoring Data, and Flow Summary

Beach Location	Site Name	Pipe Diameter (in)	Analyses Performed	Storm Events Analyzed			Did flow reach receiving water?		
				2/19/2013	3/8/2013	2/28/2014	2/19/2013	3/8/2013	2/28/2014
Zuma Beach	ASBS-004	24	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	No	Yes
	ASBS-005	36	Full Chem. List*; Bivalve Toxicity	x	x	x	No	No	Yes
	ASBS-008	24	TSS, O&G, Bivalve Toxicity	Not Monitored	x	Not Monitored	Unknown	No	Unknown
	ASBS-011	24	TSS, O&G, Bivalve Toxicity	x	x	x	No	No	No
	ASBS-013	18	TSS, O&G, Bivalve Toxicity	No Flow	x	x	No	No	No
	ASBS-016**	60	Full Chem. List*; Bivalve Toxicity	No Flow	x	x	No	No	Yes
	ASBS-018	24	TSS, O&G, Bivalve Toxicity	x	x	x	No	No	No
Westward Beach	ASBS-021	48	Full Chem. List*; Bivalve Toxicity	x	x	x	No	Yes	Yes
	ASBS-022	36	Full Chem. List*; Bivalve Toxicity	x	x	x	No	No	Yes
	ASBS-023	42	Full Chem. List*; Bivalve Toxicity	x	x	x	No	No	No
	ASBS-024	24	TSS, O&G, Bivalve Toxicity	x	x	x	No	No	Yes
Nicholas Beach	ASBS-031	22	TSS, O&G, Bivalve Toxicity	No Flow	No Flow	No Flow	No	No	No
Ocean Receiving Water	S01	n/a	Full Chem. List*; Kelp, Bivalve, and Echinoderm Toxicity	No Flow to ocean from ASBS-016	No Flow to ocean from ASBS-016		Not Applicable		

*Full chemistry list= TSS, oil and grease, metals, PAHs, pyrethroids, OP pesticides, ammonia, nitrate and total phosphorus.

* *Flow monitoring equipment installed in this outfall pipe.

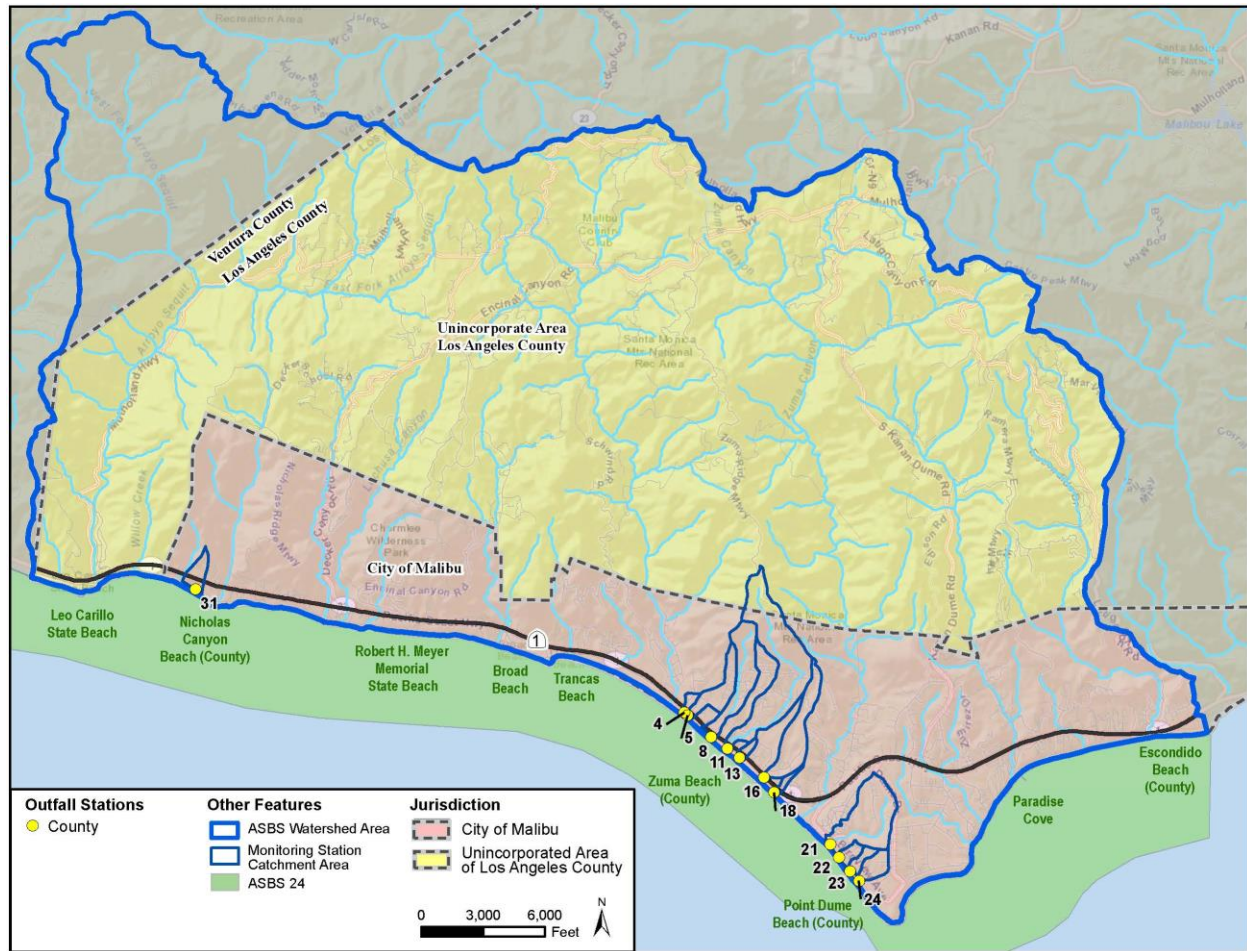


Figure 2-4. County ASBS Outfall Location Map

Zuma Beach Outfalls

ASBS-004 is a 24-inch outfall located at the northern end of Zuma Beach, adjacent to the northernmost parking lot along Zuma Beach Access Road (Figure 2-5). This outfall is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013 and February 28, 2014). The watershed draining to ASBS-004 is 9.8 acres in size and the surrounding landscape at ASBS-004 consists of a gradually sloping, broad sandy beach.



Figure 2-5. ASBS-004 Outfall



ASBS-005 is a 36-inch outfall located at the northern end of Zuma Beach, adjacent to the northernmost parking lot along Zuma Beach Access Road, and directly across from the intersection of Guernsey Avenue with PCH (Figure 2-6). This outfall is accessible during all tides and was sampled during the February 19, March 8, 2013, and February 28, 2014, storm events. The watershed draining to ASBS-005 is 65.8 acres in size and the surrounding landscape at ASBS-005 consists of a gradually sloping, broad sandy beach.



Figure 2-6. ASBS-005 Outfall

ASBS-008 is a 24-inch outfall located at the northern end of Zuma Beach, near a parking lot along Zuma Beach Access Road (Figure 2-7). This outfall is accessible during all tides and was sampled during the March 8, 2013, storm event (it was added to the list of monitored sites following the February 19, 2013, storm event). The watershed draining to ASBS-008 is 114.8 acres in size and the surrounding landscape at ASBS-008 consists of a gradually sloping, broad sandy beach.



Figure 2-7. ASBS-008 Outfall

ASBS-011 is a 24-inch outfall located in middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road (Figure 2-8). This outfall is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-011 is 7.0 acres in size and the surrounding landscape at ASBS-011 consists of a gradually sloping, broad sandy beach.



Figure 2-8. ASBS-011 Outfall

ASBS-013 is an 18-inch outfall located in middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road (Figure 2-9). This outfall is accessible during all tides and was sampled during only the March 8, 2013, and February 28, 2014, storm events, as it did not flow during the February 19, 2013, storm event. The watershed draining to ASBS-013 is 10.4 acres in size and the surrounding landscape at ASBS-013 consists of a gradually sloping, broad sandy beach.



Figure 2-9. ASBS-013 Outfall

ASBS-016 is a 60-inch outfall located in middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road (Figure 2-10). This box culvert outfall is accessible during all tides and was sampled during only the March 8, 2013, and February 28, 2014, storm events, as it did not flow during the February 19, 2013, storm event. Flow monitoring equipment was installed in this outfall. The watershed draining to ASBS-016 is 115.1 acres in size and the surrounding landscape at ASBS-016 consists of a gradually sloping, broad sandy beach.



Figure 2-10. ASBS-016 Outfall

ASBS-018 is a 24-inch outfall located at the southern end of Zuma Beach, adjacent to a lifeguard station in the middle of the beach off Zuma Beach Access Road (Figure 2-11). This outfall is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-018 is 10.0 acres in size and the surrounding landscape consists of a gradually sloping, broad sandy beach.



Figure 2-11. ASBS-018 Outfall

Westward Beach Outfalls

ASBS-021 is a 48-inch outfall located at the northern end of Westward Beach, adjacent to an entrance gate near the intersection of Birdview Ave. and Westward Beach Road (Figure 2-12). This outfall is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-021 is 170 acres in size and the surrounding landscape at ASBS-021 consists of a gradually sloping, broad sandy beach.



Figure 2-12. ASBS-021 Outfall

ASBS-022 is a 36-inch outfall located at the northern end of Westward Beach, midway between the entrance gate and the edge of the parking lot on Westward Beach Road (Figure 2-13). This outfall is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014).. The watershed draining to ASBS-022 is 18.4 acres in size and the surrounding landscape at ASBS-022 consists of a gradually sloping, broad sandy beach.



Figure 2-13. ASBS-022 Outfall

ASBS-023 is a 42-inch outfall located in the middle portion of Westward Beach, approximately 100 meters (m) north of the parking lot on Westward Beach Road (Figure 2-14). This outfall is difficult to find since it is hidden by ice plant. ASBS-023 is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-023 is 18.4 acres in size and the surrounding landscape at ASBS-023 consists of a gradually sloping, broad sandy beach.



Figure 2-14. ASBS-023 Outfall



ASBS-024 is a 24-inch outfall located in the middle portion of Westward Beach, approximately 100 m south of the edge of the parking lot on Westward Beach Road (Figure 2-15). This outfall is accessible during all tides and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-024 is 34.9 acres in size and the surrounding landscape at ASBS-024 consists of a gradually sloping, broad sandy beach.



Figure 2-15. ASBS-024 Outfall

Nicholas Beach Outfall

ASBS-031 is a 22-inch outfall located in the middle portion of Nicholas Beach, at the base of Nicholas Beach Road (Figure 2-16). This outfall is accessible during all tides; however, no flow was observed during either of the monitored storm events. The watershed draining to ASBS-031 is 30.1 acres in size and the surrounding landscape at ASBS-031 consists of a gradually sloping, broad sandy beach.



Figure 2-16. ASBS-031 Outfall

2.5.2 Outfalls Whose Ownership is Undetermined [With Inlets Owned by Caltrans]

Along Zuma Beach, 10 outfalls drain to ASBS 24 and are equal to or greater than 18 inches in diameter; however, ownership has not been determined. These outfalls have inlets maintained by Caltrans. A brief summary of the location and diameter of each of these outfalls with undetermined ownership is provided on Table 2-4, and Figure 2-17 shows the outfall locations. A description of each outfall is provided in the text that follows Figure 2-17.



Table 2-4. Locations and Diameters of Outfalls with Undetermined Ownership

Beach Location	Site Name	Latitude	Longitude	Pipe diameter (inches)
Zuma Beach	ASBS-006	34.027069	-118.838623	24
	ASBS-007	34.026184	-118.837539	24
	ASBS-009	34.024349	-118.834899	24
	ASBS-010	34.023872	-118.834304	18
	ASBS-012	34.022735	-118.832267	24
	ASBS-014	34.021247	-118.830307	24
	ASBS-015	34.02082	-118.829696	18
	ASBS-017	34.018711	-118.827049	30
	ASBS-019	34.016979	-118.824882	24
	ASBS-020	34.015602	-118.822525	36

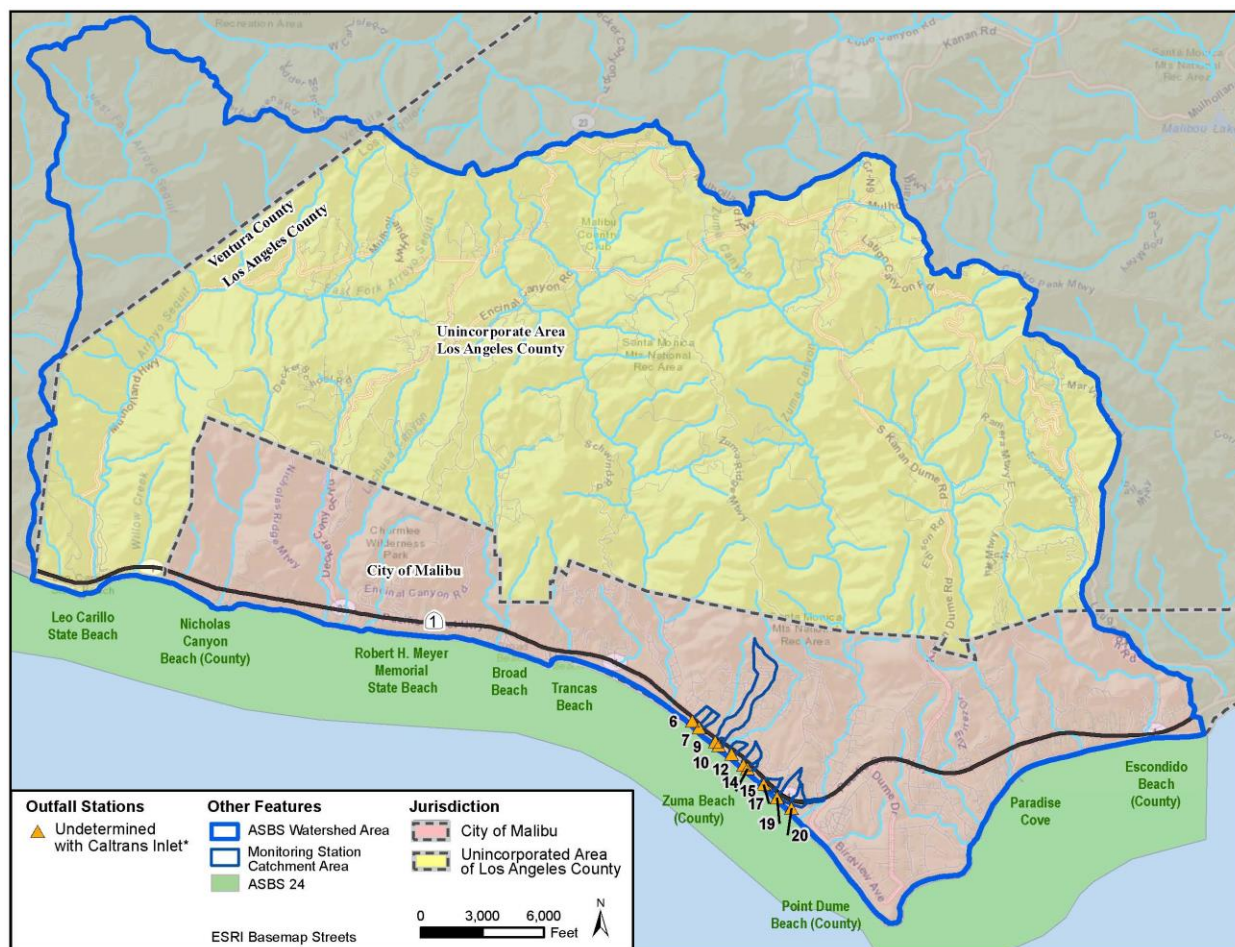


Figure 2-17. Undetermined Ownership (with Caltrans Inlets) ASBS Outfall Location Map



Zuma Beach Outfalls

ASBS-006 is a 24-inch outfall located in the northern portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road (Figure 2-18). The watershed draining to ASBS-006 is 10.2 acres in size and the surrounding landscape at ASBS-006 consists of a gradually sloping, broad sandy beach.



Figure 2-18. ASBS-006 Outfall

ASBS-007 is a 24-inch outfall located in the northern portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road (Figure 2-19). The watershed draining to ASBS-007 is 7.8 acres in size and the surrounding landscape at the outfall consists of a gradually sloping, broad sandy beach.



Figure 2-19. ASBS-007 Outfall

ASBS-009 is a 24-inch outfall located in the middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, approximately 90 m south of Seadrift Cove (Figure 2-20). The watershed draining to ASBS-009 is 78.6 acres in size and the surrounding landscape at ASBS-009 consists of a gradually sloping, broad sandy beach.



Figure 2-20. ASBS-009 Outfall



ASBS-010 is an 18-inch outfall located in the middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, approximately 170 m south of Seadrift Cove (Figure 2-21). The watershed draining to ASBS-010 is 2.4 acres in size and the surrounding landscape at ASBS-010 consists of a gradually sloping, broad sandy beach.



Figure 2-21. ASBS-010 Outfall

ASBS-012 is a 24-inch outfall located in the middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, approximately 400 m south of Seadrift Cove (Figure 2-22). The watershed draining to ASBS-012 is 7.0 acres in size and the surrounding landscape at ASBS-012 consists of a gradually sloping, broad sandy beach.



Figure 2-22. ASBS-012 Outfall

ASBS-014 is a 24-inch outfall located in the middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, directly in front of the Beaches and Harbors maintenance yard (Figure 2-23). The watershed draining to ASBS-014 is 12.1 acres in size and the surrounding landscape at ASBS-014 consists of a gradually sloping, broad sandy beach.



Figure 2-23. ASBS-014 Outfall



ASBS-015 is an 18-inch outfall located in the middle portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, approximately 65 m south of the Beaches and Harbors maintenance yard (Figure 2-24). The watershed draining to ASBS-015 is 3.0 acres in size and the surrounding landscape at ASBS-015 consists of a gradually sloping, broad sandy beach.



Figure 2-24. ASBS-015 Outfall

ASBS-017 is an 18-inch outfall located in the southern portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, directly in front of a helicopter landing pad (Figure 2-25). The watershed draining to ASBS-017 is 8.8 acres in size and the surrounding landscape at ASBS-017 consists of a gradually sloping, broad sandy beach.



Figure 2-25. ASBS-017 Outfall

ASBS-019 is a 24-inch outfall located in the southern portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, approximately 420 m north of the Zuma Beach entrance gate (Figure 2-26). The watershed draining to ASBS-019 is 20.8 acres in size and the surrounding landscape at the outfall consists of a gradually sloping, broad sandy beach.



Figure 2-26. ASBS-019 Outfall

ASBS-020 is a 36-inch outfall located in the southern portion of Zuma Beach, adjacent to a parking lot along Zuma Beach Access Road, approximately 200 m north of the Zuma Beach entrance gate, in the center of the beach (Figure 2-27). The watershed draining to ASBS-020 is 12.3 acres in size and the surrounding landscape at ASBS-020 consists of a gradually sloping, broad sandy beach.



Figure 2-27. ASBS-020 Outfall

2.5.3 District Outfalls

The nine outfalls that fall under the jurisdiction of the District are located along Broad Beach (three outfalls) and Escondido Beach (six outfalls). The location of each County Outfall is provided on Table 2-5 and shown on Figure 2-28. A summary, including the diameter, monitoring data collected at each outfall pipe, and the observed flow connection (or absence), is provided on Table 2-6. A description of each outfall is provided in the text following Figure 2-28.

Table 2-5. District Outfall Locations and Diameters

Beach Location	Site Name	Latitude	Longitude	Pipe Diameter (inches)
Broad Beach	ASBS-001	34.034702	-118.861846	24
	ASBS-002	34.035556	-118.860328	18
	ASBS-003	34.035526	-118.858276	51
Escondido Beach	ASBS-025	34.025646	-118.763717	18
	ASBS-026	34.025653	-118.763336	24
	ASBS-027	34.025726	-118.762153	24
	ASBS-028	34.025772	-118.75962	36
	ASBS-029	34.025856	-118.758468	18
	ASBS-030	34.025897	-118.757987	18



Table 2-6. District Outfall Locations, Diameters, and Monitoring Information

Beach Location	Site Name	Pipe Diameter (in)	Analyses Performed	Storm Events Analyzed			Did flow reach receiving water?		
				2/19/2013	3/8/2013	2/28/2014	2/19/2013	3/8/2013	2/28/2014
Broad Beach	ASBS-001	24	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	Yes	Yes
	ASBS-002	18	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	Yes	Yes
	ASBS-003	51	Full Chem. List*; Bivalve Toxicity	x	x	x	Yes	Yes	Yes
Escondido Beach	ASBS-025	18	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	Yes	Yes
	ASBS-026	24	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	Yes	Yes
	ASBS-027	24	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	No	Yes
	ASBS-028**	36	Full Chem. List*; Bivalve Toxicity	x	x	x	Yes	Yes	Yes
	ASBS-029	18	TSS, O&G, Bivalve Toxicity	x	x	x	Yes	No	Yes
	ASBS-030	18	TSS, O&G, Bivalve Toxicity	x	x	x	No	No	Yes
Ocean Receiving Water	S02	N/A	Full Chem. List*; Kelp, Bivalve, and Echinoderm Toxicity	x	x	x	Not applicable		

*Full chemistry list= TSS, oil and grease, metals, PAHs, pyrethroids, OP pesticides, ammonia, nitrate and total phosphorus.

** Flow monitoring equipment installed in this outfall pipe.

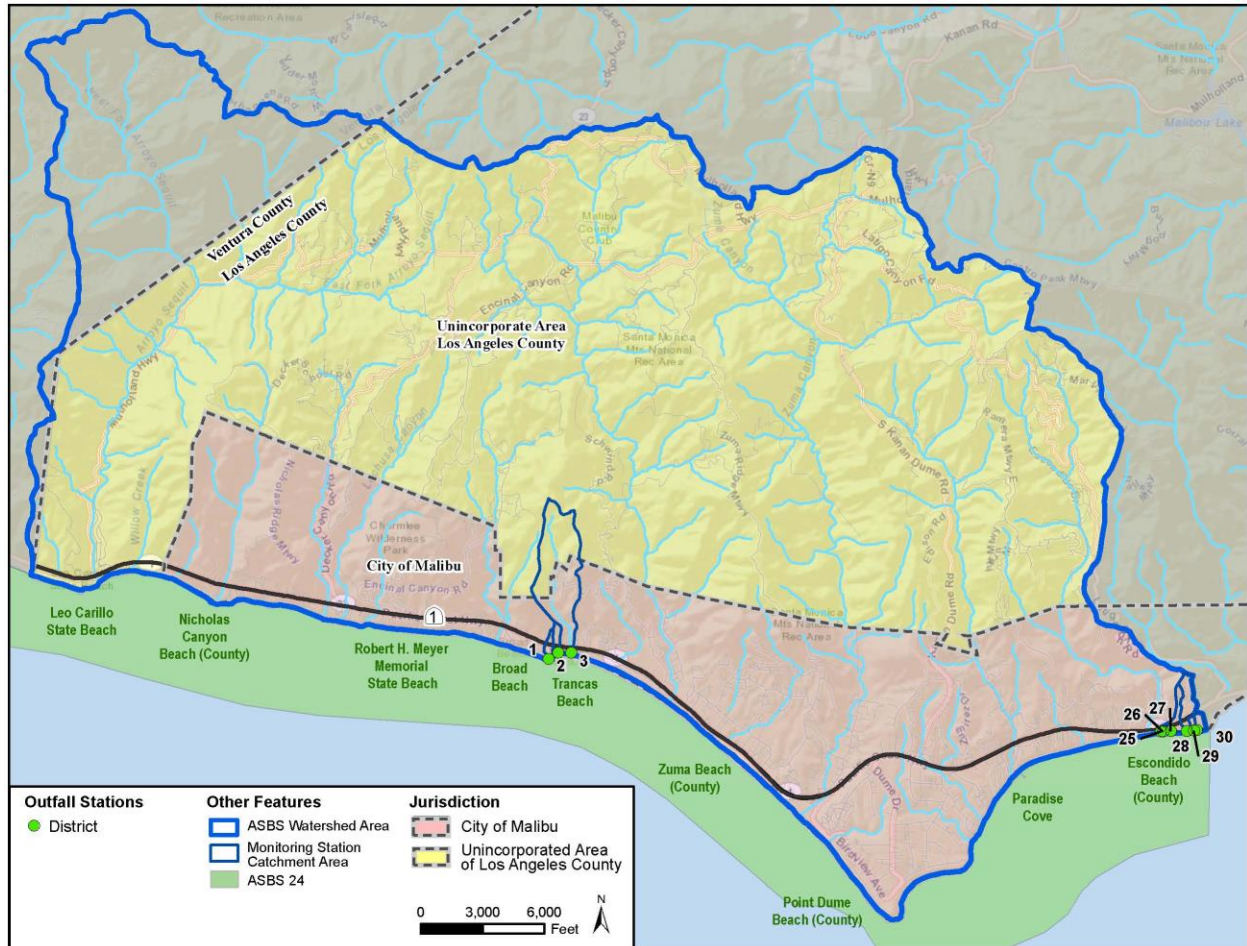


Figure 2-28. District ASBS Outfall Location Map

Broad Beach Outfalls

ASBS-001 is a 24-inch outfall located at the northern end of Broad Beach, along Point Lechuza, beneath a large residence (Figure 2-29). This outfall is inaccessible during high tide and was sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014) from a manhole located approximately 140 ft. from the beach on Point Lechuza Drive. The watershed draining to ASBS-001 is 9.4 acres in size and the area surrounding the outfall consists of a rocky intertidal area interspersed along a narrow, sandy beach.



Figure 2-29. ASBS-001 Outfall



ASBS-002 is an 18-inch outfall located at the northern end of Broad Beach, south of Point Lechuza, adjacent to a residence that was undergoing construction (Figure 2-30). This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-002 is 11.0 acres in size and the area surrounding the outfall consists of a narrow, sandy beach with intermittent rocky reef.



Figure 2-30. ASBS-002 Outfall

ASBS-003 is a 51-inch outfall located at the northern end of Broad Beach, south of Point Lechuza, between two residences (Figure 2-31). This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013 and February 28, 2014). The watershed draining to ASBS-003 is 253.5 acres in size and a rocky intertidal area is located directly west of the outfall.



Figure 2-31. ASBS-003 Outfall

Escondido Beach Outfalls

ASBS-025 is an 18-inch outfall located at the southern end of Escondido Beach, south of the Malibu Cove Colony Drive entrance off PCH (Figure 2-32). The outfall is integrated with the foundation of a residence and discharges directly onto the sand between two residences. This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-025 is 0.8 acres in size and the landscape surrounding the outfall is composed of a steep, sandy beach.



Figure 2-32. ASBS-025 Outfall



ASBS-026 is a 24-inch outfall located at the southern end of Escondido Beach, south of the Malibu Cove Colony Drive entrance off PCH (approximately 30 m southeast of ASBS-025). The outfall is integrated with the foundation of a residence and discharges directly onto the sand beneath the residence (Figure 2-33). This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-026 is 2.5 acres in size and the landscape surrounding the outfall is composed of a steep, sandy beach.



Figure 2-33. ASBS-026 Outfall

ASBS-027 is a 24-inch outfall located at the southern end of Escondido Beach, approximately 300 m east of the Malibu Cove Colony Drive entrance off PCH (Figure 2-34). The outfall is integrated with the foundation of a residence and discharges directly onto the sand beneath the residence. This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-027 is 18.9 acres in size and the landscape surrounding the outfall is composed of a steep, sandy beach.



Figure 2-34. ASBS-027 Outfall

ASBS-028 is a 36-inch outfall located at the southern end of Escondido Beach, approximately 500 m east of the Malibu Cove Colony Drive entrance off PCH (Figure 2-35). The outfall is integrated with the foundation of a residence and discharges directly onto the sand beneath the residence. Flow monitoring equipment was installed in this outfall near the inlet on Malibu Cove Colony Drive. This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-028 is 36.0 acres in size and the landscape surrounding the outfall is composed of a steep, sandy beach.



Figure 2-35. ASBS-028 Outfall



ASBS-029 is an 18-inch outfall located at the southern end of Escondido Beach, near the end of Malibu Cove Colony Drive (Figure 2-36). The outfall lies between two residences and discharges directly onto the sand. This outfall is inaccessible during high tide but was successfully sampled three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-029 is 3.8 acres in size and the landscape surrounding the outfall is composed of a steep, sandy beach.



Figure 2-36. ASBS-029 Outfall

ASBS-030 is an 18-inch outfall located at the southern end of Escondido Beach, near the end of Malibu Cove Colony Drive (approximately 45 m east of ASBS-029). The outfall is integrated with the foundation of a residence and discharges directly onto the sand beneath the residence (Figure 2-37). This outfall is inaccessible during high tide but was successfully sampled during three monitored storm events (February 19 and March 8, 2013, and February 28, 2014). The watershed draining to ASBS-030 is 8.9 acres in size and the landscape surrounding the outfall is composed of a steep, sandy beach.

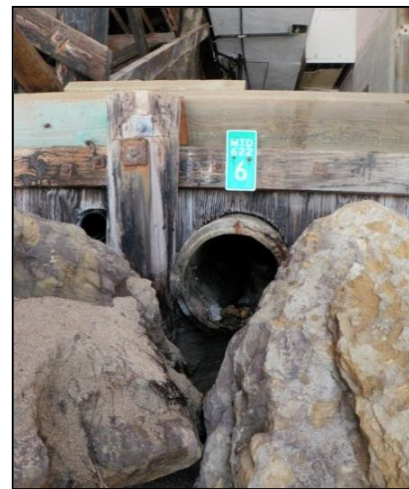


Figure 2-37. ASBS-030 Outfall

2.5.4 Private Outfalls with Inlets Owned by the City

Eight outfalls that are greater than, or equal to, 18 inches in diameter and located along Broad Beach and Little Dume Beach are privately owned with inlets maintained by the City. Currently, three of the outfalls along Broad Beach are being monitored as part of Bight 2013 and the compliance requirements of the General Exception. Although the City maintains ownership of the inlets for each of these storm drains, the ownership status of the outfalls is privately owned. The other five private outfalls with City maintained inlets along Broad Beach and Little Dume Cove that are greater than, or equal to, 18 inches in diameter are not being monitored due to inaccessibility during storm events or due to locations high on Bluffs. A brief summary of the location and diameter for each of these outfall pipes is provided on Table 2-7. Figure 2-38 shows the locations of these private outfalls with City maintained inlets, and a description of each outfall is provided in the text following Figure 2-38.



Table 2-7. City Outfall Locations, Diameters, and Monitoring Information

Beach Location	Site Name	City Outfall ID	City Inlet ID	Latitude	Longitude	Pipe diameter (inches)
Broad Beach	24-BB-01*	24-BB-01Z	24-BB-01A	34.03118	-118.84615	24
	24-BB-02*	24-BB-02Z	24-BB-02B	34.03302	-118.84988	18
	24-BB-03*	24-BB-03Z	24-BB-03A	34.0334	-118.85082	30
	ASBS-B	ASBS-B-Z**	ASBS-B-A	34.03499	-118.85567	18
	ASBS-C	ASBS-C-Z	ASBS-C-A	34.03485	-118.85502	30
	ASBS-F	ASBS-F-Z**	ASBS-F-A	34.03186	-118.84748	24
	ASBS-G	ASBS-G-Z	ASBS-G-A	34.03134	-118.84649	24
Little Dume Beach	ASBS-I	ASBS-I-Z	ASBS-I-A	34.01292	-118.79237	18

*Site currently undergoing monitoring in accordance with the General Exception.

**Site with no visible outfall.

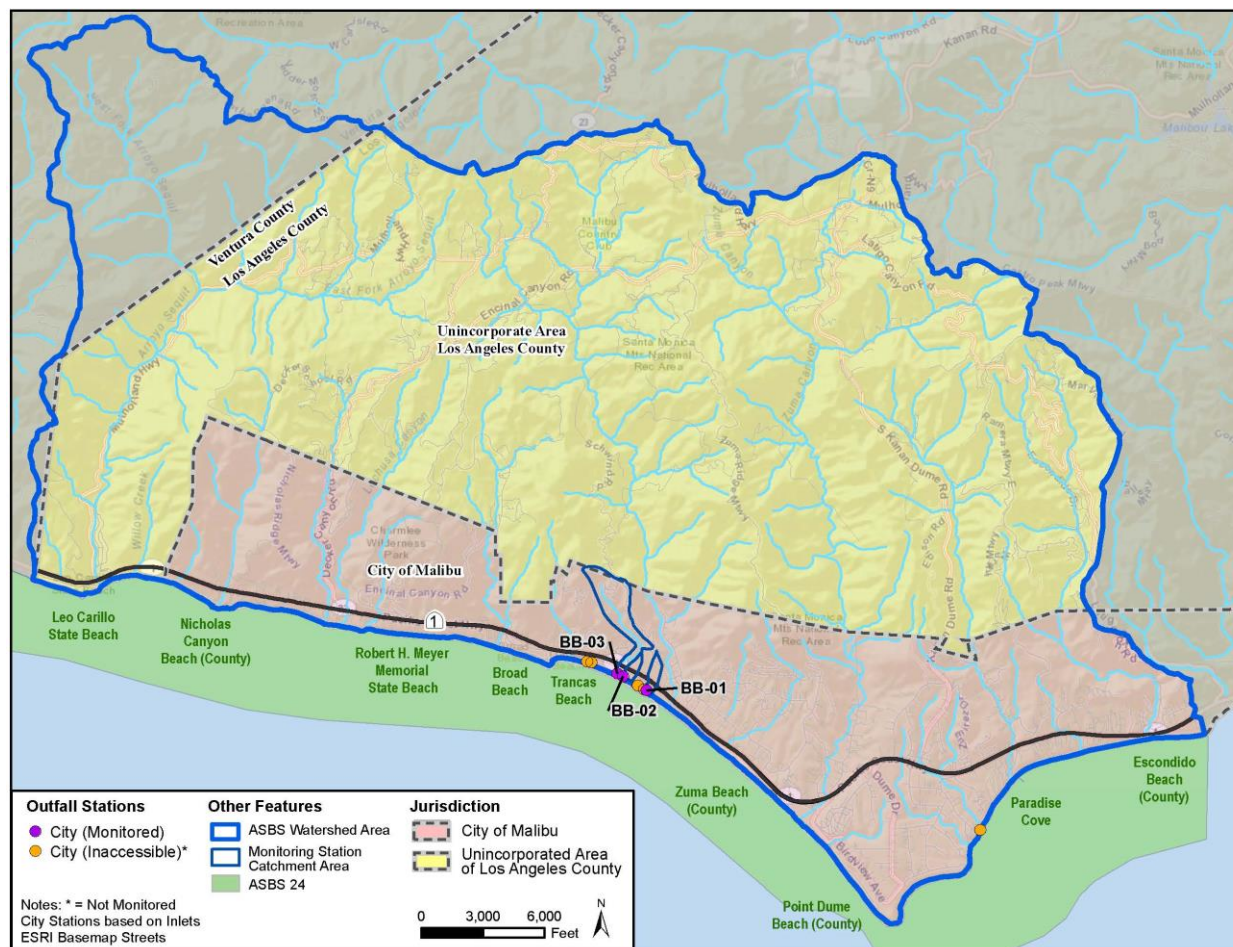


Figure 2-38. City ASBS Outfall Location Map



Broad Beach Outfalls

Site 24-BB-01Z is a 24-inch outfall located at the southern end of Broad Beach, near the intersection of Trancas Canyon Road and PCH (Figure 2-39). The outfall is located behind rock revetment and is inaccessible during high tide or dangerous surf conditions. This outfall was successfully visited during the February 28, 2014, storm event, but no flow was observed. The watershed draining to 24-BB-01Z is 19.9 acres in size and consists primarily of single family residences, commercial, transportation right-of-way (ROW), and PCH ROW land uses. The landscape surrounding the outfall is composed of a rock revetment and narrow, sandy beach with near-shore reef and kelp.



Figure 2-39. 24-BB-01Z Outfall

Site 24-BB-02Z is an 18-inch outfall located at the southern end of Broad Beach, approximately 200 meters south of the intersection of Lunita Road and PCH (Figure 2-40), when viewed on an aerial. This outfall was successfully sampled during the February 28, 2014 and December 1, 2014 storm events. The outfall is located among the shoreline rock revetment and is inaccessible during high tide or dangerous surf conditions. The watershed draining to 24-BB-02Z is 13.9 acres in size and consists primarily of single family residences, vacant, transportation ROW, and PCH ROW land uses. The landscape surrounding the outfall is composed of rock revetment a narrow, sandy beach.



Figure 2-40. 24-BB-02Z Outfall



Site 24-BB-03Z is a 30-inch outfall located at the southern end of Broad Beach, approximately 100 meters south of the intersection of Lunita Road and PCH (Figure 2-41), when viewed on an aerial. This outfall was successfully sampled during the February 28, 2014 and December 1, 2014 storm events. The outfall is located among the shoreline rock revetment and is inaccessible during high tide or dangerous surf conditions. The watershed draining to 24-BB-03Z is 127.6 acres in size and consists primarily of rural residential, vacant, single family residences, transportation ROW, and PCH ROW land uses. The landscape surrounding the outfall is composed of rock revetment and a narrow, sandy beach.



Figure 2-41. 24-BB-03Z Outfall

Site ASBS-B-Z (outfall has a potential correlation to the SWQCB list as SAD790, although not confirmed) is an 18-inch outfall located at the northern end of Broad Beach, directly across from the intersection of La Herran Road and PCH, when viewed on an aerial. The City owns the inlet to this site, but existence and ownership of the outfall has not been determined, as the outlet may have been reconfigured during installation of the private rock revetment. The outfall may be located among shoreline riprap; however, the outfall is currently not visible and thus, considered inaccessible. No sampling has been performed at this site. The landscape surrounding the outfall is composed of rock revetment and a narrow, sandy beach with some near-shore reef.

Site ASBS-C-Z is a 30-inch outfall located at the northern end of Broad Beach, approximately 30 meters south of the intersection of La Herran Road and PCH (Figure 2-42), when viewed on an aerial. While the City owns the inlet to this outfall, the outfall is considered private. The outfall is located behind and partially buried by the rock revetment and is inaccessible at all times due to the steep rock revetment that surrounds the outfall. No sampling has been performed at this site. The watershed draining to ASBS-C is 66.8 acres in size and consists primarily of single family residences, vacant, transportation ROW, and PCH ROW land uses. The landscape surrounding the outfall is composed of rock revetment and a narrow, sandy beach with some near-shore reef.



Figure 2-42. ASBS-C Outfall

Site ASBS-F is a 24-inch outfall located at the southern end of Broad Beach, approximately 350 meters northeast of the intersection of Trancas Canyon Road and PCH. The outfall is located among shoreline riprap; however, the outfall is currently not visible and thus, considered inaccessible. No sampling has been performed at this site, and the landscape surrounding the outfall is composed of a rock revetment and narrow, sandy beach.



Site ASBS-G (outfall has a potential correlation to SWQCB list as MUG232 or SAD900, although not confirmed) has a 24-inch outfall located at the southern end of Broad Beach, approximately 200 meters northeast of the intersection of Trancas Canyon Road and PCH. The outfall is located among shoreline riprap; however, the outfall is currently not visible and thus, considered inaccessible. No sampling has been performed at this site. The landscape surrounding the outfall is composed of a narrow, sandy beach.

Little Dume Beach Outfalls

Site ASBS-I (also referred to as PC02 in other documents) is an 18-inch outfall located on Little Dume Beach, approximately 100 m east of the end of Wildlife Drive (Figure 2-43). The outfall is located on a cliff-side bluff and is inaccessible. No sampling has been performed at this site. The watershed draining to ASBS-I is 6.7 acres in size and the landscape surrounding the outfall is composed of a narrow, sandy beach with near-shore reef and kelp.



Figure 2-43. ASBS-I Outfall

2.6 ASBS 24 Compliance Plan Map

A Compliance Plan Map for the ASBS 24 watershed area has been created and can be updated using ESRI ArcMap 10. This map shows storm water conveyances and other storm drain features associated with surface drainage of storm water runoff, including catch basins, inlets/outlets, outfalls, storm drain lines, channels, and creeks. The map identifies core monitoring stations and shows the location of other outfalls equal to or greater than 18 inches that are private, state, or federal and not monitored by the Parties. Drainage areas for the core monitoring stations, areas of potential sheet flow, the planned Broad Beach Road biofiltration best management practices (BMPs), watershed sub-basins and flow directions within these sub-basins are depicted, as well as the overall ASBS 24 watershed area. The map includes the locations of waste and hazardous material storage areas (located on private commercial properties), sewage conveyances and treatment facilities, landslide zones, and roads. Jurisdictional boundaries for the unincorporated area of the County, the City, and state and federal lands within these areas are shown. This subsection of the Compliance Plan provides information regarding the Compliance Plan Map datasets and the procedures for updating applicable GIS files and the map.



2.6.1 Compliance Plan Map Files

The Compliance Plan Map includes several types of files, organized by file type, in the following folders:

- **MXD** – MXD files are the map documents produced in ESRI ArcMap. An MXD contains the map template (e.g., size, layout) and calls upon ESRI GIS shapefiles that are stored in the Shapefiles folder. The MXD contains a table of contents, text, and graphic elements, and specifies how data will be displayed. The MXD establishes relative file paths to the shapefiles. Currently, the MXD folder contains only one file: *Compliance_Plan_Map.MXD*. Additional versions of the map can be saved in this folder, as needed.
- **Shapefiles** – Shapefiles are GIS format data files that are called upon by the map. Changes to shapefiles will be reflected in the map if the map calls upon the data stored in the shapefile. A spreadsheet listing all of the shapefiles, contents, and sources is provided as Table 2-8.
- **Data Files** – Data files contain MS Excel spreadsheets, including those added as tables to the MXD. Changes to MS Excel files do not update the map. New or revised tables must be added to the MXD, and can be used to create XY events (based on latitude and longitude data in the table), or joined to existing shapefiles through a common field ID to append additional data fields to the GIS features.

Table 2-8 lists the GIS shapefiles used in the Compliance Plan Map by filename, and provides GIS feature types (e.g., points, lines, polygons), descriptions of the contents of the GIS file, information regarding the original source, and how to update the data in the Compliance Plan Map as needed. The file order in this table is based on the order of the items in the map legend (Figure 2-44).

2.6.2 Compliance Plan Map Update Procedures

Update procedures are provided by GIS shape file on Table 2-8 and are dependent upon original source and other considerations. Many of the original source GIS files were provided by LACDPW, some files by the City, and were received in GIS shapefile format; therefore, files have been maintained in shapefile format (i.e., not converted to geodatabase format). The County possesses a complete set of the files used to prepare the map (Compliance Plan Map dataset). As these base data layers are updated by the Parties in their primary GIS database, the revised GIS files can be provided to the County and copied in the local Compliance Plan Map dataset, processed, and used to replace the older file versions. The City and County/District Outfall Stations (and Other Outfalls) locations are maintained in separate shapefiles such that this information can be updated independently by each party and then reinserted into the GIS database without overwriting another parties' information. If the new filename is the same as the previous version, the new data should display within ArcMap when the file is replaced in the Shapefile folder. However, if the data attribute options have been updated, the symbology for the



data layer should be checked in the table of contents to ensure that all values have a symbol and will be drawn. If the map layer does not display (i.e., a red exclamation point will appear in the table of contents next to the filename), check the data source file path and update as needed. GIS shapefiles should be clipped to the overall ASBS watershed area (GIS file), and geometry recalculated to update line lengths and polygon areas. All GIS data should be maintained in the following projected coordinate system: CA State Plane, Datum NAD83, Zone V, units Survey Feet for consistency.

In addition, GIS files can be edited within ESRI ArcMap to update map features and attribute data, such as a change in monitoring stations, a revision to the monitoring station catchment areas, the inclusion of monitoring data results to outfall locations, or the addition of new BMPs to the BMP shapefile. This process can be performed in an edit session using the Editing toolbar. Note that map labels on the map are currently static (i.e., have been converted to annotation stored in the map) to better control their placement. Therefore, text labels will need to be created for new features that are added to existing shapefiles or for new shapefile features for which map labeling is appropriate.

Facilities with hazardous material storage areas should be updated on an annual basis by requesting the Active Facility Inventory List from LA County Fire for Zip Code 90265. The address information can be formatted in an MS Excel spreadsheet for the geocoding process. After adding the table to ArcMap, run the geocoder tool, and clip the resulting shapefile to the ASBS 24 watershed area.

Updates can also be made to the MXD, such as adding new features layers, revising the layout, or other map template items to change the look of the map. New GIS files can also be easily added to the map as additional data become available related to compliance activities. Note that the map legend is static and will not automatically update when new GIS files are added to the MXD. The legend can be manually updated using the drawing and text tools or a new legend inserted. An MXD can be saved as a new file to maintain previous versions in the database.

Table 2-8. GIS Shapefiles Used in Compliance Plan Map

Filename	Type	Description	Original Source	To Update
LAC_ASBS24_Outfalls	Point	County and District Monitoring Stations in ASBS 24 Monitoring Program, including Core MS4 Outfalls, Outfalls that have Caltrans Inlets but undetermined ownership of Outfalls (not monitored) and Ocean Receiving Water Stations, and creek reference station. Includes ownership information.	Core Monitoring Stations provided by LADPW in table format and imported into GIS from an MS Excel spreadsheet using latitude and longitude data provided in file to map locations.	Station locations and attribute data can be edited in GIS to update file (i.e., add, remove, or change location or attribute data associated with monitoring stations).
City_Outfalls	Point	Outfalls identified for the City's ASBS 24 Monitoring Program. City has jurisdiction of inlets but outfalls were determined by City to be privately owned. Three of these eight Outfalls are monitored, and five are considered inaccessible. Includes the City's Ocean Receiving Water station.	Field notes in an MS PowerPoint file provided by the City. GIS file created using latitude and longitude data. Other outfalls ≥ 18 inches that were listed in the field notes but not included in monitoring program are provided in file called "Other_Outfalls_City_Recon".	Edit or replace GIS file as needed to add, remove, or change location or attribute data associated with monitoring stations.
Other_Outfalls_County_Recon	Point	This file contains outfalls that were identified in field reconnaissance activities by the County for which ownership is private or undetermined. These outfalls are not in the monitoring program. Not all outfalls were visible or could be verified.	Provided by LADPW in table format and imported into GIS from an MS Excel spreadsheet using latitude and longitude data fields provided in file.	Station locations and attribute data can be edited in GIS to update file. This file complements the LAC_ASBS24_Outfalls file as the outfalls ≥ 18 inches but not in County monitoring program as ownership is private or undetermined.
Other_Outfalls_City_Recon	Point	This file contains outfalls that were identified in field reconnaissance activities by the City of Malibu and were determined to be privately owned and were not included in the monitoring program. Not all outfalls were visible or could be verified.	Field notes in an MS PowerPoint file provided by the City. Tabular data imported into GIS using latitude and longitude data from field notes.	Station locations and attribute data can be edited in GIS to update file. This file complements the City_Outfalls that were also identified in the City recon activities, found to be privately owned but chosen for compliance monitoring.
Catchbasins_ws	Point	Catch basin locations within the ASBS 24 watershed area. Ownership or maintenance of catch basins given in file as: LACFCD for District, City, Road Maintenance Division or not listed (blank).	Based on integrating data from two different catch basin files and removing duplicates. One file provided by LADPW (used as primary data source), the other found on LA County GIS data portal (supplementary).	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary. Record catch basin cleaning frequency attribute data.
Inlet_Outlet_from_LADPW_ws	Point	Inlet and outlet locations clipped to ASBS 24 watershed.	Provided by LADPW. Feature type (inlet or outlet) attribute data was blank, so features could not be symbolized differently.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary. Improve data by completing data fields.
City_inlets_ASBS_Drainage	Point	Point locations for inlets identified by the City as owned by the City.	Table provided by the City.	Locations and attribute information can be edited in GIS or a new table imported into GIS.
Lateral_Lines_SD_from_LADPW_ws	Line	Lateral line storm drains clipped to ASBS 24 watershed.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Gravity_Main_SD_from_LADPW_ws	Line	Storm drain mains clipped to ASBS 24 watershed.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to ASBS 24 watershed boundary.
Storm_Drains_LADPW_clip_ws	Line	Includes pipes, channels, and creeks that convey stormwater runoff clipped to the watershed boundary.	LA County GIS data portal.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Prelimin_drain_areas_core_mon_outfalls	Polygon	Catchment areas delineated for the Core Monitoring Stations.	Delineated by Weston based on desktop data review using 2-ft contour data, sub-basins, and storm drain data. Not field-verified and should be considered preliminary.	Catchment areas and attribute data can be edited in GIS to update file. New drainage areas will need to be delineated as stations are added.
BMP_Areas	Polygon	Shows structural BMPs that can be mapped, and currently displays the Planned Biofiltration BMP at Broad Beach Rd. Does not include non-structure BMPS or Operations and Maintenance Activities (See compliance plan for details).	Based upon project boundary shown in Biofiltration Project report.	Edit or replace GIS file as needed to add, remove, or change location or attribute data associated with these features.
ASBS_24_Watershed	Polygon	An overall boundary watershed based on the eight watersheds that drain to the ASBS 24 area.	Based on sub-basins GIS file from LADPW with internal boundaries dissolved for the eight watersheds.	Edit boundary in GIS as needed.



Table 2-8. GIS Shapefiles Used in Compliance Plan Map

Filename	Type	Description	Original Source	To Update
Subbasins_ws	Polygon	Watershed sub-basins clipped to the ASBS 24 watershed boundary	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Subbasins_flow_dir_ws	Line	Watershed sub-basins clipped to the ASBS 24 watershed boundary.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Sewer_Treatment_Plant_ws	Point	Sewer treatment plant locations within the ASBS 24 watershed area.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Sewer_Pump_Station_ws	Point	Sewer pump station locations within the ASBS 24 watershed area.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Areas_potential_sheet_flow	Polygon	Areas identified as having potential sheet flow are the parking lots at Nicholas Canyon, Zuma, and Westward Beaches.	Parking lot areas were digitized from aerial imagery to create the polygon file.	Edit or replace GIS file as needed to add, remove, or change location or attribute data associated with these features.
Sewer_Pipe_ws	Line	Sewer pump station locations within the ASBS 24 watershed area.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Sewer_Maintenance_Service_Area_ws	Polygon	Sewer maintenance service area within the ASBS 24 watershed area.	Provided by LADPW.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
Pacific_Coast_Highway_ws	Line	Centerline feature of PCH (State Hwy 1) extracted from CAMS 2011 GIS file and clipped to the ASBS 24 watershed boundary.	LA County GIS data portal: http://egis3.lacounty.gov/dataportal/2011/12/09/2011-la-county-street-centerline-street-address-file/ .	As updated versions of file become available, extract PCH lines from the new shapefile and clip to the ASBS 24 watershed.
Roads_ws	Line	Non-private road centerline features extracted from the CAMS 2011 GIS file and clipped to the ASBS 24 watershed boundary.	LA County GIS data portal: http://egis3.lacounty.gov/dataportal/2011/12/09/2011-la-county-street-centerline-street-address-file/ .	Replace road file with updated versions as available and clip to the ASBS 24 watershed.
Facilities_with_haz_materials	Point	Geocoded addressed for facilities that generate or store hazardous materials within the ASBS 24 watershed.	Facility addresses provided by LA County Fire Dept in excel spreadsheet.	Request the annual update of Facility (Active) Inventory List from LA County Fire for Zip Code 90265. Format address data in Excel spreadsheet for geocoder. Geocode in ArcMap and clip the shapefile to the ASBS24 watershed.
County_Bndry	Polygon	Boundary of the County.	Los Angeles County GIS Data Portal.	No update expected.
Jurisdictional_Boundary_ws	Polygon	Jurisdictional boundaries for the unincorporated portion of the County and the City clipped to the ASBS 24 watershed.	Los Angeles County GIS Data Portal.	Replace GIS file with updated one (LADPW source) as available and clip to the ASBS 24 watershed boundary.
State_and_Federal_Lands_ws	Polygon	Land areas identified as in state or rederal ownership clipped to the ASBS watershed area.	Based on parcels in state or federal ownership extracted from Parcel GIS data file provided by LADPW.	Process updated parcel file (LADPW source) to extract parcels with state or federal ownership; dissolve boundaries by owner type/code; clip to the ASBS 24 watershed boundary.
ASBS_24_Boundary	Polygon	ASBS 24 watershed boundary.	CA State Water Resources Control Board.	To be updated only if boundary is changed. Replace GIS file if new one is published by agency.
USGS_Landslides_zone_clipped_ws	Polygon	Landslide zones for 1:24k USGS sheets of Point Dume and Trifuno Pass merged into a single GIS file.	Provided by the City, available from USGS.	Update GIS file as new data are published by USGS or if County revises data based on landslide activity.



COMPLIANCE PLAN MAP- AREA OF SPECIAL BIOLOGICAL SIGNIFICANCE (ASBS) 24

Legend

Stations by Responsible Party

- County Monitored Outfall
- Undetermined Outfall with Caltrans Inlet
- District Monitored Outfall
- Monitored Outfall with City Inlet
- Inaccessible Outfall with City Inlet
- Ocean Receiving Water
- Reference Site (County Station)

Priority Outfalls

- District Monitored

Other Outfalls (Identified in Recon Activities)

- District Undetermined
- Ownership Undetermined (County Recon)
- Private or Undetermined Ownership (City Recon)

Catch Basins

- City of Malibu
- District
- Road Maintenance Division
- Private or Undetermined Ownership

Other Storm Drain Features

- Inlet or Outlet Storm Drain Feature
- Storm Drain Line
- Storm Drain Channel
- Creek
- Planned BMP

Drainage Areas

- Delineated Catchments of Outfall Stations
- Overall ASBS Watershed Area
- Subbasins ASBS Watershed Area
- Subbasin Flow Direction Arrows
- Areas of Potential Sheet Flow

Sewer Facilities

- Sewer Treatment Plant
- Sewer Pump Station
- Sewer Pipe
- Sewer Maintenance Service Area

Roads

- Pacific Coast Highway
- Secondary - Collector
- Ramp
- Minor - Local
- Private Road

Hazardous Materials

- Facilities with Hazardous Material Storage Areas

Jurisdictional Boundary

- County Boundary
- Unincorporated Area of Los Angeles County
- City of Malibu

State and Federal Lands

- State of California
- Federal Land

Other Boundaries and Zones

- ASBS-24
- USGS Landslide Zones (digital version only)

Notes:
1. District = Los Angeles County Flood Control District
2. All outfalls shown on this map are ≥ 18 inches diameter
3. Data subject to revision
4. No areas prone to erosion have been identified



0 0.25 0.5 0.75 1 Miles

Figure 2-44. Compliance Plan Map Legend



3.0 DRY WEATHER COMPLIANCE

Section I.A.2.b of the General Exception states that the ASBS Compliance Plan will describe measures taken by the Parties to eliminate non-authorized, non-storm water runoff (e.g., dry weather flows), how these measures will be maintained over time, and how these measures are monitored and documented (SWRCB, 2012b).

As discussed in more detail in the following sections, the Parties' existing dry weather elimination programs have been effective in eliminating non-exempt discharges. However, conditionally exempt hillside dewatering and natural creek flows are expected to continue to be a source of discharges from MS4 outfalls. The County, FCD, and City will continue to implement the non-structural programs, identified in this document, that have been designed to prevent non-exempt dry weather discharges. Two key components of these programs are the City's dry weather runoff elimination and water conservation programs.

The ASBS dry weather runoff elimination program was originally established as part of a State Proposition 84 grant-funded ASBS focused outreach project. This program included creating the Coastal Preservation Specialist (CPS) position to educate residents and business owners about dry weather runoff elimination, pollution prevention, and water conservation within the City of Malibu in areas potentially tributary to the ASBS. As the need for drought education grew, coordination of the local water conservation program was expanded and integrated more thoroughly into the runoff elimination program.

Elimination of non-stormwater runoff to the entire MS4 system within the City, and thus all potential dry weather discharges to the ASBS, was targeted through these programs. In addition to the CPS position, the programs also provide education, resources, and tools, such as opportunities for site evaluations, rebates, and incentives. Having shown that additional resources and focused staff were necessary for successful runoff elimination and public awareness about the ASBS, the CPS position was permanently established as the Environmental Programs Specialist (Specialist) to conduct citywide monitoring, documentation, and reporting on dry weather discharges, among other assignments.

The City will continue to respond to reports of runoff and over-irrigation; most reports are received either directly by staff at City Hall, the City's 24-hour Pollution Prevention Hotline, online water waster reporting form, or as observations by staff in the field. The City will also periodically proactively patrol neighborhoods with a history of over-irrigation, and will address or prevent non-stormwater discharges by meeting with property owners and home/property owner associations within the entire area tributary to ASBS 24 within the City limits. Ongoing efforts include property owner education regarding discharge prevention and source control with enforcement actions when necessary.

The City also continues to conduct a PIPP by providing educational information about the ASBS and BMPs to the beach going community at large. The City's multi-platform educational outreach campaign, *Keep It Clean, Malibu*, continues to be promoted throughout the community. The community has been receptive and enthusiastic about the program. The *Keep It Clean, Malibu* campaign and relevant videos may be found at www.KeepItCleanMalibu.com and ASBS



education in general at www.MalibuCity.org/ASBS. To date, Malibu's *Keep It Clean* Campaign has won five awards and received both national and statewide recognition.

The City provides a 24-hour Pollution Prevention Hotline for the community to report any environmental concerns, including runoff. The hotline is advertised on the City's website and in a display at City Hall.

The City also maintains a website (www.malibucity.org/waterwaster) for reporting water wasting activities including, but not limited to, excessive irrigation and overspray. Though focused on water conservation, this website also serves to receive information about runoff from community members who may not normally be aware of water quality issues, but, due to public information programs on California's current severe drought, may be more engaged in water issues. With additional eyes on the street, the City can be promptly notified if any dry weather discharges are observed, and coordinate with the County when any of their FCD or Public Works MS4 is affected. Since implementing the hotline and *waterwaster* website, response to complaints and enforcement actions to cease runoff or discharges have improved citywide and enhanced the ability to more effectively document incidents.

The following sections identify the nonstructural measures the Parties have implemented that are designed to eliminate non-authorized, non-storm water runoff, including public information and participation programs (PIPPs), operations and maintenance (O&M) programs, and enforcement programs. A list of existing programs is provided in Appendix B. When used in combination, nonstructural controls have been proven to provide improved effectiveness in load and flow reduction, at a lower cost, than many structural solutions (Brown et al., 2010; Pohl, 2010; Cac and Ogawa, 2010; Krieger et al., 2010). Ongoing dry weather elimination program activities will be documented and the results will be submitted in the MS4 Annual Report to the Los Angeles Regional Water Quality Control Board.

Dry weather monitoring of outfalls has been performed to ensure compliance with the requirements of the General Exception. This document summarizes those monitoring activities and results.

3.1 Nonstructural Controls

Nonstructural controls are designed to prevent dry weather runoff and pollution generation, control sources of dry weather runoff and pollution once generated, and eliminate the true source of pollutants, if appropriate. This document identifies nonstructural controls used by the Parties in order to meet the requirements of the General Exception and Special Protections of the California Ocean Plan (SWRCB, 2012a).

3.1.1 Nonstructural Program Terms and Definitions

Nonstructural programs are designed to prevent pollution generation, control sources of pollution once generated, and eliminate the true source of pollutants. The following common terms and definitions are related to nonstructural controls, which are used throughout the document, including:



- Pollution Prevention Measures target pollutants and wastes before they are generated. These measures typically emphasize conserving or reusing resources to prevent pollution.
- Source Controls target specific sources of pollution to reduce or eliminate pollutants from entering the municipal separate storm sewer system (MS4) and / or ultimately the receiving water. Source controls may include institutional controls (e.g., codes, ordinances, and regulations), outreach, education, incentive programs, and enforcement measures.
- True Source Controls recognize that the source pollutant may be the physical design of a product, such as copper-based pesticides or copper break-pads. In this instance, product regulation and true source control can only be achieved at the state or national level. True source controls support regulatory change outside the local jurisdiction.

Nonstructural programs have been classified in this document using a “three-legged stool” approach where the three legs of the stool consist of PIPPs, Enforcement Programs, and O&M Programs (see Figure 3-1). When used in combination, nonstructural controls have been proven to provide improved effectiveness in load and flow reduction, at a lower cost, than many structural solutions (Brown et al., 2010; Pohl, 2010; Cac and Ogawa, 2010; Krieger et al., 2010).

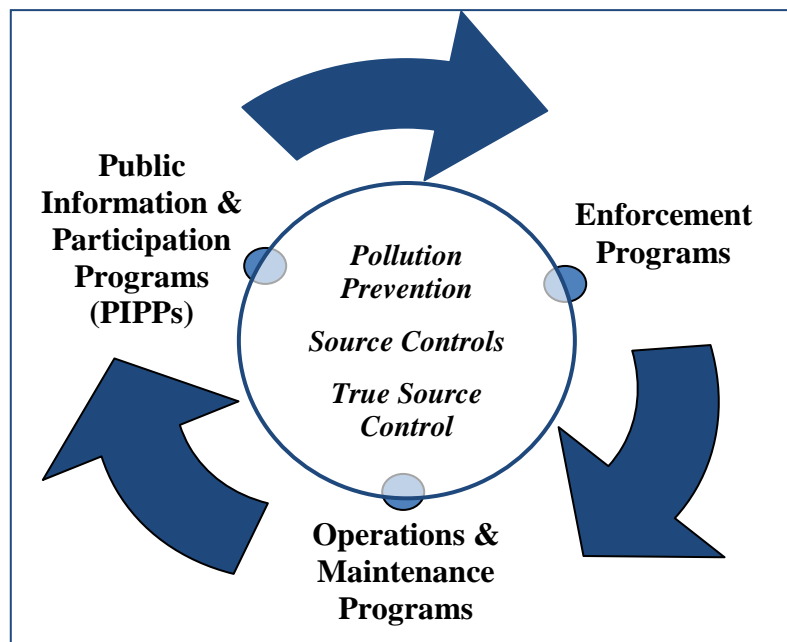


Figure 3-1. ASBS 24 Nonstructural Programs



3.1.2 Nonstructural Program Adaptive Management Process

The ASBS 24 PIPPs, enforcement, and O&M nonstructural programs have been implemented using adaptive management (

Figure 3-2) to plan, implement, assess, and refine individual nonstructural controls. Nonstructural programs implemented to date have ensured compliance with the zero dry weather discharge criteria of the Special Protections. Receiving water data collected under the 2013 Regional Monitoring Program represent the initial assessment of wet weather loading to ASBS 24. Some nonstructural programs implemented to date, identified in this document, also have the potential to help reduce wet weather pollutant loads. Effectiveness assessments will play a key role in ongoing implementation of the nonstructural program by identifying the optimal enhanced programs process for planning nonstructural

and establishing a subsequent phases of implementation.

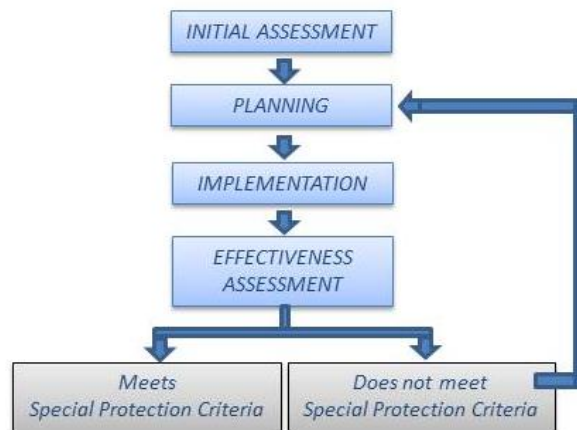


Figure 3-2. Adaptive Management Process

3.2 Existing Nonstructural Programs

The Parties proactively participate in regional nonstructural planning efforts and implement nonstructural controls to protect the receiving water quality of ASBS 24. A detailed list of existing PIPPs, enforcement programs, and O&M programs is provided in Appendix B. This section contains a description of key nonstructural programs related to compliance with the prohibited discharges listed in the General Exception.

3.2.1 Public Information and Participation Programs

PIPPs encompass the education, outreach efforts, and rebate / incentive programs implemented by the Parties which encourage positive behavior changes that eliminate or reduce potential polluting behaviors, encourage reporting and cleanup of discharges, and reduce water consumption. Waste management and water conservation PIPPs have been implemented by the County and the City and are described in the following sub-sections.



3.2.1.1 Waste Management PIPPs – Outreach Programs

Clean LA is the County’s main PIPP. Clean LA offers online and hotline resources to residents, businesses, and local governments to answer questions related to household hazardous and electronic waste collection, composting, recycling, illegal dumping prevention, and water quality impacts of proper waste management. The Clean LA hotline, which is shared with the District, fielded 34,064 calls throughout Los Angeles County during the fiscal year covered under the 2011-2012 Annual Report (LACDPW, 2012). Within the Clean LA tool box, the Rethink LA program encourages “rethinking” about opportunities to implement reduction, recycling, and reuse, and offers the Los Angeles County Materials Exchange (LACoMAX) as a unique Web platform for buying recycled products, exchanging materials, and advertising garage sales. These online educational resources are interlinked and represent the types of programmatic tiering possible within a PIPP.

Similarly, the Malibu Green Room Web page, a one-stop resource for all things “green” in the City, is one of the City’s key PIPP resources. The Web page includes information related to environmental protection ordinances, the City’s 24-Hour Pollution Prevention Hotline (initiated in June 2012), special waste collection events, the ocean friendly gardens (OFG) and California (CA) Friendly Landscapes programs and examples of properties where such gardens are installed, design and implementation of structural BMPs, and environmental events, as well as examples of what actions the City has taken to become more sustainable. This Web page is linked with other City-managed Web pages, such as the ASBS Web page, the *Keep it Clean*, *Malibu* campaign and projects and programs offered by partner agencies.

3.2.1.2 Water Conservation PIPPs – Incentive Programs

Three incentive programs are managed regionally by the Los Angeles County Waterworks and local water districts and are advertised within the ASBS 24 watershed by the County and City. The programs are used to encourage water conservation for outdoor landscaping, thereby preventing dry weather runoff to ASBS 24 from over-irrigation. These programs vary based on available funding, but have included the Landscape Irrigation Efficiency Program (completed in 2013), which offered installation of free, efficient sprinkler heads and an irrigation survey at qualified properties; the Water Saving Devices Rebate Program, a residential rebate program for water saving devices such as rotary sprinkler nozzles and irrigation controllers; and Cash for Grass, a residential rebate program for replacing grass with water-efficient landscaping.

3.2.1.3 Water Conservation PIPP – Surfrider Ocean Friendly Garden (OFG) Program

The Surfrider OFG Program is a regional effort to promote water conservation and eliminate dry weather runoff from over-irrigation and other urban sources. The County and City manage webpages identifying OFG “case studies” within their jurisdiction and frequently host educational and outreach events at OFGs located at public facilities. The City also promotes the Metropolitan Water District-funded California Friendly Landscapes program, which is a reimagining of the OFG program intended to engage a broader audience who might not otherwise resonate with the concept of “ocean friendly”.



3.2.1.4 Water Conservation PIPP – CA Friendly Landscaping Program

The CA Friendly Landscaping Program targets residences and businesses to promote water conservation and eliminate non-point source pollution from landscaping. It is a reimagining of the OFG Program by the Metropolitan Water District in an attempt to engage a broader audience statewide. Similarly to the OFG Program, it is promoted by its local water Districts and agencies. The program includes educational workshops, training events, and incentives such as landscape water efficiency rebates. The City hosted two CA Friendly Landscaping Workshops from 2013-2014.

3.2.1.5 Water Conservation PIPP – City of Malibu ASBS Focused Outreach Program

The City of Malibu Focused ASBS Outreach Program included a CPS position that was created by the City under a Proposition 84 grant to perform direct and focused outreach to residents and to develop an outreach campaign to reach the community at large raising awareness of ASBS 24. One of the roles of the CPS was to develop and implement PIPPs that prevent dry weather flows. The CPS mailed a general ASBS education letter to every parcel within the ASBS and regularly gave public educational and school presentations on ASBS topics (e.g., OFGs, water conservation) that may be implemented by residents and are being implemented by the City. Additionally, the CPS attended public events to educate about protecting the ASBS. As the City's representative, the CPS interfaced with schools for environmental education programs with Pepperdine University, Point Dume Marine Science School, and Malibu High School. The CPS also developed new ASBS content and maintained pages on the City's web page, interfaced with the media, and expanded the City's outreach of ASBS topics using social media platforms including Facebook, Twitter, and Instagram. The *Keep It Clean, Malibu* website was enhance though this program and encourages residents to prevent pollution by providing guidance on the proper use of common products and best practices relating to other sources (e.g., pet waste).

In addition, ASBS 24 coastline and inland areas that could be tributary to it were regularly patrolled by the CPS, who looked for dry-weather runoff and other pollution threats in the coastal and inland areas. County staff routinely coordinated with the CPS by reported over irrigation. When individual properties were identified as non-compliant with ASBS regulations, such as due to over-irrigation, they were mailed educational materials and a cease-and-desist letter. The CPS personally engaged with these property owners and residents by providing education on the potential impacts to the ASBS and tailoring solutions to the property.

As part of the Proposition 84 State funding, the CPS was tasked with developing an outreach campaign to educate people about the issue and the result was *Keep it Clean, Malibu* – a multi-platform educational campaign designed to positively, proactively make people think about storm drains and what goes into them. The campaign contains five main elements:

1. A series of four Public Service Announcements starring a beautiful urban mermaid coming into contact with the pollutants we create on land.
2. A series of four storm drains painted by a local artist to draw attention to the drains and their connection to the ocean. A video highlighting the making of this artwork was also created.
3. An active social media campaign on Instagram primarily, but also Facebook and Twitter. Citizens are encouraged to get involved in celebrating the ASBS by posting pictures of the gorgeous marine life in the area.



4. Two special events designed to kick off the campaign and draw attention to the issue – a ribbon cutting ceremony for the storm drain art project and a red carpet premier for the video series, which was held on Earth Day.
5. Distribution of wearable collateral materials (bright blue hats and temporary tattoos) which prominently feature the “Keep it Clean, Malibu” slogan, in effect creating walking billboards of the message.

In addition to these five main elements, the City partnered with local organizations to promote the ASBS campaign messages at their special events and through their websites and social media. These partnerships range from water and energy utilities to schools to business and community groups. The special events included:

1. Pepperdine University Earth Day Fair
2. Earth Day Celebration hosted by Malibu Chamber of Commerce and Malibu Country Mart
3. Rhyming in the Universe Earth Day Celebration hosted by Team United and Malibu Ballet Performing Arts Society
4. Fiesta Malibu hosted by Juan Cabrillo Elementary School

The bright blue hats and temporary tattoos used to promote the *Keep It Clean, Malibu* message were received with enthusiasm. In order to receive a hat, citizens sign an ASBS Pledge to prevent polluted runoff and protect ocean water quality with their daily activities.

Even though the grant-funded outreach project that included the CPS is complete, the City added a new position in July 2014 which assumed the outreach and inspections duties of the CPS. The *Keep It Clean, Malibu* campaign and relevant videos may be found at www.KeepItCleanMalibu.com and ASBS education in general at www.malibucity.org/ASBS.

3.2.2 Operations and Maintenance Programs

O&M programs are in place to maintain infrastructure within the area draining to ASBS 24. O&M programs, including street and parking lot sweeping, catch basin cleaning, and trash management and recycling programs, have been implemented by the LACDPW and the City and are described in the following sections. A map of the different programs and their implementation areas is presented in Figure 3-3.

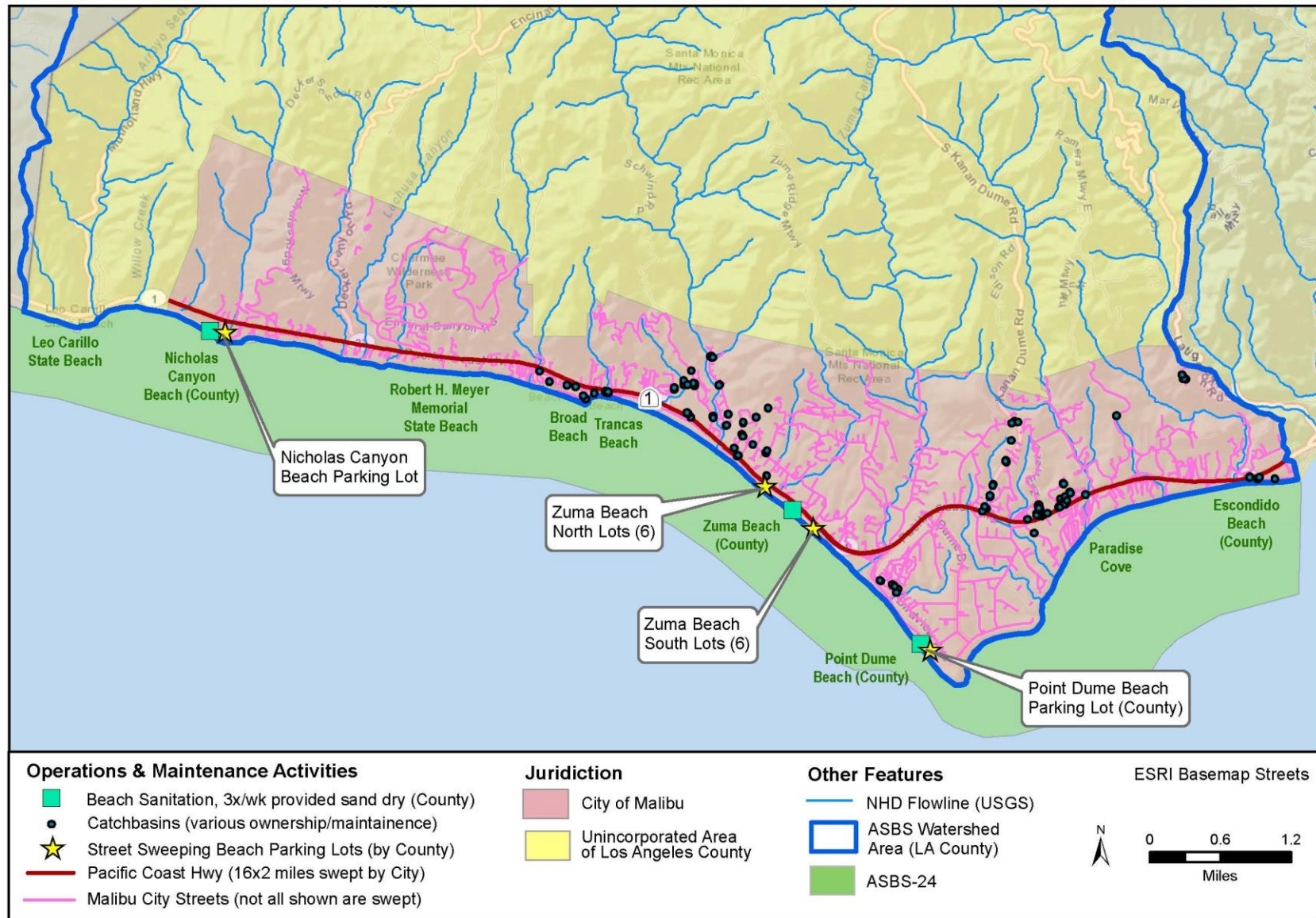


Figure 3-3. Locations of O&M Operations



3.2.2.1 Street and Parking Lot Sweeping

Studies have demonstrated that street sweeping is effective in reducing sediment, metals, and pesticide loading and, to a lesser extent, bacteria loading to the receiving water through physical removal of pollutants from paved surfaces (City of San Diego, 2010a, City of Portland, 2006). The County and City regularly maintain the roads, streets, and parking lots within the area draining to ASBS 24. The existing sweeping programs are presented on Table 3-1. Within the ASBS 24 drainage area, the County has jurisdiction over three beaches with County-maintained parking lots. All parking lots are swept on Saturday, Sunday, and Monday by a vacuum or regenerative air sweeper. The City shares a contract with California Department of Transportation (Caltrans) for sweeping PCH. The City's sweeping program was modified in 2013 to agree with Caltrans' statewide street sweeping policy, which requires use of mechanical sweeping equipment no more than once per week. The PCH is scheduled to be swept on Friday mornings (from 2:00 a.m. to 7:00 a.m.) to optimize sweeper access to the curb and gutter. City-maintained streets are swept monthly with a mechanical sweeper. The City maintains four regular sweeping schedules that are completed on the first, second, or third Monday or the third Wednesday of each month.

Table 3-1. Existing Street and Parking Lot Sweeping Programs within ASBS 24

Agency	Location	Technology	Frequency
Los Angeles County Dept. of Beaches & Harbors	Nicholas Canyon County Beach Parking Lot	Vacuum/ Regenerative Air	3 times/week
	Zuma Beach County Beach (12 Parking Lots)	Vacuum/ Regenerative Air	3 times/week
	Point Dume County Beach Parking Lot	Vacuum/ Regenerative Air	3 times/week
City of Malibu	Pacific Coast Highway	Mechanical	Once/week
	City-Maintained Streets	Mechanical	Once/month

3.2.2.2 Catch Basin Cleaning

The LACDPW and City implemented catch basin inspection and cleaning programs are designed to ensure that catch basins are: 1) properly marked with a “no dumping” message, most commonly applied with paint and stencil 2) free of debris, and 3) in good condition. Catch basins are visually inspected by staff in the field and problem systems are flagged for maintenance. The routine inspection and cleaning/repair program is implemented in accordance with the priority assigned by each permittee to each system (i.e., catch basins consistently generating the highest volumes of trash and debris are Priority A; moderate volumes are Priority B; low volumes are Priority C). Priority A catch basins are cleaned four times a year, Priority B catch basins are cleaned twice a year, and Priority C catch basins are cleaned once a year. There are 152 catch basins within the ASBS 24 drainage area under the Parties' jurisdiction. As reported in the City of Malibu's 2011-2012 Annual Report, the material removed from the catch basins within the drainage areas to ASBS 24 mostly consists of “green waste that grows and thrives in the Southern California climate.” There are 21 catch basins under the City's jurisdiction, which are classified as Priority B. There are 93 Priority B catch basins under the District's jurisdiction. The remaining 38 are under the County's jurisdiction (Road Maintenance Division) and are located in the upper portion of the watershed. These 38 catch basins are not part of the MS4 that drains to the ASBS and are classified as Priority C catch basins.

3.2.2.3 Waste Management & Recycling Programs

The County's and City's waste management programs include collection of waste and recyclables in public places such as bus stops, safe disposal of household hazardous waste; used oil collection/recycling events; waste management education; solid waste hauler permitting; Christmas tree recycling; brush clearance/green waste recycling events; bulky item collection; construction and demolition debris recycling; electronic and universal waste disposal; and an expanded polystyrene foam recycling program (i.e., Waste to Waves program). Education about recycling opportunities is provided through the PIPP discussed in Section 3.2.1.

The County's waste management program includes a regional beach sand "sanitation" program that is implemented at the three County Beaches located within ASBS 24. The beach sanitation program involves collecting beach debris in a screened hopper pulled by a tractor and properly disposing of the material. A rake system attached to the back of the tractor turns over the sand and allows solar radiation to "sanitize" the beach sand. Beach sand sanitation activities are implemented three times per week, provided that the beach sand is not wet. The implementation is scheduled during the morning hours to allow for maximal day-light exposure.



Figure 3-4. County Beach Sand Sanitation Program Equipment at Work

3.2.3 Enforcement Programs

Enforcement programs supporting environmental ordinances passed by the County and City are intended to eliminate non-authorized flows as defined in the General Exception; control illicit discharges; provide sediment and erosion control for construction sites'; verify National Pollutant Discharge Elimination System (NPDES) and ASBS compliance; and implement appropriate education and enforcement in response to urban runoff, trash, and other greening efforts. Existing enforcement programs within the area draining to ASBS 24 include the LACDPW and City illicit connection/illicit discharge (IC/ID) elimination programs, LACDPW and City construction programs, the City's commercial and industrial (should an industrial facility begin operating; there are currently no industrial facilities in the City) business inspection program, and City enforcement of violations observed while implementing the Clean Bay Restaurant certificate program (discussed in further detail later in this document). IC/ID elimination programs are discussed in the following section, and construction programs, commercial and industrial business inspection programs, and the Clean Bay Restaurant certificate program are discussed as part of the Inspection Program Assessment in Section 3.3.1.



3.2.3.1 Illicit Connection/Illicit Discharge Elimination Programs

The IC/ID Programs implemented by the Parties are designed to eliminate pollution by illicit connections and discharges to the MS4 and ultimately the ocean receiving waters. The regional IC/ID Programs start with detection. The LACDPW staffs a 24-hour Pollution Prevention Hotline, which is shared with the District and available in English and Spanish. A Chinese hotline is also offered, which is available in Mandarin. Any IC/IDs reported to the hotlines are routed to the appropriate personnel for response, which may include ceasing, cleaning up, or diverting IC/ID flows before they reach the ocean receiving water. The City utilized the LACDPW's hotlines for public reporting of IC/IDs through June 2012, and then the City launched its own 24-hour Pollution Prevention Hotline. IC/IDs may also be detected by the Parties during desktop screening of the MS4. Permitted and suspected IC/IDs are stored in the Maintenance Management System database for the LACDPW and District and in an Access database for the City. Regional IC/ID investigation data collected by the Parties and reported for the last 11 fiscal years, which run from July 1st of the previous calendar year through June 30th of the corresponding calendar year, are presented on Table 3-2.

The need for enforcement actions within the area draining to ASBS 24 is infrequent, with an overall decreasing pattern in the past 5 years. Recent dry weather monitoring of LACDPW outfalls has determined that no dry weather flows from these outfalls reach the ocean receiving water. Annually, there are relatively few IC/IDs within the City's jurisdiction and most of the IC/IDs tracked have been related to irrigation runoff. When individual properties are identified as non-compliant with ASBS regulations due to irrigation runoff, they are mailed a letter to "cease and desist" the observed discharge. The City staff (previously CPS) then works with the property owners to help correct the runoff problem. The property owner must submit a report within 1 month detailing how the problem was fixed. The City may conduct additional site visits and continue monitoring the site, or other additional actions depending on the specific case. General letters, including Notices to Comply, are sent to high-priority neighborhoods and individuals identified, based on the City's field reconnaissance and historic data. Areas where discharges, if they were to occur, are more likely to impact the ASBS are deemed a high priority. The purpose is to inform and educate the public about ASBS discharge restrictions. The City maintains a database with information on every case, including all communication and photos.



Table 3-2. 2011-2012 IC/ID Program Regional Data

Fiscal Year ¹	Total Reported/ Identified		Cleaned Up/ Terminated/ Discontinued		No Evidence Discharge		Conditionally Exempt/In Compliance		Enforcement or Other Action	
	IDs	ICs	IDs	ICs	IDs	ICs	IDs	ICs	IDs	ICs
County of Los Angeles (Source LACDPW, 2012)										
2002	18	2	18	2	0	-	0	0	0	0
2003	73	4	73	4	0	-	0	0	0	0
2004	11	0	11	0	0	-	0	0	0	0
2005	77	0	77	0	0	-	0	0	0	0
2006	65	0	65	0	0	-	0	0	0	0
2007	39	0	39	0	0	-	0	0	0	0
2008	219	1	219	1	7	-	0	0	0	1
2009	72	2	66	1	28	-	4	0	5	2
2010	34	2	34	1	3	-	0	0	0	2
2011	6	0	6	0	1	-	0	0	0	0
2012	2	0	1	0	1	-	0	0	0	0
Fiscal Year ¹	Total Reported/ Identified		Cleaned Up/ Terminated/ Discontinued		No Evidence Discharge		Conditionally Exempt/In Compliance		Enforcement or Other Action	
	IDs	ICs	IDs	ICs	IDs	ICs	IDs	ICs	IDs	ICs
Los Angeles County Flood Control District (Source: District, 2012)										
2002	495	494	154	48	5	-	3	398	1	0
2003	631	1,563	268	123	0	-	1	85	1	154
2004	265	1,375	166	145	44	-	4	89	0	68
2005	203	1,352	170	138	59	-	2	523	6	33
2006	204	1,079	184	84	37	-	0	819	11	31
2007	221	479	204	41	16	-	0	226	9	36
2008	223	775	216	33	7	-	0	426	11	218
2009	151	534	138	40	12	-	0	262	0	46
2010	88	409	59	67	29	-	0	219	0	68
2011	51	99	51	17	0	-	0	68	0	12
2012	87	170	87	50	14	-	0	95	0	9
Fiscal Year ^{1,2}	Total Reported/ Identified		Cleaned Up/ Terminated/ Discontinued		No Evidence Discharge		Conditionally Exempt/In Compliance		Enforcement or Other Action	
	IDs	ICs	IDs	ICs	IDs	ICs	IDs	ICs	IDs	ICs
City of Malibu (Source: City, 2012)										
2002	6	0	5	0	1	-	0	0	0	0
2003	9	0	7	0	2	-	0	0	0	0
2004	5	0	5	0	0	-	0	0	0	0
2005	9	0	6	0	3	-	0	0	1	0
2006	25	0	11	0	13	-	1	0	11	0
2007	11	0	6	0	5	-	0	0	7	0
2008	41	3	25	1	6	-	5	0	20	3
2009	36	2	26	2	4	-	0	0	28	2
2010	36	1	16	1	13	-	3	0	18	1
2011	27	0	15	0	7	-	3	0	8	0
2012	17	0	8	0	2	-	6	0	5	0

Note 1: IC/ID data covers the entire jurisdictional areas of the County, District, and City.

Note 2: Due to the ASBS restrictions on non-storm water discharges, the City considers any discharge inland of ASBS to not be conditionally exempt regardless of the nature of the discharge (with the exception of the exemptions in the Special Protections for seeps and other such natural flows including footing drains).



3.2.4 Dry Weather Monitoring

3.2.4.1 City of Malibu ASBS Focused Outreach Program

As part of the City of Malibu ASBS Focused Outreach Program the ASBS 24 was regularly patrolled by the CPS who looked for dry-weather runoff and other pollution threats in the coastal and inland areas. The CPS was funded by a Proposition 84 grant that continued through July 2014. Even though the grant-funded outreach project that included the CPS is complete, the City added a new position in July 2014 which assumed the outreach and inspections duties previously performed by the CPS. When individual properties are identified as being out of compliance with the Special Provisions and City policies, such as through over-irrigation, they are mailed educational materials and a cease-and-desist letter (see Section 3.2.3.1). City staff personally engages with these property owners by providing education on the potential impact to the ASBS and tailoring solutions (e.g., water conservation techniques, available rebate programs) to the property. There were eighty-three illicit discharge cases over the study period covered by the grant (November 2011 – March 2014) with a 96% success rate abating the runoff with “cease and desist discharge” letters followed by additional outreach, assistance, and sometimes site visits. Site visits were conducted at twenty-five properties to understand and mitigate runoff. Of the eighty-three cases over the project period, only three remain open. Two of the illicit discharge cases (2%) required assistance from code enforcement to gain compliance. Seventeen of the eighty-three properties were beachfront properties (20%), and only one illicit discharge from a low priority nonpoint source over the two and a half year project period actually reached the receiving water (1%). The patrol program coupled with outreach efforts to correct the observed issues is successful, but labor intensive.

3.2.4.2 County Dry Weather Outfall Inspections

County staff has been regularly performing inspections of outfalls along the ASBS to document the presence or absence of flow and where needed, take action to eliminate prohibited discharges. A summary of these outfall inspections for 2012 and 2013 is provided on Table 3-3 and Table 3-4, respectively. Of the inspected outfalls, only ASBS-002 had flows reaching the surf. Flow from this outfall was noted reaching the surf once out of the 13 times visited in 2012 and once out of the three times visited in 2013. In both cases these flows reaching the surf were observed in the first month that inspections occurred (January and February for 2012 and 2013, respectively). The suspected source of the flow was over-irrigation in 2012; outreach to residents has been performed as detailed Section 3.2.1. It is anticipated that this outreach effort has addressed the potential source of the non-storm water flows. In 2013 the suspected source of the flow was from a nearby construction site, and City staff visited that construction site to ensure that appropriated BMPs were in place to prevent future discharges. Inspections performed March and May of 2013 at ASBS-002 indicated that flow was not present. Several other outfalls were observed with flows or ponded water; however, due to the distance between the outfall and the surf zone, these minor flows did not reach the receiving water. Inspections will continue to ensure that discharges of non-storm, non-authorized runoff do not occur.



Table 3-3. 2012 Outfall Dry Weather Inspections Summary

Outfall	Beach	January, 2012			February, 2012			March, 2012			April, 2012			Source / Notes
		No. of Visits	No. of Flow	No. Flow to Surf	No. of Visits	No. of Flow	No. Flow to Surf	No. of Visits	No. of Flow	No. Flow to Surf	No. of Visits	No. of Flow	No. Flow to Surf	
ASBS-001	Broad Beach	1	1		4	2		4	2		3	1		Undetermined
ASBS-002	Broad Beach				6	3	1	4	2		3	1		Over irrigation
ASBS-003	Broad Beach	1			6			4			3			
ASBS-004	Zuma Beach	1			5	4		4	4		2	1		Over irrigation
ASBS-005	Zuma Beach	1			5			4			2			
ASBS-006	Zuma Beach				5	1		4			2			Undetermined low flow
ASBS-007	Zuma Beach				5	4		4	4		2	2		Hillside dewatering
ASBS-008	Zuma Beach													
ASBS-009	Zuma Beach				5			4			2			
ASBS-010	Zuma Beach													
ASBS-011	Zuma Beach				5	2		4	4		2	1		Hillside dewatering
ASBS-012	Zuma Beach													
ASBS-013	Zuma Beach													
ASBS-014	Zuma Beach													
ASBS-015	Zuma Beach													
ASBS-016	Zuma Beach													
ASBS-017	Zuma Beach													
ASBS-018	Zuma Beach													
ASBS-019	Zuma Beach													
ASBS-020	Zuma Beach													
ASBS-021	Westward Beach													
ASBS-022	Westward Beach													
ASBS-023	Westward Beach				2	1		3			2	1		Undetermined low flow
ASBS-024	Westward Beach													
ASBS-025	Escondido Beach													
ASBS-026	Escondido Beach													
ASBS-027	Escondido Beach	1	1		3	3		5	4		1	1		Hillside dewatering
ASBS-028	Escondido Beach													
ASBS-029	Escondido Beach				3	3		5	4		1	1		Hillside dewatering
ASBS-030	Escondido Beach				3	1		5			1			Sudsy water
ASBS-031	Nicholas Beach													



Table 3-4. 2013 Outfall Dry Weather Inspections Summary

Outfall	Beach	February, 2013			March, 2013			May, 2013			July, 2013			Source / Notes
		No. of Visits	No. of Flow	No. Flow to Surf	No. of Visits	No. of Flow	No. Flow to Surf	No. of Visits	No. of Flow	No. Flow to Surf	No. of Visits	No. of Flow	No. Flow to Surf	
ASBS-001	Broad Beach	1			1			1						
ASBS-002	Broad Beach	1	1	1	1			1						Construction site. Corrected.
ASBS-003	Broad Beach	1			1			1						
ASBS-004	Zuma Beach	1	1		1	1		1	1		1			Over irrigation
ASBS-005	Zuma Beach	1			1			1			1			
ASBS-006	Zuma Beach	1			1			1			1			
ASBS-007	Zuma Beach	1	1		1	1		1	1		1			Hillside dewatering
ASBS-008	Zuma Beach	1			1			1			1			
ASBS-009	Zuma Beach	1			1			1			1			
ASBS-010	Zuma Beach	1			1			1			1			
ASBS-011	Zuma Beach	1	1		1	1		1	1		1	1		Natural stream north of PCH
ASBS-012	Zuma Beach	1			1			1			1			
ASBS-013	Zuma Beach	1			1			1			1			
ASBS-014	Zuma Beach	1			1			1			1			
ASBS-015	Zuma Beach	1			1			1			1			
ASBS-016	Zuma Beach	1			1			1			1			
ASBS-017	Zuma Beach	1			1			1			1			
ASBS-018	Zuma Beach	1			1			1			1			
ASBS-019	Zuma Beach	1			1			1			1			
ASBS-020	Zuma Beach	1			1			1			1			
ASBS-021	Westward Beach	1			1			1			1			
ASBS-022	Westward Beach	1			1			1			1	1		Trickle of water drops observed
ASBS-023	Westward Beach	1			1			1			1			
ASBS-024	Westward Beach	1			1			1			1			
ASBS-025	Escondido Beach	1			1									
ASBS-026	Escondido Beach	1			1									
ASBS-027	Escondido Beach	1			1									
ASBS-028	Escondido Beach	1			1									
ASBS-029	Escondido Beach	1	1		1	1								Hillside dewatering
ASBS-030	Escondido Beach	1			1									
ASBS-031	Nicholas Beach	1			1			1			1			



3.3 Inspection Program Assessment

Section I.A.2.c of the General Exception states that for MS4s, the ASBS Compliance Plan requires the following minimum inspection frequencies:

1. Weekly during the rainy season for construction sites.
2. Monthly during rainy season for industrial facilities.
3. Twice during the rainy season for commercial facilities.

In addition, the General Exception states that storm water drain outfalls equal to or greater than 18 inches in diameter or width will be inspected once prior to the beginning of the rainy season and once during the rainy season, and maintained to remove trash and other anthropogenic debris (SWRCB, 2012b).

Section 3.3.1 outlines the Parties' existing inspection programs and Section 3.3.2 outlines the recommended inspection program enhancements that would meet the requirements of the General Exception.

3.3.1 Existing Inspection Programs

The following sections outline the Parties' inspection programs that are currently in place. Discussions of specific LACDPW, District, and City inspections, where available, are limited to those areas draining to ASBS 24.

3.3.1.1 Commercial and Industrial Inspection Programs

Existing inspection programs for commercial and industrial facilities (e.g., restaurants, retail gasoline outlets (RGOs), automotive service facilities, United States Environmental Protection Agency (EPA) Phase I facilities, landfills) were conducted in accordance with the requirements of the 2001 NPDES permit (Order No. 01-182) (LARWQCB, 2001). The Permit included requirements for tracking, inspecting, and ensuring compliance for those facilities that are critical sources of storm water pollutants. The 2012 NPDES permit (Order No. R4-2012-0175) inspection frequencies are unchanged from the 2001 Permit requirements, although the minimum interval between inspections is reduced from 12 months to 6 months. The 2012 Permit also includes the requirement that commercial and industrial facility operators be notified of BMP requirements applicable to their site at least once during the 5-year permit cycle.

Commercial facility inspections are required by the NPDES Permit at a minimum of twice during the 5-year permit cycle. In 2008, the City began inspecting food-service related commercial businesses annually, exceeding the permit requirements. For industrial facilities, one industrial facility inspection is required within the first 2 years of the 2012 Permit and a second inspection is only required if an industrial facility has not filed a No Exposure Certification with the SWRCB. The City inspects RGOs and auto service facilities at least every other year, exceeding the permit requirement. The 2012 Permit requires follow-up inspections to be completed within 4 weeks of an infraction, and a minimum of two follow-up inspections and two enforcement letters must be issued to demonstrate a permittee's good faith effort to encourage a business to comply with the NPDES requirements.



Overall, the General Exception requires more frequent inspections than the NPDES permits. Commercial facility inspections are required at a minimum of twice per year during the rainy season. Industrial facility inspections are required a minimum of monthly, also during the rainy season. A summary of the seasonal minimum inspection frequencies required by the two NPDES permits and the General Exception for commercial and industrial facilities are presented on Table 3-5.

Table 3-5. Minimum Inspection Frequencies for Commercial and Industrial Facilities

Inspection Program	Inspection Frequency Required in ASBS 24	Historic Inspection Frequency, NPDES Permit Order R4-2012-0175	Historic Inspection Frequency, NPDES Permit Order No. 01-182
Commercial	Twice/year (rainy season)	Twice/5-year permit cycle, with at least 6 months between inspections	Twice/5-year Permit cycle, with at least one year between inspections ³
Industrial ¹	Monthly (rainy season)	Twice/5-year permit cycle, with at least 6 months between inspections ²	

¹ Industrial inspections frequencies will be implemented, if applicable to the ASBS 24 watershed.

² First inspection is required within 2 years of permit effective date. Second inspection (with at least 6 months between) is required before permit expiration if a No Exposure Certification has not been filed. Second inspections will also be performed at a minimum of 25% of facilities with No Exposure Certifications.

³ No second inspection required at Phase I Tier II facilities determined to have no risk of exposure of industrial activities to storm water.

3.3.1.2 County Industrial and Commercial Inspection Program

The land use under the LACDPW's jurisdiction within the area draining to ASBS 24 is primarily undeveloped open space. There are no industrial facilities or commercial facilities within the area draining to ASBS 24 that must comply with the inspection frequencies outlined in the General Exception.

3.3.1.3 District Industrial and Commercial Inspection Program

Aside from its own properties and facilities, the District has no planning, zoning, development, permitting, or other land use authority over industrial or commercial facilities within its service area. As such, the District has no qualifying industrial or commercial facilities within the area draining to ASBS 24 that must comply with the inspection frequencies outlined in the General Exception.

3.3.1.4 City Industrial/Commercial Facilities Inspection Program

The goals of the City's commercial and industrial (should an industrial facility begin operating; there are currently no industrial facilities in the City) inspection program include compliance verification, enforcement as needed, and education regarding storm water and urban runoff issues, recycling, and City environmental quality ordinances.

The City's commercial and industrial inspection program is overseen by environmental programs staff. During an inspection, educational materials that may be provided include surface cleaning techniques, waste management, waste minimization, and recycling options; storm water pollution prevention tips; and potential BMPs tailored to the inspected business. Businesses may



call City staff with any storm water- or inspection-related questions. City environmental programs staff also coordinates interdepartmentally with other City staff including the code enforcement officer, Public Works and the Building Safety inspectors, who have been trained to watch for storm water BMP infractions and are authorized to issue correction notices in the field. Code enforcement and the environmental programs staff work together to issue cease-and-desist letters if violations have not been corrected. Repeat offenses are subject to increased enforcement procedures and may be subject to Malibu's administrative citation ordinance, exposing the violator to civil penalties as well as traditional enforcement remedies.

The City conducts annual inspections of food-service commercial facilities and at least every other year on automotive related service facilities, going above and beyond the historic requirements of the NPDES Permit. There is not an extensive base of commercial businesses operating within the City. As reported in the 2011-2012 Annual Report (City, 2012), the City inspected 60 restaurants/food service-related businesses, three grocers,¹ six RGOs, and three automotive services² during the reporting year. Only a subset of these commercial businesses is located within the ASBS 24 watershed. Based on a review of available data, the area draining to ASBS 24 contains approximately 15 businesses that sell or serve food, three inns/motels/hotels, a couple of other stores, and one service station.

In conjunction with the annual commercial inspection program, the City implements the Clean Bay Restaurant Certification program of the Bay Foundation in partnership with several other agencies in the south Santa Monica Bay area specifically for food-service related businesses. Through the program, restaurants and other food management businesses are inspected and certified for proper handling of food waste, managing wash water, and implementing environmental policies that protect the storm drain system and ultimately the ocean receiving waters. The program certifies businesses as either 100% compliant with all program criteria or as non-compliant and therefore not certified under the Clean Bay Restaurant program. The program's primary success stems from brand recognition. It is a benefit to the partner agencies to work together in a larger regional and more recognized certification program so they may share resources such as promotional items and marketing materials, the advantage of Bay Foundation staff helping to promote the program at special events, and a standardized protocol; in essence, taking advantage of strength in numbers. As popularity and name recognition increases, there is a greater incentive to be certified in the program and more businesses will want to participate and take the extra steps to ensure they maintain certification. If a participant is found to not meet criteria or have a violation during the year that they are certified, they are subject to a strict rescinding policy and may have the certification revoked until the next period. The City's 2011-2012 Annual Report indicated that 93% of relevant businesses under the City's jurisdiction were currently certified under the program (City, 2012).

The City has complied with requirements to conduct inspections of industrial facilities when applicable. Industrial land use is very limited within the City's jurisdiction; in the 2011-2012 Annual Report, only one facility had active coverage under the State Industrial Activities Storm

¹ During the 2012-2013 annual reporting year, the Hughes Market grocery closed for business. The business will be replaced with a new organic grocer.

² All four RGOs that formerly housed automotive bays no longer offer these services. Two of the automotive service facilities are primarily RGOs.



Water General Permit and was in the process of terminating coverage. This business is under new ownership and is now a hardware store.

The City is exploring protocols to identify and track any new commercial and industrial facilities located within the area draining to ASBS 24 and ensure that inspections are implemented in accordance with the General Exception requirements. All current commercial facilities have been identified. Food service-related and RGO businesses in the area which may drain to the ASBS are being inspected at least twice in the wet season. There are no industrial facilities.

3.3.1.5 Construction Site Inspection Programs

In accordance with the Los Angeles County Municipal NPDES Permit, permittees are required to develop, implement, and enforce a construction program that prevents illicit construction-related discharges of pollutants into the MS4 and receiving waters; implements and maintains structural and nonstructural BMPs to reduce pollutants in storm water runoff from construction sites; reduces construction site discharges of pollutants to the MS4 to the maximum extent practicable; and prevents construction site discharges to the MS4 from causing or contributing to a violation of water quality standards.

Existing construction site inspection programs were implemented in accordance with the requirements of the 2001 NPDES permit. The Permit requires permittees to inspect all construction sites (1 acre and greater) a minimum of once during the wet season and requires implementation of BMPs such as inspection of graded areas during rain events to control erosion from slopes and channels. For all construction sites where a Storm Water Pollution Prevention Plan (SWPPP) is not adequately implemented, permittees are required to conduct a follow-up inspection within 2 weeks of the initial inspection. In addition, proof of a Waste Discharger Identification (WDID) number for filing a Notice of Intent (NOI) for coverage under the General Construction Storm Water Permit and certification that a SWPPP has been prepared is required prior to issuance of a grading permit. Permittees are also required to use a database or other effective system to track grading permits for construction sites totaling 5 acres or greater. In the case of violations, two follow-up inspections within 3 months and two enforcement letters must be issued to demonstrate a permittee's good faith effort to encourage a business to comply with the NPDES requirements.

The 2012 NPDES Permit outlines the new, more stringent requirements for construction site frequency that became effective on December 28, 2012. According to the 2012 NPDES Permit, construction sites with a minimum of 1 acre of soil disturbance must be inspected by permittees a minimum of three times (e.g., prior to land disturbance, during active construction, and at the conclusion of the project) and at least monthly during the rainy season. Additionally, sites that discharge to a water body listed on the Section 303(d) List as impaired for sediment or turbidity, or determined to be a "significant threat to water quality," will be inspected by permittees at least once every 2 weeks during the rainy season. All sites will be inspected prior to a forecasted storm event³ and within 48 hours after a recorded storm event.⁴ The 2012 NPDES Permit

³ A forecast storm event is defined by the NPDES permit as two or more consecutive days with a greater than 50% chance of rainfall that has been predicted by the National Oceanic and Atmospheric Administration (NOAA). This definition is in agreement with the definition of a storm event in the Construction General Permit.



requires construction sites consisting of less than 1 acre of soil disturbance to be managed through the permittees' erosion and sediment control ordinances and building permit requirements. These smaller construction sites shall be inspected on an as-needed basis. The inspection requirements of the 2012 NPDES Permit are in addition to the visual inspection programs implemented by the construction contractor's Qualified SWPPP Practitioner in accordance with the requirements of the Construction General Permit.⁵ Under the 2012 NPDES Permit, permittees are required to use an electronic system to inventory permits for all construction sites.

The General Exception requires more frequent inspections than the 2012 NPDES Permit in areas draining to ASBS 24. Construction sites, defined as sites with 1 acre or more of disturbance (SWRCB, 2010), must be inspected weekly during the rainy season. A summary of the seasonal minimum inspection frequencies required by the two NPDES permits and the General Exception are presented on Table 3-6.

Table 3-6. Minimum Inspection Frequencies for Construction Sites (1 Acre or Greater)

Inspection Program	Inspection Frequency Required in ASBS 24	Historic Inspection Frequency, NPDES Permit Order R4-2012-0175	Historic Inspection Frequency, NPDES Permit Order No. 01-182
Construction	Weekly (rainy season)	Three times (before, during, and following construction) and: Monthly (rainy season) or Once every two weeks (rainy season)*	Once/year, following rain event

*For construction sites tributary to a water body on the Section 303(d) List due to sediment or turbidity.

3.3.1.6 County Construction Site Inspection Program

The LACDPW Architectural Engineering, Construction, and Building and Safety Divisions, along with applicable County departments, are responsible for County construction inspections. The LACDPW's construction program requires all construction projects to develop and implement erosion and sediment control BMP plans prior to the start of construction (i.e., Wet Weather Erosion Control Plan [WWECP] for sites less than one acre of disturbed land, Local Storm Water Pollution Prevention Plan [LSWPPP] and a WWECP for sites greater than 1 acre of disturbed land). The LSWPPP must include year-round BMPs to control pollutants that originate from the construction site due to construction activities.

⁴ A recorded storm event is defined in the NPDES permit as a ½-inch rain event. This definition is in agreement with the definition of a storm event in the Construction General Permit.

⁵ In accordance with the Construction General Permit, non-storm water visual inspections are required weekly for Risk Level 1, 2, and 3 projects. These inspections are recorded quarterly and performed daily for LUP Type 1, 2, and 3 projects. Inspections are also required before forecasted storm events and within 48 hours of a recorded storm event.



In addition to filing an LSWPPP, for projects greater than 1 acre, the applicant must file a NOI per the State General Construction Storm Water Permit and obtain a WDID number from the State Water Resources Control Board (SWRCB, 2010). Prior to grading plan approvals, the LACDPW requires the applicant to submit copies of the NOI, WDID, and SWPPP. Projects are notified of any required changes to the SWPPP and BMPs prior to the start of the rainy season. Inspections occur thereafter, and also after each significant rainfall event. Post-construction structural BMPs are inspected annually as part of the permit renewal process. In the event that enforcement actions are taken, they occur in the order listed: warnings, stop-work notices, office meetings, notices of violation, referrals to the Regional Board, and fines or non-payment of general contractor's invoices until the violation is corrected.

The LACDPW has begun implementing new protocols to identify and track active construction sites located within the area draining to outfalls that discharge to the ASBS 24 in order to ensure that inspections are implemented in accordance with the General Exception schedule requirements, where applicable.

3.3.1.7 District Construction Site Inspection Program

Aside from its own properties and facilities, the District has no planning, zoning, development, permitting, or other land use authority over new developments or redevelopment projects, or development construction sites within its service area. Under the 2012 NPDES Permit, the District is subject to the minimum control measures of a Public Agency Activities Program, which differ from the minimum control measures imposed on other permittees. Only the Public Construction Activities Management Program, a component of the Public Agency Activities Program, could potentially be applicable to District facilities within the area draining to ASBS 24. When active construction sites under the jurisdiction of District are located within the area draining to ASBS 24, internal construction site inspections would be implemented in accordance with the existing inspection criteria defined by the LACDPW, as discussed in Section 3.3.1.6.

3.3.1.8 City Construction Site Inspection Program

Grading within the City is limited to single-lot development. The area of disturbance is restricted due to development constraints implemented by the Santa Monica Mountains Local Coastal Plan and the Municipal Code. The Development Construction Inspection Program is implemented by the Environmental Sustainability Department and the Public Works Department. Applicants are notified if an NOI for coverage under the State General Construction Storm Water Permit is required, and plans are not approved until proof of a WDID has been submitted.

The City's construction inspection program for all sediment-disturbing projects begins with a pre-grading meeting with the general contractor, deputy building official, and environmental & building safety inspector (occasionally the LACDPW inspector). At the pre-grading meeting, the SWPPP is reviewed and appropriate BMPs, including sediment and erosion controls, are discussed, and the implementation schedule is developed by construction phase. During the meeting, it is stressed to all contractors that the job site will be shut down until the required measures are in place if the contractor fails to comply. The SWPPP is discussed with the general contractor at commencement of building construction activities, with a reminder of the repercussions (i.e., tiered enforcement actions, up to and including site closure) of failing to

comply. Project sites are visited regularly during the grading phase. During the construction phase, the building inspector routinely conducts on-site inspections. The implementation and maintenance of the appropriate BMPs are checked at each inspection.

Violations are addressed immediately. All issues receive an Initial Notice of Violation/Warning and corrective actions are required with strict compliance deadlines (24 hours during rainy weather and up to 72 hours during non-critical times). Sites are then re-inspected to verify compliance and a stop-work order may be issued until compliance is verified (City, 2012).

In accordance the General Construction Permit construction projects of 1 acre or greater are inspected at least twice during the rainy season The City currently inspects all construction sites monthly, and higher risk construction sites before/during rain events as of the 2013-2014 winter. The City is implementing new protocols to identify and track active single-lot construction sites located within the area draining to outfalls that discharge to the ASBS 24 to ensure that construction site inspections are implemented weekly during the rainy season, in accordance with the General Exception requirements (summarized on Table 3-6).

3.3.1.9 Storm Drain Outfall Inspection and Cleaning Programs

Existing storm drain inspection programs were implemented in accordance with the requirements of the 2001 NPDES Permit . Each permittee was required to implement a Public Agency Activities Program to minimize storm water pollution impacts and to identify opportunities to reduce these impacts from areas of existing development. One of the activities covered under the Public Agency Activities Program is storm drain operation and maintenance, which includes visual monitoring of open-channels and other drainage structures for trash and debris at least annually; removal of trash and debris from open channels at least once annually prior to the wet season; elimination of the discharge of contaminants during MS4 maintenance; and proper disposal of debris and trash removed during storm drain maintenance. The storm drain inspection frequency was not modified in the 2012 NPDES Permit .

In addition to the annual inspection required by the NPDES Permits, the General Exception requires an additional inspection during the rainy season. A summary of the minimum inspection frequencies required by the two NPDES Permits and the General Exception is presented on Table 3-7.

Table 3-7. Minimum Inspection Frequencies for Storm Drain Outfalls

Inspection Program	Inspection Frequency Required in ASBS 24	Historic Inspection Frequency, NPDES Permit Order R4-2012-0175	Historic Inspection Frequency, NPDES Permit Order No. 01-182
MS4 outfalls	Once prior to rainy season; once during rainy season	Once/year, before the rainy season	Once/year, before the rainy season

3.3.1.10 County MS4 Outfall Inspection Program

Systems within the area draining to ASBS 24 that are at least 18 inches in diameter are generally located in the parking lots along County beaches. Beach sand frequently piles up in the outlet of these systems. These outfalls are cleared by DBH prior to the rainy season and catch basin systems are cleaned out in late summer or early fall, prior to the rainy season and again during

the rainy season, as part of the LACDPW's Road Maintenance Division annual drainage inspection program.

The LACDPW has begun implementing new protocols to identify applicable outfalls that discharge to ASBS 24 to ensure that inspections are implemented in accordance with the General Exception schedule requirements (i.e., in addition to prior to the rainy season, second inspection to be performed during the rainy season).

3.3.1.11 City MS4 Outfall Inspection and Cleaning Program

The City's Storm Drain/Culvert Facilities Maintenance program is in place for annual and post-storm inspection and cleaning of storm drain facilities. All storm drain inlets are cleaned annually, and priority storm drains are cleaned at a minimum of twice annually. This program ensures that litter, debris, and pollutants are removed to prevent them from getting into the local waterways and impacting beneficial uses. In collaboration with LACDPW, the City will be conducting similar protocols to identify outfalls that discharge to ASBS 24. In general, citywide outlets are inspected when accessible. No applicable ASBS outlets are owned by the City. A contract service provider conducts the culvert cleaning and maintenance work on behalf of the City.

3.3.2 Inspection Program Enhancements to Comply with ASBS Special Protection Requirements

As the Parties modify their inspection programs to comply with the requirements of the current 2012 NPDES Permit, the Parties will need to include enhanced protocols for inspection programs implemented for sites within the area draining to outfalls that discharge to the ASBS 24. The inspection program requirements of the 2012 NPDES Permit and the General Exception are presented in Section 3.3.1 and the details of the required program enhancements are discussed in the following sections.

3.3.2.1 County Inspection Program Enhancements

The recommended enhancements to the LACDPW's existing inspection program are presented on Table 3-8 and include:

- During the rainy season, increase the inspection frequency to once per week for construction sites (at least 1 acre) under the LACDPW's jurisdiction that are located within the applicable area draining to ASBS 24.
- Conduct inspection and cleaning of storm drain outfalls measuring at least 18 inches in diameter or width catch basins that are located within the area draining to ASBS 24 once prior to the rainy season and once during the rainy season, at a minimum.

Table 3-8. County Inspection Program Enhancements

Program	Enhancement	Frequency
Commercial	Not applicable	-
Industrial	Not applicable	-
Construction (at least 1 acre)	Increase inspection frequency	Once/week (rainy season)
Storm Drain Outfalls	Coordinate inspections with	Once/dry season (prior to rainy season)



	ASBS criteria	and once/rainy season/year
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3.3.2.2 District Inspection Program Enhancements

The recommendations for the DPW's inspection program are presented on Table 3-9 and include the following:

- When the District's active construction sites (at least 1 acre) are located within the applicable area draining to ASBS 24, District will implement inspections once per week during the rainy season in accordance with Special Protections and during the dry season in accordance with the requirements of the 2012 NPDES Permit.
- Conduct inspection and cleaning of storm drain outfalls measuring at least 18 inches in diameter or width catch basins which are located within the area draining to ASBS 24 once prior to the rainy season and once during the rainy season, at a minimum.

Table 3-9. District Inspection Program Enhancements

Program	Enhancement	Frequency
Commercial	Not applicable	-
Industrial	Not applicable	-
Construction (at least 1 acre)	Increase inspection frequency	Once/week (rainy season)
Storm Drain Outfalls	Coordinate inspections with ASBS criteria	Once/dry season (prior to rainy season) and once/rainy season/year

3.3.2.3 City Inspection Program Enhancements

The recommended enhancements to the City's existing inspection program are presented on Table 3-10 and include the following:

- During the wet season, increase the inspection frequency for construction sites (at least 1 acre) within the City's jurisdiction that are located within the applicable area draining to ASBS 24 to once per week. Applicable construction sites are being inspected at this increased frequency.
- The outfalls associated with City maintained inlets are located on private properties and considered private. The City does not own or maintain outfalls that discharge to ASBS 24. As such, no enhancements are currently proposed for the City to inspect and clean outfalls.

Table 3-10. City Inspection Program Enhancements

Program	Enhancement	Frequency
Commercial	Increase inspection frequency	Twice/year (rainy season)
Industrial	Currently not applicable based on existing land uses	-
Construction (at least 1 acre)	Increase inspection frequency	Once/week (rainy season)



4.0 RECEIVING WATER ASSESSMENT

A determination of whether there is currently an exceedance of the natural water quality of the ASBS is the first step in the process of assessing the potential pollutant load reductions targets required to enhance the water quality of the ASBS. Wet weather receiving water quality monitoring data results were evaluated in comparison to data for reference monitoring sites, in accordance with the flowchart provided as Attachment 1 to the General Exception, to determine if an exceedance of the natural water quality currently exists.

4.1 Determination of Compliance with Natural Water Quality

In 2008, a study was conducted as part of Bight 2008 to assess water quality in southern California ASBS (Schiff et al., 2011). The study was designed to evaluate the range of natural water quality near reference drainage locations and to compare water quality near ASBS discharges to these natural water quality conditions. Additional reference monitoring was performed under the Regional Monitoring Program. During the development of the draft Compliance Plan, compliance with natural water quality was determined by comparing receiving water data from wet weather monitoring conducted for ASBS 24 to the 85th percentile threshold of reference sample concentrations measured during Bight 2008 and Bight 2013.

Concentrations of pollutants in post-storm receiving water were compared to those in pre-storm receiving water and to the 85th percentile threshold of reference sample concentrations. When post-storm receiving water concentrations are greater than the 85th percentile threshold and are greater than pre-storm concentrations for two or more storm events, results from the next storm are analyzed. If post-storm receiving water concentrations are again greater than the 85th percentile threshold and pre-storm concentrations, the constituent(s) are classified as exceedances of natural water quality. Concentrations of TSS, ammonia, nitrate, total orthophosphate, and total metals were compared to the 85th percentile thresholds.

Wet weather monitoring was performed by LACDPW at two receiving water locations: 1) S01, located off Zuma Beach directly out from ASBS-016, a 60-inch storm drain; and 2) S02, located off Escondido Beach, directly out from ASBS-028, a 36-inch storm drain. Monitoring was conducted during storm events occurring on February 19 and March 8, 2013, and February 28, 2014. Wet weather flows from ASBS-016 only reached the ocean receiving water at S01 during the February 28, 2014, monitored event. The City performed monitoring at receiving water Site 24-BB-03R. For safety reasons, this site was only sampled during the February 28, 2014, event. Therefore, the assessment of compliance with natural water quality was primarily performed for receiving water station S02, which had samples collected during three wet weather events. Receiving water station S02 is associated with ASBS-028, which is a 36-inch outfall that drains a mixture of developed and vacant land. There are additional identified point source clustered west and east of this site with three (ASBS-025, ASBS-026, and ASBS-027) located to the west (within 0.25 miles) and two (ASBS-029 and ASBS-030) located to the east (within 0.1 miles). Therefore, receiving water station S02 is considered to be representative of the typical to worst case scenario of the potential impact that storm water runoff may have on the water quality within the ASBS. **Error! Reference source not found.** shows the locations of the receiving water stations monitored in support of the preparation of this Plan.

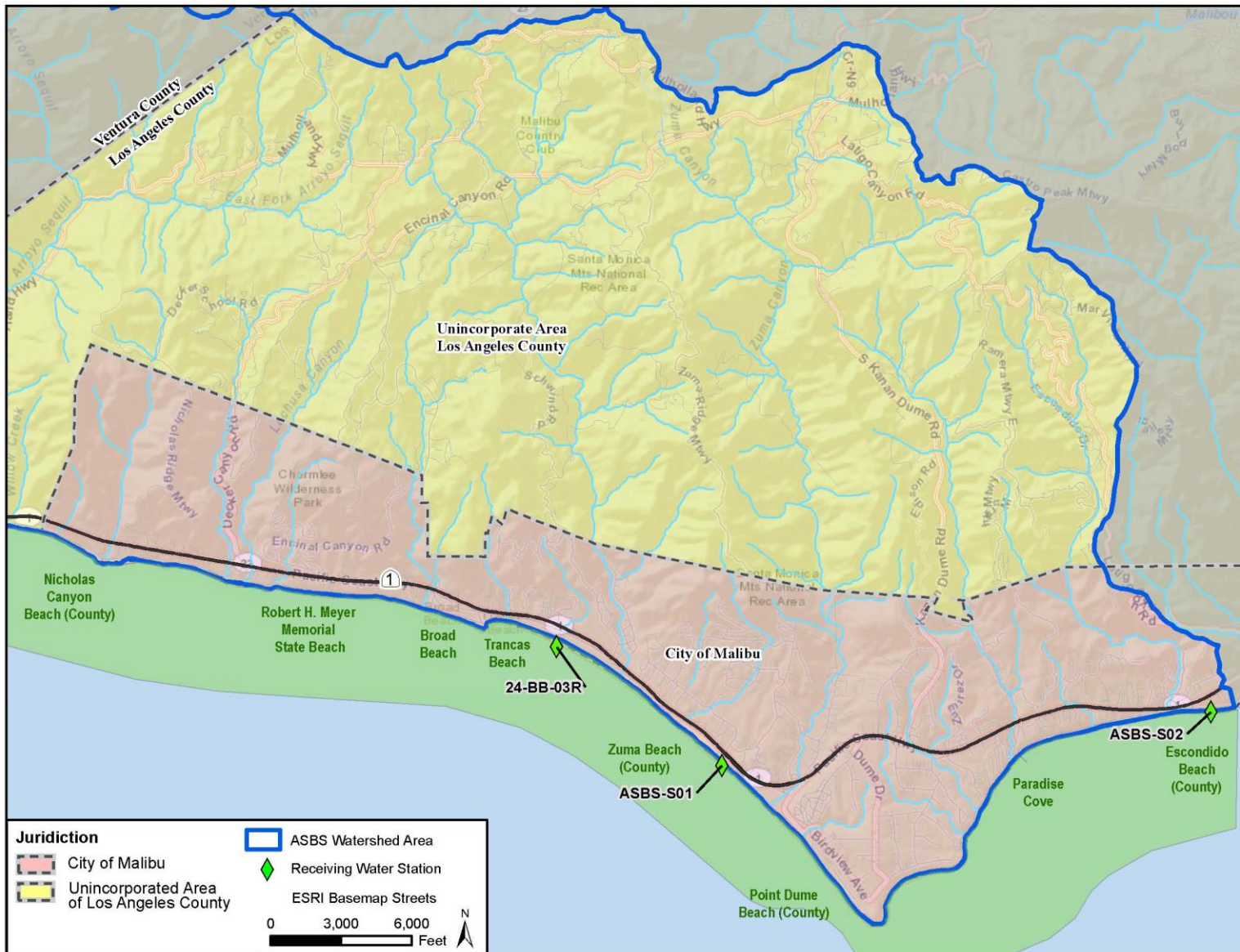


Figure 4-1. ASBS 24 Receiving Water Monitoring Location



4.1.1 February 19, 2013, Storm Event Receiving Water Monitoring

The February 2013 storm event resulted in approximately 0.12 inches of rainfall based on rain gauge data obtained from County Fire Station 70 located at 3970 Carbon Canyon Road in Malibu, CA. Receiving water results were compared to the available list of constituents of reference site 85th percentile values. Post-storm concentrations of nitrate as nitrogen (N), selenium, total PAHs, and total pyrethroids were greater than the 85th percentile threshold (see Table 4-1). However, the nitrate as N post-storm concentration was less than the pre-storm concentration; therefore, the nitrate as N concentration is considered to be similar to background concentrations and is not classified as an exceedance. Since the selenium, total PAHs, and total pyrethroids concentrations were greater than the 85th percentile threshold and were greater than pre-storm concentrations, results from the proceeding storm event were analyzed to determine whether the natural water quality has been exceeded.

For constituents that are summed to get total values for comparison to 85th percentile total values (e.g., all OP pesticides, total PAHs, total pyrethroids), half of the method detection limits (MDL) were used for non-detect values. In the case of total pyrethroids for example, the reference sampling resulted in all non-detect values, and therefore the summation of the MDLs for the 10 selected pyrethroids is 6.75 µg/L. Following this process to determine total pyrethroids for the ASBS 24 receiving water stations results in an exceedance of 85th percentile threshold value anytime a pyrethroid included in the assessment has a measurable result (i.e., 85th percentile threshold in reality is zero). In actuality, the individual pyrethroid values may be less than half the MDL values (undetermined currently based on laboratory limitations) resulting in the possibility that the total pyrethroid value is less than the 85th percentile threshold. The same is true for both all OP pesticides and total PAHs assessments.



Table 4-1. February 2013 Receiving Water Results

		85th Percentile of Reference Data	S01-PRE	S02-PRE	S02-POST
Parameter	Units		2/18/2013	2/18/2013	2/19/2013
General Chemistry					
Ammonia as N	mg/L	0.015	0.09	0.04J	<0.02
Nitrate as N	mg/L	0.374	0.51	0.38	0.25
Oil & Grease	mg/L	0.5	14.1	<1	<1
Total Orthophosphate as P	mg/L	0.114	0.02	0.02	0.03
Total Suspended Solids	mg/L	55.4	5.2	7.9	40.5
Total Metals					
Arsenic (As)	µg/L	`	1.718	1.471	1.393
Cadmium (Cd)	µg/L	0.16	0.0229	0.0601	0.058
Chromium (Cr)	µg/L	2.6	0.3192	0.5437	0.6366
Copper (Cu)	µg/L	1.9	0.149	0.321	0.454
Lead (Pb)	µg/L	0.72	0.0513	0.102	0.1867
Mercury (Hg)	µg/L	0.0006	<0.0012	<0.0012	<0.0012
Nickel (Ni)	µg/L	2.2	0.2724	0.509	0.7661
Selenium (Se)	µg/L	0.017	0.007J	0.015	0.031
Silver (Ag)	µg/L	0.08	0.03	0.01J	<0.01
Zinc (Zn)	µg/L	19	1.0376	1.2033	12.2809
Organophosphorus Pesticides					
*All OP Pesticides	ng/L	6	6	6	6
Polynuclear Aromatic Hydrocarbons					
*Total PAHs	ng/L	12.5	12.5	12.5	41.1
Pyrethroids					
Bifenthrin	ng/L		<0.5	<0.5	<0.5
Deltamethrin/Tralomethrin	ng/L		<0.5	<0.5	<0.5
Esfenvalerate	ng/L		1.1J	<0.5	0.8J
All Other Pyrethroids	ng/L		ND	ND	ND
*Total Pyrethroids	ng/L	6.75	8.6	6.75	7.3

< - result less than the MDL.

ND - results less than the MDLs (multiple MDL values)

J - Analyte was detected at a concentration below the reporting limit and above the method detection limit.
Reported value is estimated.

Red outline – Post-storm receiving water concentration is greater than 85th percentile of Reference Data AND greater than pre-storm concentration.

*Totals calculated using result values when if detected and half the MDL when results were <MDL.



4.1.2 March 8, 2013, Storm Event Receiving Water Monitoring

The March 2013 storm event resulted in approximately 0.74 inches of rainfall based on rain gauge data obtained from County Fire Station 70. The selenium and total PAHs concentrations in the receiving water were again greater than both the 85th percentile threshold and pre-storm concentrations (see Table 4-2). As a result, the concentrations of both constituents are considered to be exceedances of natural water quality and may be contributing to alterations in natural ocean water quality within ASBS 24. In addition, concentrations of nitrate as N, copper, lead, mercury, zinc, and total PAHs were greater than both the 85th percentile threshold and pre-storm concentrations. Results from the subsequent monitored wet weather event (February 2014) were used to evaluate whether the listed constituents in storm water runoff were considered to be contributing to an exceedance of natural water quality.

The receiving water Site S02 results for the first monitored event (February 2013 event) included a concentration total pyrethroid that was greater than both the 85th percentile threshold and pre-storm concentrations (see Table 4-1). The February 2014 receiving water Site S02 concentration for total pyrethroid was not greater than both the 85th percentile threshold and pre-storm concentrations (see Table 4-2).

Table 4-2. March 2013 Receiving Water Results

		85th Percentile of Reference Data	S01-PRE	S02-PRE	S02-POST
Parameter	Units		3/6/2013	3/6/2013	3/8/2013
General Chemistry					
Ammonia as N	mg/L	0.015	0.04J	0.03J	<0.02
Nitrate as N	mg/L	0.374	0.48	0.49	0.54
Oil & Grease	mg/L	0.5	<1	<1	<1
Total Orthophosphate as P	mg/L	0.114	0.03	0.03	0.06
Total Suspended Solids	mg/L	55.4	3.8	14.9	33.3
Total Metals					
Arsenic (As)	µg/L	1.72	1.558	1.563	1.577
Cadmium (Cd)	µg/L	0.16	0.0281	0.0587	0.1396
Chromium (Cr)	µg/L	2.6	0.2422	0.6549	2.5224
Copper (Cu)	µg/L	1.9	0.157	0.378	2.924
Lead (Pb)	µg/L	0.72	0.0288	0.1558	1.0434
Mercury (Hg)	µg/L	0.0006	<0.0012	<0.0012	0.0046J
Nickel (Ni)	µg/L	2.2	0.2849	0.625	1.8595
Selenium (Se)	µg/L	0.017	0.008J	0.017	0.052
Silver (Ag)	µg/L	0.08	<0.01	0.01J	<0.01
Zinc (Zn)	µg/L	19	2.6986	37.8762	54.1039
Organophosphorus Pesticides					
*All OP Pesticides	ng/L	6	6	6	6
Polynuclear Aromatic Hydrocarbons					
*Total PAHs	ng/L	12.5	12.5	12.5	25.5
Pyrethroids					
Bifenthrin	ng/L		<0.5	<0.5	8.4
Deltamethrin/Tralomethrin	ng/L		10.6	26.6	<0.5
Esfenvalerate	ng/L		<0.5	<0.5	<0.5
All Other Pyrethroids	ng/L		ND	ND	ND
*Total Pyrethroids	ng/L	6.75	19.85	35.85	17.65

< - result less than the MDL.

ND - results less than the MDLs (multiple MDL values)

J - Analyte was detected at a concentration below the reporting limit and above the method detection limit.

Reported value is estimated.

Red outline – Post-storm receiving water concentration is greater than 85th percentile of Reference Data AND greater than pre-storm concentration.

Orange fill – Analyte concentration has exceeded 85th percentile of Reference Data during 1st and 2nd monitoring event.

*Totals calculated using result values if above the MDL and half the MDL when results were less than the MDL.



4.1.3 February 28, 2014, Storm Event Receiving Water Monitoring

The February 2014 storm event resulted in a total event rainfall of approximately 2.26 inches of rainfall based on rain gauge data obtained from County Fire Station 70. Pre- and post-storm samples were collected at Sites S01, S02, and 24-BB-03R.

The concentrations of total orthophosphate as P, TSS, mercury, selenium, silver, total PAHs, and total pyrethroids in receiving water at Site S02 were greater than both the 85th percentile threshold and pre-storm concentrations (see Table 4-3). Based on the results from the first and second monitored events in accordance with the General Exception, selenium and total PAHs are considered to be exceedances of natural water quality. The selenium and total PAHs results at Site S02 from the February 2014 event are consistent with those previous data. The mercury result being higher than both the 85th percentile threshold and pre-storm concentration for the second consecutive monitored event is considered to be exceedance of the natural water quality and may be contributing to alterations in natural ocean water quality within ASBS 24. Of the three storms monitored, the February 2014 events results for Site S02 are the only one where orthophosphate as P, TSS, or silver were above both the 85th percentile threshold and pre-storm concentrations. Therefore, the receiving water Site S02 measured concentrations of total orthophosphate as P, TSS, and silver being above both the 85th percentile threshold and pre-storm concentrations during one event are not considered to be exceedances of natural water quality.

The receiving water Site S02 results for the second monitored event (March 2013 event) included concentrations of nitrate as N, copper, lead and zinc that were greater than both the 85th percentile threshold and pre-storm concentrations (see Table 4-2). The February 2014 receiving water Site S02 concentrations for nitrate as N, copper, lead, and zinc were not greater than both the 85th percentile threshold and pre-storm concentrations (see Table 4-3), and therefore these constituents are not considered to be exceedances of the natural water quality.

Mercury, silver, zinc, and total PAHs concentrations in receiving water were greater than both the 85th percentile threshold and pre-storm concentrations for Site S01 (see Table 4-3). This monitored event was the only one of three in which flow from ASBS-016 reached the receiving water at Site S01, and thus, was the only time receiving water chemistry data were obtained at S01 as part of the General Exception monitoring. Based on first and second event results for Site S02, total PAHs is considered to be an exceedance of natural water quality. Based on second and third event results for Site S02, mercury is considered to be an exceedance of natural water quality. The receiving water Site S01 measured concentrations of silver and zinc being above both the 85th percentile threshold and pre-storm concentrations during one event is not considered to be an exceedance of natural water quality.

Pre-storm and post-storm samples were collected and analyzed at Site 24-BB-03R. For safety reasons, this site was not sampled previous to this event. The selenium concentration in the receiving water was greater than both the 85th percentile threshold and pre-storm concentrations for Site 24-BB-03R (see Table 4-3). The concentration of selenium being above the 85th percentile threshold and pre-storm concentrations is not considered an exceedance of natural water quality at Site 24-BB-03R. The selenium result at Site 24-BB-03R above the 85th percentile threshold and pre-storm concentrations are consistent with the results for Site S02 where

selenium is considered to be an exceedance of natural water quality based on the first and second event results.

Table 4-3. February 2014 Receiving Water Results

Parameter	Units	85th Percentile of Reference Data	S01-PRE	S01-POST	S02-PRE	S02-POST	24-BB-03R-PRE	24-BB-03R-POST
			2/25/2014	2/28/2014	2/25/2014	2/28/2014	2/25/2014	2/28/2014
General Chemistry								
Ammonia as N	mg/L	0.015	<0.02	<0.02	<0.02	<0.02	ND	ND
Nitrate as N	mg/L	0.374	0.03J	0.02J	0.02J	<0.01	0.04	ND
Oil & Grease	mg/L	0.5	<1	<1	<1	<1	ND	ND
Total Orthophosphate as P	mg/L	0.114	0.02	0.02	0.02	0.18	0.02	0.02
Total Suspended Solids	mg/L	55.4	19.5	25.2	87.7	150	10.8	7.1
Total Metals								
Arsenic (As)	µg/L	1.72	1.472	1.283	6.604	4.122	1.388	1.322
Cadmium (Cd)	µg/L	0.16	0.0249	0.0228	0.5099	0.2623	0.0152	0.022
Chromium (Cr)	µg/L	2.6	1.1131	0.3893	26.0119	4.9578	1.4705	0.6962
Copper (Cu)	µg/L	1.9	0.676	0.221	6.001	2.289	0.167	0.646
Lead (Pb)	µg/L	0.72	0.2367	0.0584	7.265	1.5477	ND	0.2159
Mercury (Hg)	µg/L	0.0006	<0.0012J	0.014	<0.0012	0.0261	ND	ND
Nickel (Ni)	µg/L	2.2	0.8679	0.3565	21.5664	4.2441	0.2951	0.4901
Selenium (Se)	µg/L	0.017	0.016	0.011J	0.083	0.155	0.012	0.026
Silver (Ag)	µg/L	0.08	0.09	0.18	0.03	0.14	0.14	0.12
Zinc (Zn)	µg/L	19	5.3515	21.0509	41.7076	12.0229	2.9144	17.3532
Organophosphorus Pesticides								
*All OP Pesticides	ng/L	6	6	6	6	6	6	6
Polynuclear Aromatic Hydrocarbons								
*Total PAHs	ng/L	12.5	17.4	18.5	29.6	84.1	19.2	18.8
Pyrethroids								
Bifenthrin	ng/L		<0.5	<0.5	<0.5	2.5	<0.5	<0.5
Deltamethrin/Tralomethrin	ng/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Esfenvalerate	ng/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
All Other Pyrethroids	ng/L		ND	ND	ND	ND	ND	ND
*Total Pyrethroids	ng/L	6.75	6.75	6.75	6.75	9	6.75	6.75

< - result less than the MDL.

ND - results less than the MDLs (multiple MDL values)

J - Analyte was detected at a concentration below the reporting limit and above the method detection limit.

Reported value is estimated.

Red outline – Post-storm receiving water concentration is greater than 85th percentile of Reference Data AND greater than pre-storm concentration.

Orange fill – Analyte concentration has exceeded 85th percentile of Reference Data during 1st and 2nd monitoring event.

*Totals calculated using result values if above the MDL and half the MDL when results were less than the MDL.

4.1.4 December 2, 2014, Storm Event Receiving Water Monitoring

The December 2014 storm event resulted in a total event rainfall of approximately 1.14 inches based on rain gauge data obtained from County Fire Station 70. Pre- and post-storm samples were collected at Site 24-BB-03R.

The concentrations of total ammonia as N, silver, and total PAHs, in receiving water at Site 24-BB-03R were greater than both the 85th percentile threshold and pre-storm concentrations (see



Table 4-4. December 2014 Receiving Water Results). Based on the results from the third (see Table 4-3) and fourth monitored events, in accordance with the General Exception, there were no exceedances of natural water quality. Of the two storms monitored, the December 2014 event result for Site 24-BB-03R is the only one in which total ammonia as N, silver, or total PAHs were above both the 85th percentile threshold and pre-storm concentrations. Therefore, the receiving water Site 24-BB-03R measured concentrations of total ammonia as N, silver, and total PAHs being above both the 85th percentile threshold and pre-storm concentrations during one event are not considered to be exceedances of natural water quality.

Table 4-4. December 2014 Receiving Water Results

Parameter	Units	85th Percentile of Reference Data	24-BB-03R PRE	24-BB-03R POST
			12/2/2014	12/2/2014
General Chemistry				
Ammonia as N	mg/L	0.015	ND	0.19
Nitrate as N	mg/L	0.374	0.03	0.02
Oil & Grease	mg/L	0.5	ND	ND
Total Orthophosphate as P	mg/L	0.114	0.02	0.02
Total Suspended Solids	mg/L	55.4	16.3	4.7
Total Metals				
Arsenic (As)	µg/L	1.72	1.321	1.387
Cadmium (Cd)	µg/L	0.16	0.0257	0.0168
Chromium (Cr)	µg/L	2.6	0.5345	0.2928
Copper (Cu)	µg/L	1.9	0.577	0.317
Lead (Pb)	µg/L	0.72	0.3221	0.2596
Mercury (Hg)	µg/L	0.0006	ND	ND
Nickel (Ni)	µg/L	2.2	0.6118	0.2955
Selenium (Se)	µg/L	0.017	ND	0.01
Silver (Ag)	µg/L	0.08	0.07	0.12
Zinc (Zn)	µg/L	19	6.6900	7.0000
Organophosphorus Pesticides				
*All OP Pesticides ng/L		6	ND	ND
Polynuclear Aromatic Hydrocarbons				
Total PAHs ng/L		12.5	41.3	41.4
Pyrethroids				
Bifenthrin	ng/L		ND	ND
Deltamethrin/Tralomethrin	ng/L		ND	ND
Esfenvalerate	ng/L		ND	ND
All Other Pyrethroids	ng/L		ND	ND
*Total Pyrethroids	ng/L	6.75	ND	ND

< - result less than the MDL.

ND - results less than the MDLs (multiple MDL values)

J - Analyte was detected at a concentration below the reporting limit and above the method detection limit.

Reported value is estimated.

Red outline – Post-storm receiving water concentration is greater than 85th percentile of Reference Data AND greater than pre-storm concentration.

Orange fill – Analyte concentration has exceeded 85th percentile of Reference Data during 1st and 2nd monitoring event.

*Totals calculated using result values if above the MDL and half the MDL when results were less than the MDL.



4.1.5 Receiving Water Monitoring Conclusions

In post-storm samples collected in the receiving water (Site S02), selenium and total PAHs concentrations were above the 85th percentile reference threshold and had post-storm concentrations that exceeded those of the pre-storm samples collected during three consecutive monitored storm events (February and March 2013 and February 2014). Mercury results at Site S02 were above 85th percentile reference threshold and pre-storm concentrations for two consecutive events (March 2013 and February 2014). Based on the guidance found in Attachment 1 of the General Exception, this indicates an exceedance of natural water of the ASBS for these constituents.

Receiving water samples (Site S02) collected during the second monitored event had concentrations of nitrate as N, copper, lead, and zinc above the 85th percentile reference thresholds and were above the pre-storm concentrations. Based on Attachment 1 of the General Exception, if these constituents are above the 85th percentile reference thresholds in post-storm receiving water samples collected during the next monitoring event, then there would be an exceedance in the natural water quality of the ASBS for these additional constituents. February 2014 receiving water (Site S02) concentrations for nitrate as N, copper, lead, and nickel were not greater than both the 85th percentile threshold and pre-storm concentrations, and these constituents are not considered an exceedance of natural water quality.

Of the three storms monitored, the only event in which flow from ASBS-016 reached the receiving water at Site S01 was during the February 28, 2014, storm (third monitored event), and thus, was the only time receiving water chemistry data were obtained at S01 as part of the General Exception monitoring. Mercury, silver, zinc and total PAHs concentrations in receiving water were greater than both the 85th percentile threshold and pre-storm concentrations for Site S01. Based on the Site S02 results from the first and second events total PAHs is considered to be exceedance of natural water quality. Based on the Site S02 results from the second and third events mercury is considered to be exceedance of natural water quality. The receiving water Site S01 measured concentrations of silver and zinc being above both the 85th percentile thresholds and pre-storm concentrations during one event is not considered to be exceedances of natural water quality.

Pre-storm and post-storm samples were collected and analyzed at Site 24-BB-03R during the February 2014 and December 2014 events. For safety reasons, this site was not sampled at other events. The ammonia as N, silver, and PAH concentrations in the receiving water were greater than both the 85th percentile and the pre-storm concentration for site 24-BB-03R during the December event (see Table 4-4). However, during the February 2014 event only selenium concentration in the receiving water was greater than both the 85th percentile threshold and pre-storm concentration for Site 24-BB-03R (see Table 4-3). Therefore, the concentration of ammonia, silver, PAH, and selenium being above the 85th percentile threshold and pre-storm concentrations are not considered exceedances of natural water quality at Site 24-BB-03R.



4.2 Bight 2008 Data for ASBS 24

A review of Bight 2008 ASBS 24 data was conducted, and a summary of the review is provided for reference and for comparison to the determination made in this Compliance Plan. Bight 2008 constituent concentrations values were obtained from a series of graphs provided as an appendix to the Bight 2008 report and are approximate (tabular data not currently available). The Bight 2008 effort included collecting and analyzing both reference and discharge receiving water samples. The Bight 2008 report showed the comparison between the reference 85th percentile threshold values and discharge samples (Schiff et al., 2011).

4.2.1 Metals

For total chromium, the Bight 2008 85th percentile threshold of reference conditions was 1.6 µg/L (revised by Bight 2013 data to 2.6 µg/L). Of the five ASBS 24 post-storm samples assessed for total chromium during Bight 2008, four had concentrations below the threshold (ranging from approximately 0.5 to 1.0 µg/L) and one was above the threshold (approximately 3.4 µg/L)(Schiff et al., 2011).

For total copper, the Bight 2008 85th percentile threshold was 2.2 µg/L (revised by Bight 2013 data to 1.9 µg/L). Of the three ASBS 24 post-storm samples assessed for total copper during Bight 2008, two had concentrations below the threshold (approximately 0.4 and 0.5 µg/L) and one was slightly above the threshold (approximately 2.3 µg/L)(Schiff et al., 2011).

For total nickel, the Bight 2008 85th percentile threshold was 1.5 µg/L (revised by Bight 2013 data to 2.2 µg/L). For the three ASBS 24 post-storm samples assessed during Bight 2008, two had concentrations below the threshold (approximately 0.5 and 0.7 µg/L) and one was above the threshold (approximately 4.2 µg/L)(Schiff et al., 2011).

For total zinc, the Bight 2008 85th percentile threshold was 8.6 µg/L (revised by Bight 2013 data to 19 µg/L). Of the five ASBS 24 post-storm samples assessed for total zinc during Bight 2008, three had concentrations below the threshold (ranging from 0 to approximately 2.1 µg/L) and two were above the threshold (approximately 10.5 and 11.0 µg/L)(Schiff et al., 2011).

Samples collected as part of the Bight 2008 efforts were not analyzed for mercury or selenium, and thus no Bight 85th percentile thresholds were established for these constituents.

4.2.2 Total Suspended Solids

For TSS, the Bight 2008 85th percentile threshold was 16.5 mg/L (revised by Bight 2013 data to 55.4 µg/L). Of the five ASBS 24 post-storm samples assessed for TSS during the Bight 2008, two had concentrations below the threshold (approximately 8.0 and 10.0 µg/L) and three were above the threshold (ranging from approximately 50 to 130 µg/L)(Schiff et al., 2011).



4.2.3 Total PAHs

For total PAHs, the Bight 2008 85th percentile threshold was 19.6 ng/L (revised by Bight 2013 data to 12.5 ng/L). Of the four ASBS 24 post-storm samples assessed for total PAHs during the Bight 2008, all four samples had concentrations below the threshold (approximately 0, 5, 8, and 11 ng/L)(Schiff et al., 2011).

4.2.4 Organophosphorus Pesticides and Pyrethroids

Samples collected as part of the Bight 2008 efforts were not analyzed for organophosphorus pesticides or pyrethroids, and thus no Bight 85th percentile thresholds were established for these constituents.

5.0 OUTFALL ASSESSMENT OF POLLUTANT LOAD REDUCTION TARGETS

An assessment of the potential pollutant load reductions targets was performed to determine the magnitude of controls required to be implemented in order to enhance the water quality of the ASBS. The first step in the assessment process was to evaluate wet weather receiving water quality monitoring data in comparison to data for reference monitoring sites, in accordance with the flowchart provided as Attachment 1 to the General Exception, to determine if an exceedance of the natural water quality currently exists (see Section 4.0). This evaluation determined that an exceedance of natural water exists for three constituents at receiving water Site S02 and discussed in more detail in Section 4.0. Water quality results from outfall monitoring were evaluated for the applicable constituent to identify discharge locations that have a potential to be contributing to the exceedance of natural water quality. More specifically, the assessment evaluated where BMPs may be required to achieve outfall design storm discharge concentrations, on average, by either: 1) end-of-pipe concentrations below the Table B Instantaneous Maximum Water Quality Objectives (WQOs) in Chapter II of the Ocean Plan, or 2) achieving a 90% reduction in pollutant loading during storm events for the responsible applicant's total discharge. The Ocean Plan was updated subsequent to the General Exception adoption. The updated Ocean Plan now refers to Table B as Table 1 (formerly Table B), and this Plan utilized the updated table title.

5.1 Outfall Wet Weather Monitoring Results

The General Exception states that the ASBS Compliance Plan shall describe how the necessary pollutant reductions in storm water runoff will be achieved through prioritization of outfalls and implementation of BMPs to reduce end-of-pipe pollutant concentrations during a design storm to below either the Table 1 Instantaneous Maximum WQOs in Chapter II of the Ocean Plan or a 90% reduction in pollutant loading during storm events for the applicant's total discharge. For the constituents that are currently in exceedance of the natural water quality of the ASBS (mercury, selenium, and total PAHs), this draft ASBS Compliance Plan evaluates outfall discharges in comparison to the Table 1 Instantaneous Maximum WQOs as the pollutant load targets in order to be in compliance with the General Exception.

Chemistry results obtained from outfalls to ASBS 24 during the February 2013, March 2013, February 2014, and December 2014 storm events are presented on Table 5-1 through Table 5-4, respectively. Site ASBS-008 was not added to the monitoring list until after the February 19, 2013, storm event, so no data were collected during the first monitoring event. Site ASBS-008 was inadvertently not monitored during the third storm event. Sites ASBS-013, ASBS-016, and ASBS-031 did not flow during the February 19, 2013, storm event, and Sites ASBS-013 and ASBS-031 did not flow during the March 8, 2013, storm event. Site ASBS-031 did not flow during the February 2014 storm event. Outfalls that were less than 36 inches in diameter were evaluated for oil and grease and TSS only, while outfalls that were 36 inches or greater in diameter were evaluated for ammonia, nitrate, oil and grease, TSS, total orthophosphate, total metals, PAHs, organophosphorus pesticides, and pyrethroids. Table 5-1 through Table 5-3 include both PAHs (based on 13 constituents listed in the Ocean Plan) and total PAHs (based on the 25 constituents analyzed by the laboratory based on guidance from the Bight 2013



Committee). These tables also list the more commonly detected individual pyrethroids as well as the total pyrethroids.



Table 5-1. February 2013 Outfall Chemistry Results

Parameter	Units	CA Ocean Plan	001	002	003	004	005	008	011	013	016 ¹	018	021	022	023	024	025	026	027	028 ²	029	030	031	
		Instantaneous Maximum	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	2/19/2013	
General Chemistry																								
Ammonia as N	mg/L	6			1.47		1.12	Not sampled		Not sampled	Not sampled		0.78	1	0.68						0.64			Not sampled
Nitrate as N	mg/L				10.15		5.57						4.48	8.24	12.45						7.02			
Oil & Grease	mg/L		1.3	1.4	1.6	4	1.6		<1			<1	<1	1.9	2.3	6	3.7	7	3.1	<1	<1	30.9		
Total Orthophosphate as P	mg/L				0.53		0.6						0.22	0.35	0.63						0.28			
Total Suspended Solids	mg/L		270.7	53.8	584	284	186.5		1.8				75.5	22.5	38.7	63.2	453	90.5	870	218	16.3	133	61.3	
Total Metals																								
Arsenic (As)	µg/L	80			2.129		1.664	Not sampled		Not sampled	Not sampled		1.15	0.949	2.231						0.876			Not sampled
Cadmium (Cd)	µg/L	10			0.3074		0.3482						0.0953	0.1168	0.201						0.269			
Chromium (Cr)	µg/L	20			10.1209		7.9002						1.393	3.1286	3.2046						1.8548			
Copper (Cu)	µg/L	30			63.557		30.469						11.434	84.928	266.162						13.136			
Lead (Pb)	µg/L	20			13.9921		5.8034						1.317	4.3272	4.8762						2.0076			
Mercury (Hg)	µg/L	0.4			0.1611		0.0505						<0.0012	<0.0012	<0.0012						<0.0012			
Nickel (Ni)	µg/L	50			11.5741		10.4739						2.7542	3.1307	7.007						5.2478			
Selenium (Se)	µg/L	150			0.794		0.102						0.138	0.151	0.355						0.435			
Silver (Ag)	µg/L	7			<0.01		<0.01						<0.01	<0.01	<0.01						<0.01			
Zinc (Zn)	µg/L	200			141.3834		128.8537					60.3801	135.3146	269.0515					38.9739					
Organophosphorus Pesticides																								
*All OP Pesticides	ng/L				ND		ND	N.S.		N.S.	N.S.		ND	ND	2868.9					ND			N.S.	
Polynuclear Aromatic Hydrocarbons																								
Fluoranthene	ng/L				59.2		122	Not Sampled		Not Sampled	Not Sampled		26.9	70.9	101.2					<1			Not Sampled	
PAHs ³	ng/L				102		208.4						42	103.7	255.6						<1			
Total PAHs ⁴	ng/L				161.2		341.4						68.9	174.6	380.2						6.1			
Pyrethroids																								
Bifenthrin	ng/L				700.8		<0.5	Not Sampled		Not Sampled	Not Sampled		<0.5	320.9	1184.5					<0.5			Not Sampled	
Deltamethrin/Tralomethrin	ng/L				<0.5		<0.5						<0.5	<0.5	<0.5						<0.5			
Esfenvalerate	ng/L				152.4		<0.5						<0.5	<0.5	<0.5						<0.5			
All Other Pyrethroids	ng/L				29.3		ND						ND	ND	344.4						ND			
*Total Pyethroids	ng/L				882.5		ND						ND	320.9	1528.9						ND			
< - results less than the method detection limit (MDL).																								
ND - results less than the MDLs (multiple results)																								
Green fill- concentration is greater than California Ocean Plan lmax criteria																								
Note 1 - Site associated with Receiving Water Station S01																								
Note 2 - Site associated with Receiving Water Station S02																								
Note 3 - PAHs based on constituents listed in Ocean Plan																								
Note 4 - Total PAHs based on constituents listed in Bight 2013 Work Plan.																								



Table 5-2. March 2013 Outfall Chemistry Results

Parameter	Units	CA Ocean Plan	001	002	003	004	005	008	011	013	016 ¹	018	021	022	023	024	025	026	027	028 ²	029	030	031
		Instantaneous Maximum	3/8/2013	3/8/2013	3/8/2013	3/7/2013	3/7/2013	3/8/2013	3/7/2013	3/7/2013	3/8/2013	3/8/2013	3/8/2013	3/7/2013	3/8/2013	3/8/2013	3/8/2013	3/7/2013	3/7/2013	3/8/2013	3/7/2013	3/7/2013	3/7/2013
General Chemistry																							
Ammonia as N	mg/L	6			2.1		4.75			Not Sampled	4.8		0.57	1.32	0.66					7.8			Not Sampled
Nitrate as N	mg/L				3.78		3.51				10.2		3.24	4.84	5.15					5.29			
Oil & Grease	mg/L		221.1	<1	1.1	83.4	<1	<1	<1		<1	<1	<1	<1	1.3	1.2	1.5	4.8	1.7	6.7	<1	1.2	
Total Orthophosphate as P	mg/L				0.5		0.34				0.79		0.51	0.16	0.51					0.75			
Total Suspended Solids	mg/L		531	52.7	315.7	17.5	37.1	115.4	<0.5		782	58.1	64.1	10.7	33	63.6	64.3	660	17.9	616	29.7	32.4	
Total Metals																							
Arsenic (As)	µg/L	80			2.505		1.43			Not Sampled	3.738		2.13	2.257	2.158					7.287			Not Sampled
Cadmium (Cd)	µg/L	10			0.6881		0.0848				1.2527		0.5355	0.0901	0.0767					10.9524			
Chromium (Cr)	µg/L	20			23.8781		2.5783				39.2081		7.1327	1.9708	1.8344					32.3596			
Copper (Cu)	µg/L	30			41.556		27.149				33.872		20.484	35.044	116.98					198.495			
Lead (Pb)	µg/L	20			19.8277		1.7097				10.1402		3.9416	1.0592	3.6519					46.2982			
Mercury (Hg)	µg/L	0.4			0.0238		0.0158				0.0236		0.0148	0.007J	<0.0012					0.0596			
Nickel (Ni)	µg/L	50			22.3039		4.5323				47.8272		10.479	2.0729	3.4917					77.0818			
Selenium (Se)	µg/L	150			0.363		0.115				0.176		0.076J	0.521	0.151					1.004			
Silver (Ag)	µg/L	7			<0.01		0.06				<0.01		0.08	0.06	0.04					0.06			
Zinc (Zn)	µg/L	200			142.7101		104.6536				125.2092		88.1959	41.841	157.6642					800.687			
Organophosphorus Pesticides																							
*All OP Pesticides	ng/L				ND		ND			N.S.	ND		ND	ND	4128.6					ND			N.S.
Polynuclear Aromatic Hydrocarbons																							
Fluoranthene	ng/L				199.3		29.4			Not Sampled	70		51.8	9.8	83.8					476			Not Sampled
PAHs ³	ng/L				665.2		53				231.3		131.8	18.5	251.4					1145.6			
Total PAHs ⁴	ng/L				1036.2		101.4				340.2		205.2	31.3	473.9					1754.2			
Pyrethroids																							
Bifenthrin	ng/L				214		<0.5			Not Sampled	<0.5		<0.5	74.6	167.5					203.9			Not Sampled
Deltamethrin/Tralomethrin	ng/L				<0.5		50.3				<0.5		<0.5	<0.5	<0.5					<0.5			
Esfenvalerate	ng/L				<0.5		<0.5				<0.5		<0.5	<0.5	<0.5					<0.5			
All Other Pyrethroids	ng/L				ND		37.8				ND		ND	ND	268.6					ND			
*Total Pyethroids	ng/L				214		88.1				ND		ND	74.6	436.1					203.9			

< - results less than the method detection limit (MDL).
ND - results less than the MDLs (multiple results)
Green fill- concentration is greater than California Ocean Plan lmax criteria
Note 1 - Site associated with Receiving Water Station S01
Note 2 - Site associated with Receiving Water Station S02
Note 3 - PAHs based on constituents listed in Ocean Plan
Note 4 - Total PAHs based on constituents listed in Bight 2013 Work Plan.



Table 5-3. February 2014 Outfall Chemistry Results

Parameter	Units	CA Ocean Plan	001	002	003	004	005	008	011	013	016 ¹	018	021	022	023	024	025	026	027	028 ²	029	030	031	24-BB-02Z	24-BB-03Z	
		Instantaneous Maximum	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	2/28/2014	
General Chemistry																										
Ammonia as N	mg/L	6			4.95		0.37	Not Sampled			0.68		0.43	1.51	<0.02					0.21			Not Sampled		0.47	
Nitrate as N	mg/L				0.63		0.54				0.72		0.86	1.53	24.54					0.27					0.2	
Oil & Grease	mg/L		<1	<1	2.5	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	2.5	1.3	1J	<1	1.3			ND	ND
Total Orthophosphate as P	mg/L				1.08		0.2				0.86		0.83	0.84	0.94					0.27						0.34
Total Suspended Solids	mg/L		79.2	296	5095	593	497			70.4	119	803	55.3	148	7.9	4.8	27.5	18.2	103.2	78.8	40.3	1.9		42.6		82.8
Total Metals																										
Arsenic (As)	µg/L	80			9.083		1.792	Not Sampled			2.748		3.523	3.733	4.731					0.656			Not Sampled		2.598	
Cadmium (Cd)	µg/L	10			3.8221		0.5467				1.4084		0.5483	0.1789	0.2771					0.1864					0.5776	
Chromium (Cr)	µg/L	20			75.3533		20.632				23.607		5.9767	2.1554	1.7879					1.2621					22.7594	
Copper (Cu)	µg/L	30			109.663		27.954				29.906		25.054	56.105	84.921					26.219					28.435	
Lead (Pb)	µg/L	20			71.7821		6.1139				8.1312		5.7255	2.1098	0.5393					17.5522					16.3304	
Mercury (Hg)	µg/L	0.4			<0.0012		<0.0012				<0.0012		<0.0012	<0.0012	<0.0012					<0.0012					<0.0012	
Nickel (Ni)	µg/L	50			91.1114		25.8248				38.049		9.1185	4.7738	8.8064					2.9016					11.9473	
Selenium (Se)	µg/L	150			0.331		0.221				0.226		0.319	1.22	5.101					0.334					0.099	
Silver (Ag)	µg/L	7			0.17		0.08				0.1		0.07	0.21	0.06					0.01J					0.02	
Zinc (Zn)	µg/L	200			454.8282		98.3671				151.1528		93.2702	97.0057	199.0364					87.6536				177.7661		
Organophosphorus Pesticides																										
*All OP Pesticides	ng/L				ND		ND	N.S.			ND		ND	ND	ND					ND			N.S.		ND	
Polynuclear Aromatic Hydrocarbons																										
Fluoranthene	ng/L				753.3		243	Not Sampled			92.6		105.8	14.2	612.6					204.7			Not Sampled		210.7	
PAHs ³	ng/L				7159.2		906.4				778		570.3	54.7	1982.1					812.2					1633.1	
Total PAHs ⁴	ng/L				9115.8		1341.8				1087.2		773.6	130.2	3195.6					1178.8					2187.2	
Pyrethroids																										
Bifenthrin	ng/L				694.4		43.4	Not Sampled			5.4		80.3	16.9	188.7					1673.6			Not Sampled		31.6	
Deltamethrin/Tralomethrin	ng/L				<0.5		<0.5				<0.5		<0.5	<0.5	<0.5					<0.5					<0.5	
Esfenvalerate	ng/L				15.6		<0.5				<0.5		1.5J	0.6J	<0.5					<0.5					<0.5	
All Other Pyrethroids	ng/L				3979.8		1.6				132.4		7.6	86.6	19.9					2.2					44.6	
*Total Pyethroids	ng/L				4689.8		45				137.8		89.4	104.1	208.6					1675.8					76.2	

< - results less than the method detection limit (MDL).

ND - results less than the MDLs (multiple results)

Green fill- concentration is greater than California Ocean Plan Imax criteria

Note 1 - Site associated with Receiving Water Station S01

Note 2 - Site associated with Receiving Water Station S02

Note 3 - PAHs based on constituents listed in Ocean Plan

Note 4 - Total PAHs based on constituents listed in Bight 2013 Work Plan.



Table 5-4. December 2014 Outfall Chemistry Results

Parameter	Units	CA Ocean Plan	24-BB-02Z	24-BB-03Z
		Instantaneous Maximum	12/1/2014	12/1/2014
General Chemistry				
Ammonia as N	mg/L	6		0.76
Nitrate as N	mg/L			0.8
Oil & Grease	mg/L		ND	0.76
Total Orthophosphate as P	mg/L			0.76
Total Suspended Solids	mg/L		555.0	1
Total Metals				
Arsenic (As)	µg/L	80		3.600
Cadmium (Cd)	µg/L	10		0.9106
Chromium (Cr)	µg/L	20		14.3354
Copper (Cu)	µg/L	30		43.640
Lead (Pb)	µg/L	20		18.3158
Mercury (Hg)	µg/L	0.4		ND
Nickel (Ni)	µg/L	50		15.9330
Selenium (Se)	µg/L	150		0.304
Silver (Ag)	µg/L	7		0.10
Zinc (Zn)	µg/L	200		154.3246
Organophosphorus Pesticides				
All OP Pesticides	ng/L			ND
Polynuclear Aromatic Hydrocarbons				
Fluoranthene	ng/L			210.7
PAHs ³	ng/L			284.7
Total PAH5 ⁴	ng/L			533.1
Pyrethroids				
Bifenthrin	ng/L			34.5
Deltamethrin/Tralomethrin	ng/L			ND
Esfenvalerate	ng/L			ND
All Other Pyrethroids	ng/L			ND
Total Pyrethroids	ng/L			34.5
< - results less than the method detection limit (MDL).				
ND - results less than the MDLs multiple results)				
Green fill- concentration is greater than California Ocean Plan !max criteria				
Note 1 - Site associated with Receiving Water Station SO1				
Note 2 - Site associated with Receiving Water Station SO2				
Note 3 - PAHs based on constituents listed in Ocean Plan				
Note 4 - Total PAHs based on constituents listed in Bight 2013 Work Plan.				



The Ocean Plan Table 1 Instantaneous Maximum WQOs for mercury and selenium are 0.4 µg/L and 150 µg/L, respectively. Table 1 does not list Instantaneous Maximum WQOs for PAHs. This Plan focused on mercury and selenium in this assessment of pollutant load reduction targets. During the four monitored events the sampling results were all below these Ocean Plan Table 1 Instantaneous Maximum values. During the first storm monitored in 2013 (February 8, 2013), the highest measured values of mercury and selenium were 0.16 µg/L and 0.79 µg/L, respectively, at ASBS-003. Outfall ASBS-028 had measured mercury and selenium concentrations of 0.06 µg/L and 1.0 µg/L, respectively, during the second monitored storm, which occurred in March 2013. During the third monitored storm, which occurred in February 2014, the measured selenium concentration at Outfall ASBS-023 was the highest value measured at 5.1 µg/L. All outfall samples collected and analyzed for mercury had results of non-detect during the third event. The summary of the highest measured values in comparison with the Ocean Plan Table 1 Instantaneous Maximum values as well as other Ocean Plan Table 1 limiting concentrations is provided on Table 5-5.

Table 5-5. Ocean Plan Comparison to Summary of Maximum Outfall Results

Parameter	Ocean Plan Table 1 Values (Receiving Water Mixing Zone)			Maximum Measured Value (in Outfall Prior to Mixing Zone)		
	6-Month Median	Daily Maximum	Instantaneous Maximum	February 2013, Event 1	March 2013, Event 2	February 2014, Event 3
Mercury	0.04	0.16	0.4	0.16	0.06	<0.0012
Selenium	15	60	150	0.79	1.0	5.1

The summary table of maximum outfall results values for mercury and selenium indicate that the pollutant loading storm water discharges from outfalls for these constituents is far below the Ocean Plan Table 1 Instantaneous Maximum values. The highest mercury value measured is equal to the Ocean Plan Table 1 Daily Maximum values. The highest selenium value measured is below the Ocean Plan Table 1 Instantaneous Maximum with over an order of magnitude difference between the two. The highest selenium value measured is also below the most limiting concentration of the Ocean Plan Table 1, which the 6-Month Median value. The measured values of mercury and selenium, besides those presented in the summary table above, were significantly less than the maximum measured.

Common major sources of mercury include scrap metal piles, deteriorating metal and paint, and airborne emissions from burning coal, oil or municipal waste (UWE, 1997). Selenium is a naturally occurring element that persists in soils and aquatic sediments and may be leached from sediments as a result of modifications in the natural hydrologic regime (LARWQCB, 2002). Higher levels of selenium are also documented to be associated with the Monterey/Modelogeologic formation, which is prevalent in this area.

5.2 Outfall Assessment Conclusions

Following the guidance found in the Special Protections an assessment of outfalls was performed to determine where structural controls may be required to achieve the specified pollutant loading limitations on point source discharges into ASBS 24. Preceding the outfall assessment was the receiving water assessment that indicated, also based on the guidance found in the Special



Protections, that there are exceedances of natural water in the receiving water during wet weather events for mercury, selenium, and total PAHs where samples were available for this assessment. The outfall assessment included comparing the monitoring data for mercury and selenium to Ocean Plan Table 1 Instantaneous Maximum limitations. The Ocean Plan Table 1 does not list Instantaneous Maximum values for the protection of marine aquatic life for total PAHs, it only lists 30-day Average concentration limits for the protection of human health. The results of the comparison indicate the discharges to the ASBS from point sources (outfalls) are currently achieving, and significantly below, the target levels. Therefore, based on available data and guidance documents, the outfalls being evaluated in this Plan under the Regional Monitoring Program are currently not considered priority outfalls, and in accordance with the Special Protections of the General Exception, additional controls (e.g., BMPs) to achieve pollutant load reductions are not required in the tributary drainage areas to the Parties' outfalls.

Based on the guidance presented within the Special Protections, the assessments performed in the preparation of this Compliance Plan indicated that additional structural BMPs are not required. However, the Parties recognize that the ASBS 24 is one of most valued resources in the region and that wherever possible, and feasible, additional reductions in pollutant loading should be achieved. Accordingly, in July 2015, the City deemed construction complete for structural BMPs for the areas of Broad Beach Road and Wildlife Road where City inlets drain to private outlets in the ASBS area. Various existing nonstructural programs will continue to be implemented in order to maintain compliance with the requirements of the Special Protections and possibly achieve further reductions in pollutant loading. The Parties are considering implementing nonstructural controls and enhancements to existing controls for the purpose of further reducing pollutant loading to the ASBS.



6.0 CONTROL MEASURES

6.1 Enhanced Nonstructural Programs

Existing nonstructural PIPPs, O&M programs, and enforcement programs will continue to be implemented and maintained into the future to ensure ongoing protection of ASBS 24 and to meet the requirements of the ASBS Special Protections. This section describes enhancements to existing nonstructural programs intended to further promote load reductions and further improve and protect ASBS water quality. Proposed Potential program enhancements for feasibility consideration that will be evaluated and are presented in Appendix C and include the following:

- Infrastructure priority re-evaluation program.
- Enhanced, collaborative, environmentally friendly, alternative services program(s).
- ASBS education signage (County).
- Aggressive street sweeping (City).
- Street sweeping parking ordinances (City).
- Architectural copper and metal building material mitigation program(s) (City).
- Metal building material ordinances (City).

6.1.1.1 Infrastructure Priority Re-Evaluation Program

Currently, the County is in the design phase of retrofitting Unincorporated County areas catch basins in in North Santa Monica Bay from Arroyo Sequit on the northwest through Topanga Canyon on the southeast with full capture trash screens (this area includes the ASBS 24 drainage area). This activity includes a complete field inventory of all catch basins in the area. The Parties will enhance their existing annual cleaning programs for retrofitted catch basins.

If evaluation of future wet weather monitoring data indicates that additional nonstructural solutions are necessary to meet the Special Protection water quality criteria, the City and County will review and re-evaluate the existing inspection/cleaning priorities assigned to infrastructures located in the ASBS 24 drainage area. Agency-wide infrastructure inspection/cleaning programs (priorities and frequencies) are established using NPDES permit criteria and historic debris load data for each system. The receiving water or watershed of each system (e.g., catch basin, street, and parking lot) is not directly considered. Increased cleaning may be appropriate for ASBS 24 to enhance source control of gross pollutants (e.g., trash, debris, sediments) as well as associated pollutants, such as metals, organics, and nutrients. An infrastructure re-evaluation program may also provide benefits such as a streamlined, efficient, and effective implementation program for ASBS 24.

6.1.1.2 Enhanced Collaborative Environmentally Friendly Alternative Services Program(s)

When implementing this type of program, the County and City will look for opportunities to enhance existing environmentally friendly alternative services and PIPPs currently provided by the Parties. Types of existing PIPPs that may be enhanced include the Clean Bay Restaurant Certification Program, the *Keep It Clean, Malibu* campaign, City of Malibu's Environmentally

Preferable Purchases and Practices Policy (EPPP), Recycled Products Purchasing Policy (RCPP), Restaurant Certification Program, and Los Angeles County's Rethink LA Program. The LACoMAX platform has been presented as an example of types of enhancements and synergies, which may be implemented depending on water quality needs and available funding.

Users have identified LACoMAX as “easy, fast and rewarding” and a “great resource for L.A. County” to exchange goods. To reach a larger audience, this program could be cross-referenced with similar programs such as the Malibu Green Room webpage, Craigslist-Los Angeles, and other regional websites. The platform currently provides six management regions for exchange, and the platform could be expanded to include ASBS- and TMDL-specific regions, along with educational information related to the benefits of the program and reduced impacts to the ASBS and receiving waters that may be caused by improper disposal of unwanted items. Partner webpages could provide links to other exchange programs and up-cycling venues (e.g., Goodwill, consignment, thrift stores, and swap meets). Additional enhancements to the platform may be identified by analyzing user data from the existing platform and/or requesting users to complete questionnaires.

6.1.1.3 ASBS Educational Signage

This program would involve the design and installation of educational placards along boardwalks and at parking lot entrances to the beaches. These placards, translated in both English and Spanish, will describe the unique resources of ASBS 24 and highlight features of interest specific to each beach. Additional educational messages related to source controls and pollution prevention measures will be determined based on wet weather data and targeted sources. This program could provide a direct nonstructural intervention to potential pollutant sources at County beaches, as well as influence behavior for local beachgoers who live in residential areas that discharge to ASBS 24.

6.1.1.4 Aggressive Street Sweeping

This program would involve enhancing the City’s existing street sweeping program. Aggressive street sweeping may include increased frequency of sweeping, use of enhanced sweeping technologies, or other sweeping solutions (USEPA, 2012a). The City may choose to implement a pilot study to determine the optimal sweeping program prior to full-scale implementation.

The City currently sweeps roads within its jurisdiction once each month and shares a contract with Caltrans to have PCH swept weekly. This program would involve increasing the frequency of sweeping on City streets located within the area draining to ASBS 24 to once per week. Increasing the sweeping frequency has been shown to increase the potential load reduction associated with metals, sediments, trash, and debris (City of San Diego, 2010a).

Vacuum and regenerative-air street sweeping technologies have been shown to be more effective than mechanical sweeping technologies at removing fine particulate matter, especially related to metals debris (City of San Diego, 2010a; City of Portland, 2006). As of 2013, the City uses motorized mechanical street sweeping equipment for all street sweeping activities. This proposed nonstructural program enhancement would apply to all City-maintained streets and would involve either: 1) replacing mechanical street sweepers with enhanced sweeping technologies during the standard end of the equipment life-cycle, or 2) requiring contractors responsible for local sweeping activities to only use enhanced sweeping technologies.



Because the City shares a street sweeping contract with Caltrans for sweeping the PCH it is subject to conditions of an agreement. At present, Caltrans' policy requires once-per-week sweeping using mechanical sweeping equipment. Historically, the City used enhanced sweeping technologies for streets within their jurisdiction, including the PCH. The City was requested by Caltrans to use mechanical sweepers due to their state-wide policy. Implementation of this recommended nonstructural program enhancement will require one of the following Caltrans policy changes: 1) a state-wide policy change, 2) local exemption to the state-wide policy, or 3) agreement to do additional sweeping beyond the state-wide policy requirement, using a vacuum or regenerative-air sweeper along the PCH in the ASBS 24 drainage area.

6.1.1.5 Street Sweeping Parking Ordinances

Mechanical sweeping technologies are most effective at removing trash, debris, and sediment from paved surfaces when the equipment travels along the curb and gutter (City of San Diego, 2010a; City of Portland, 2006). Under the existing City street sweeping program, residents and business owners have been requested to use off-street parking on scheduled street sweeping days whenever possible. Vehicles continue to park along the PCH and City streets during street sweeping days. The City currently does not have an ordinance restricting parking.

The City may consider implementing an ordinance prohibiting parking on City-maintained streets during regularly scheduled street sweeping activities. This programmatic enhancement would increase the potential load reduction associated with street sweeping activities independent of modifications to existing street sweeping equipment and sweeping frequency. Prior to implementation of a general parking ordinance, the City may need to conduct an education and outreach campaign and public opinion survey to identify the most effective street sweeping schedule and evaluate the public's appetite for program implementation. However, it is important to note that such an ordinance would be subject to scrutiny by the California Coastal Commission due to public beach access concerns, and is not likely to be feasible.

6.1.1.6 Architectural Copper and Metal Building Material Mitigation Program(s)

Metal building materials may appear to be a limited wet weather source, but in coastal areas buildings may be a year-round source of runoff and metals loading because the marine layer can create measurable runoff as water condenses on rooftops and buildings structures (City of San Diego, 2010b). Monitoring data of storm water wash-off from some metal building materials has been shown to be associated with elevated copper and zinc levels (Golding, 2008).

This program will investigate the feasibility of offering rebates for architectural copper and zinc mitigation measures applied to metal building structures. Potential mitigation measures may include: application of sacrificial paint (e.g., copper and zinc oxidation protection paints), downspout diversions, rain barrels, and cisterns. The rebate program could be modeled after the Cash for Grass and other water conservation incentive programs discussed in Section 3.2.1.2. Education materials could be incorporated into existing materials, such as the Surfrider OFG materials and ASBS materials, and online media, such as the Malibu Green Room and Clean LA websites.



6.1.1.7 Metal Building Material Ordinances

As discussed in Section 6.1.1.6, buildings with metal architectural features may be a year-round source of runoff and metals loading. Metal building material ordinances, including the architectural copper ban and zinc alternative building material ordinance, are proposed as a potential programs enhancement and are a true source control. It is generally recognized that implementation of any kind of metal building material ordinance will require significant education and outreach. Targeted audiences will include residents and businesses, and may also include architects and engineers who design and build structures within the ASBS 24 drainage area. A program such as this would first need to go through a feasibility review and also receive City Council approval.

Architectural Copper Ban

This City ordinance would prohibit use of architectural copper for all new developments and re-development projects for buildings and facilities located within the ASBS 24 watershed.

Zinc Alternative Building Material Ordinance

Galvanized zinc is frequently specified by agencies, including Caltrans, for outdoor installations due to material durability and lack of maintenance requirements. This City program would evaluate the feasibility of implementing a zinc building material policy that would eliminate, reduce, mitigate, or control the use of zinc building materials. Concurrent with the feasibility analysis, stakeholders would be engaged through public meetings. Based upon the findings of the feasibility analysis and stakeholder engagement process, a proposed zinc ordinance would be implemented.

6.2 Structural BMPs

The pollutant loading reduction assessment (Section 5.0) performed in preparation of this Plan indicated that structural BMPs are not required (pollutant loading is on average below the Ocean Plan Table B Instantaneous Maximum WQOs for the modeled design storm). However, in July 2015, the City deemed construction complete for structural BMPs for the areas of Broad Beach Road and Wildlife Road where City inlets drain to private outlets in the ASBS area.. These projects each installed biofiltration BMPs, and the Wildlife Road project only also included limited infiltration improvements to capture and treat wet weather flows entering the associated catch basins. Additional information on these projects, including conceptual design and drainage analysis, is included in Appendix C.

6.3 Pollutant Load Reduction Quantification For Nonstructural Controls

This section demonstrates how existing nonstructural programs have contributed to compliance with the zero dry weather discharge criteria of the Special Protections. This section also discusses the quantifiable percent reductions that have been achieved and that will be achieved using enhanced nonstructural controls. The quantification of the effectiveness of nonstructural controls is a developing science. Although the effectiveness of most nonstructural controls is not well documented in available literature, data on recent studies (e.g., street sweeping and source studies) provide a basis for developing quantification estimates. It has also been documented

(City of San Diego, 2010a; Brown et al., 2010; Pohl, 2010; Cac and Ogawa, 2010; Krieger et al., 2010) that nonstructural controls that target operational and true source controls can provide far more cost-effective, long-term solutions than end-of-pipe treatment BMPs.

Nonstructural BMPs are designed to reduce the concentrations of constituents at the source prior to the generation of surface storm water runoff and therefore prior to runoff entering storm drains, reaching BMPs, and reaching the receiving water. Typical load reductions associated with the quantification of nonstructural programs is on the order of 25% (LARWQCB, 2005) (County of Los Angeles, 2012).

6.3.1 Load Reductions Associated with Nonstructural Solutions

The scope of the nonstructural program load reduction quantification is limited. Many nonstructural programs currently implemented within ASBS 24, such as the Parties' IC/ID and spill response programs, cannot be quantified and entered into a load reduction model because they are designed to control constituents at their source for a sporadic event. However, these programs do offer a water quality benefit, and various types of data are available and may be used to demonstrate changes in public behavior.

When targeted at the actual pollutant source, nonstructural solutions (e.g., operational source controls) have been shown in studies to be very effective at removing the source and therefore reducing concentrations/loads to below regulatory requirements. For example, the *Mission Bay Clean Beaches Initiative Bacterial Source Identification Study* found birds and over-irrigation to be two major sources of bacterial contamination (Weston, 2004). Monitoring conducted following a redesign of the irrigation system and relocation of an in-water raft popularly used by birds indicated that bacterial concentrations in the receiving waters were very low. During the study, there was one exceedance, and follow-up studies showed that the source of the exceedance was not associated with irrigation runoff or birds (Weston, 2006).

Furthermore, true source controls that replace or modify the constituent content of products that have been determined to impact water quality should be part of the nonstructural program. True source controls have been proven to be highly cost effective as in the case of the banning of the pesticide Diazinon, which has resulted in a clear reduction from well above to now below the water quality objective in the Chollas Creek watershed, which is under a TMDL for this contaminant (SDRWQCB, 2007). Senate Bill 346 adopted in 2010 which requires reduction of copper in brake pads in California was achieved through the Brake Pad Partnership. The legislation was based on scientific data showing the impact of copper from brake pads on water quality in urban areas. This true source control approach will significantly reduce copper concentrations in most urbanized watersheds. In the urbanized Chollas Creek watershed (which is under a dissolved metals TMDL), it has been estimated that approximately 90% of the copper loading is from brake pad deposition (City of San Diego, 2009). It is anticipated that most of the copper load reduction necessary to meet the Chollas Creek TMDL will be achieved from the reduction of copper in brake pads, a true source control strategy.

As indicated in the Outfall Wet Weather Monitoring Results for 2013 and the Pollutant Load Reduction Targets, zinc and TSS are currently considered to be in exceedance of the natural water quality in ASBS 24. Nonstructural controls that include both operational and true source control measures to reduce zinc and TSS loading have therefore been emphasized.



6.3.2 Aggressive Street Sweeping

According to the EPA, street sweeping programs may reduce the need for other structural storm water BMPs and may prove more cost effective than structural BMPs, especially in more urbanized areas (USEPA, 2012a). Aggressive street sweeping can be highly effective in reducing wet weather metals loading (City of San Diego, 2010a; Seattle Public Utilities, 2009; City of Portland, 2006) and, to a lesser extent, bacteria (Skinner et al., 2010), while continuing to address trash, debris, and sediment pollution.

The County has implemented an aggressive street sweeping program at County Beach parking lots (i.e., sweeping three to four times per week with enhanced sweeping equipment). Given that these parking lots experience a reduced traffic load compared to the PCH and City streets, and have an aggressive sweeping schedule and program, the County's existing parking lot sweeping program is considered to be appropriate for protecting ASBS 24 water quality (i.e., program at a high level where adding enhancements may provide diminishing returns).

The City currently implements a two-part street sweeping program, including weekly mechanical sweeping along PCH and monthly mechanical sweeping along City-maintained streets. Sections 6.1.1.4 and 6.1.1.5 discuss potential enhancements to the City's existing sweeping program, including modifications to the sweeping schedule, sweeping equipment, and City parking policies. The pollutant load reductions associated with these enhanced sweeping program options are discussed in Appendix A. Program implementation may be limited by cost, especially once enhanced sweeping programs have reached a point of diminishing returns (USEPA, 2012a).

6.3.3 Commercial Programs

Commercial land use represents a very small portion of the ASBS 24 watershed, and the City's existing commercial inspection and outreach programs have been effective at preventing discharges from these facilities. Restaurants and grocers represent the predominant commercial business within this drainage area and existing programs have ensured compliance with the zero dry weather runoff criteria of the Special Protections by eliminating outdoor washing activities and promoting pollution prevention measures. As of February 2013, 51 of the 63 qualifying restaurants and food management businesses within the City's entire jurisdiction (e.g., 81% overall participation) were re-certified as being 100% compliant with all Clean Bay Restaurant Certificate Program criteria, which includes zero dry weather discharge off-site. It is important to note that the program also includes criteria that are not related to water quality. For instance, if a business is not implementing a recycling program, they would not be eligible for certification. Therefore, the percentage of businesses protecting water quality is likely to be higher than the overall participation rate. Ongoing implementation of this program will continue to ensure continue compliance with the zero dry weather runoff criteria of the Special Protections.

The City's existing commercial programs also provide wet weather water quality benefits. For example, waste management and spill prevention programs eliminate or control outdoor trash, metals, grease, and bacteria sources, which may be washed into the MS4 during storm events. Elimination of outdoor washing activities, especially near landscaped areas, can also control erosion and sediment disturbance. To date, the existing commercial inspection and outreach programs implemented by the City have potentially resulted in a 1% to 4% pollutant load



reduction and have been incorporated into the initial assessment of wet weather load. Additional future load reductions may be achieved as participation in the Clean Bay Restaurant Certificate Program grows towards 100% participation and as synergies between PIPP programs are identified and incorporated into Enhanced Collaborative Environmentally Friendly Alternative Services Program(s).

6.3.4 Outreach, Water Conservation, and Irrigation Management Programs

Nationally, lawn care accounts for 32% of the total residential outdoor water use (USEPA, 2013) and over-irrigation is a common source of runoff. While irrigation runoff is a freshwater source and does not represent a pollutant unto itself, irrigation-related dry weather flows have the potential to erode landscaping and mobilize pollutants. Even when irrigation water does not reach the MS4, pollutant mobilization to impervious surfaces can create a non-point source of pollution during wet weather.

Use of water-saving devices (e.g., irrigation controllers, sprinkler heads) conserve water and prevent over-irrigation. The former Landscape Irrigation Efficiency Program (LIEP) and Water Saving Devices Rebates Programs' educational literature provide an estimated water savings of 13,500 gallons per location converted per year. Use of drought-tolerant plants and landscaping in place of grass provides additional water savings and further reduces the likelihood of over-irrigation. The water conservation and over-irrigation reduction programs that the County and the City administer and provide educational support for in the ASBS 24 drainage area have helped control over-irrigation runoff and achieve compliance with the zero dry weather discharge criteria of the Special Protections. These programs have also helped reduce pollutant mobilization and creation of non-point sources on impervious surfaces. As participation in the rebate program grows, there is potential for an additional 1% to 2% wet weather pollutant load reduction through this indirect source control program.

OFGs and CA Friendly Landscapes are structural BMPs that infiltrate runoff and bio-remediate pollutants, effectively disconnecting both dry weather and the first flush of storm water runoff from the receiving water. The City has two demonstration landscapes that can be used as examples to the community: one at Legacy Park and one at Bluffs Park. The City recognizes three residential OFGs, one of which is located within ASBS 24 at Point Dume. Promotion of local OFGs contributes to their implementation by residents, educational institutions, and businesses. Ongoing implementation of this program and the resulting net increase in OFG implementation will likely translate to an additional 1% to 2% wet weather pollutant load reduction.

The City provides education and outreach on water-saving incentive programs and OFGs, and responds to irrigation-related IC/IDs. The City's 24-hour Pollution Prevention Hotline received fewer than 10 calls during the first year, or on average less than one per month. (The Clean LA hotline, which is shared with the District, fielded 34,064 calls during the fiscal year covered under the 2011-2012 Annual Report [LACDPW, 2012].) Most of the IC/ID field investigations have been due to over-irrigation and were resolved within a month through collaboration between the City and the property owner. Additionally, as of September 5, 2014, the City launched a online water wasting report form in response to the historic drought conditions. This reporting form makes it more efficient for the community to notify and the City to respond to incidents of runoff due to over-irrigation among other water wasting activities. Ongoing



implementation of the ASBS Focused Outreach Program will continue to increase participation in rebate programs and OFG and CA Friendly Landscape implementation, contributing to the wet weather load reductions previously discussed.

6.3.5 Metal Building Material Management Program

Recent studies have shown that architectural copper and galvanized steel building materials can elevate the metals concentrations measured in storm water runoff from 10 to 100 times greater than concentrations measured for non-metal building materials (City of San Diego, 2009; Chang et al., 2004; Davis et al., 2001). Zinc in storm water runoff measured directly from galvanized metal surfaces is typically very high, between 1,000 and 15,000 µg/L (Golding, 2008).

An aggressive outreach and incentive program may encourage targeted audiences to proactively modify infrastructure (e.g., install OFGs and rain barrels to capture runoff, replace with non-metal materials, diversion of air conditioning condensate away from metal infrastructure) and behaviors (e.g., proactive housekeeping, apply and maintain sacrificial coatings). In the ASBS, a phase-out and full ban of copper and zinc building materials represents a true source control measure that could significantly reduce metals loading to ASBS 24. In Palo Alto, a similar metal building material ordinance for copper plumbing fixtures was implemented in response to a copper TMDL (City of Palo Alto, 2011). Institutional controls and regulatory change also represent an important step toward laying the foundation for inspections, if determined to be appropriate.

A Simple Method model was prepared to estimate the load reductions from implementing this program. To complete the model, several assumptions related to a typical watershed were made and include the following:

- An urban watershed composed of 50% residential, 40% open space, and 10% transportation.
- Of runoff from these land uses, 25% have elevated concentrations of copper resulting from building materials (e.g., copper rain gutters).
- Incentive program would be utilized by 20% of the residential land use area.
- Where the incentive program is utilized, copper concentration reductions in storm water would be in the range of 40% to 80%.

Based on these assumptions, metal building material management programs could result in a 6% to 12% pollutant load reduction. For more information on the load reduction calculations, see Appendix D.



7.0 ASSESSMENT OF ANTHROPOGENIC SEDIMENTATION POTENTIAL

In accordance with the requirements of the General Exemption, the natural habitat conditions in the ASBS shall not be altered as a result of anthropogenic sedimentation (SWRCB, 2012b). An assessment of the potential areas prone to anthropogenic sedimentation was performed as part of this Compliance Plan for the purpose of identifying areas where sediment control BMPs may be required. The general assessment process included first performing a desktop analysis of geological conditions, topography, land use, and aerial imagery for the applicable area. Next, a reconnaissance of the area was performed to verify desktop findings and further analyze the drainage areas. Finally, the desktop and reconnaissance data collected were then compiled into this Plan, which details the assessment methodologies, results, and conclusions.

7.1 Sedimentation Definitions

Basic definitions relating to sedimentation and the coverage/applicability of the sedimentation identification assessment are provided below. These terms are relevant to the entire sedimentation assessment. Additional terms, applicable to specific subsections, are defined within the applicable subsection, as needed.

Erosion

“The process by which soil particles are detached and transported by the actions of wind, water, or gravity.” (SWRCB, 2010).

Sediment

“Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth’s surface either above or below sea level.” (SWRCB, 2010).

Sedimentation

“Process of deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.” (SWRCB, 2010).

Anthropogenic Sedimentation

For the purposes of this assessment, anthropogenic sedimentation is defined as sedimentation resulting from mankind activities in the past or present. Stated differently, anthropogenic sedimentation is any sedimentation that would not be present in nature in the absence of mankind and mankind improvements (i.e., past and present absence of mankind).

Compliance Plan Anthropogenic Sedimentation Assessment Area

In accordance with the General Exception, the Compliance Plan focuses on the assessment of point source discharges, including pollutants, and the potential controls to reduce pollutant loading from these point sources. Therefore, the Compliance Plan assessment of areas prone to anthropogenic sedimentation was limited to the tributary drainages areas associated with the point source outfalls detailed in Section 2.6 of the Compliance Plan. Figure 7-1 shows the Parties’ identified outfalls and drainage areas (catchment areas).

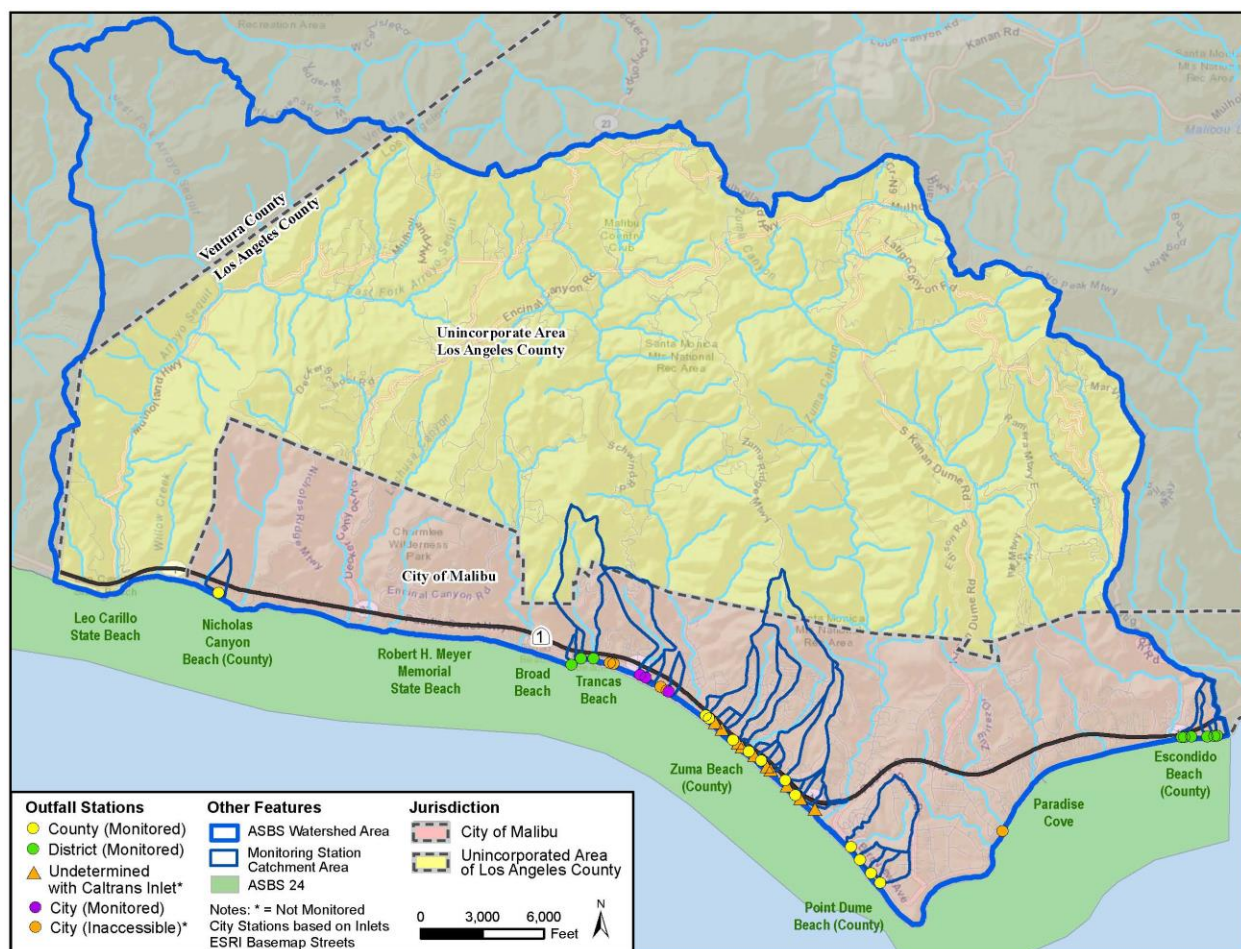


Figure 7-1. ASBS 24 Identified Outfall Catchment Areas

7.2 Desktop Analysis

A desktop analysis was performed evaluating the geology, topography, land use, and general surface condition (e.g., vegetation cover) in order to identify potential areas prone to erosion within the drainage areas tributary to the Parties' outfalls. The collection of area geological data included conducting literature reviews of five references applicable to the region ([City, 1995], [NPS, 1997], [Yerkes and Campbell, 1979], [SWRCB, 1979], and [SWRCB, 2012c]). County of Los Angeles Department of Transportation staff were interviewed regarding roadway maintenance activities and the frequency of sediment removal performed in the area. Sediment risk data for the area, obtained from the General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) (SWRCB, 2010), were evaluated to determine the general sediment risk for disturbed areas. GIS data relating to topography, land use, and aerial imagery were analyzed to evaluate surface gradients and vegetative coverage types in the area.

7.2.1 ASBS 24 Assessment Area Geology

As detailed in Section 2.6, the Compliance Plan identified 38 outfall point sources along the ASBS 24 coast within the Parties' jurisdiction. The drainage area for the northerly most outfall,



located near Nicholas Canyon State Beach (ASBS-031), consists primarily of Santa Monica Mountain (Topanga Formations) with Trancas Formation along the shoreline. The drainage areas for the outfalls along the west half of Broad Beach (ASBS-001, -002, and -003) consist primarily of the Santa Monica Mountains (Topanga, Santa Susana/Coal Canyon, and Lajas Formations) with small areas of Trancas Formation along the coastline. The outfalls along the east half of Broad Beach and the northeast half of Zuma Beach (BB-001 through BB-003 and ASBS-004 through ASBS-016) have drainage areas that consist of varying percentages of Modelo Formation along the coast and Santa Monica Mountains (Topanga, Santa Susana/Coal Canyon, and Lajas Formations; Conejo Volcanics; and Diabase Intrusions). The outfalls located along the southeast half of Zuma Beach and Point Dume Beach (Westward Beach) (ASBS-017 through ASBS-024) have drainage areas within the Monterey/Modelo Formation. The drainage areas of the six outfalls located along Escondido consist of Santa Monica Mountain and small areas of Modelo Formation along the coast. Figure 7-2 and Figure 7-3 show the geological features and drainage areas of the Parties' outfalls identified in this Plan (NPS, 2007).

Map symbols used along the coastal area were defined using the National Geologic Map Database. Pleistocene marine terrace deposits along the shoreline include the Trancas and Monterey Formations. The symbols used to depict general costal geologic features in Figure 7-2 through Figure 7-3 included the following:

- Qa – Alluvial gravel, sand, and clay of flood plains.
- Qaf – Artificial cut and fill.
- Qao – Older dissected alluvial gravel, sand, and clay; on coastal area deposited in part on a wave-cut platform, forms several terraces.
- Qg – Gravel and sand of major stream channels.
- Qls – Landslide debris.
- Qos – Old dune sand at Point Dume.
- Qs – Beach Sand.
- Tr – Trancas Formation composed of marine sandstone, mudstone, silty shale, and claystone.
- Tmt – Monterey/Modelo Formation composed of marine clay shale and laminated to platy siltstone with sandstone.

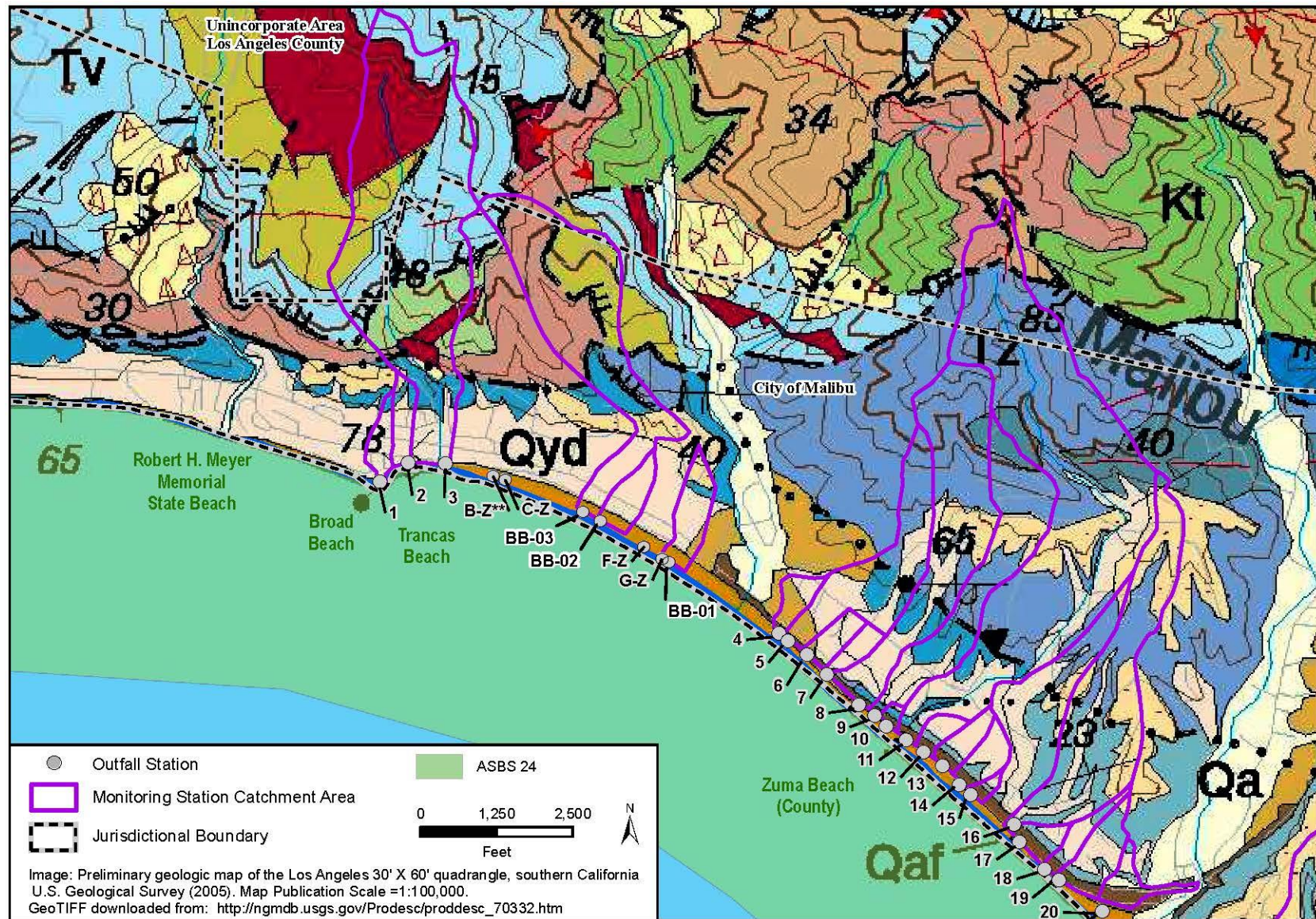


Figure 7-2. Geology of Outfall Drainage Areas, Broad Beach, and Zuma Beach

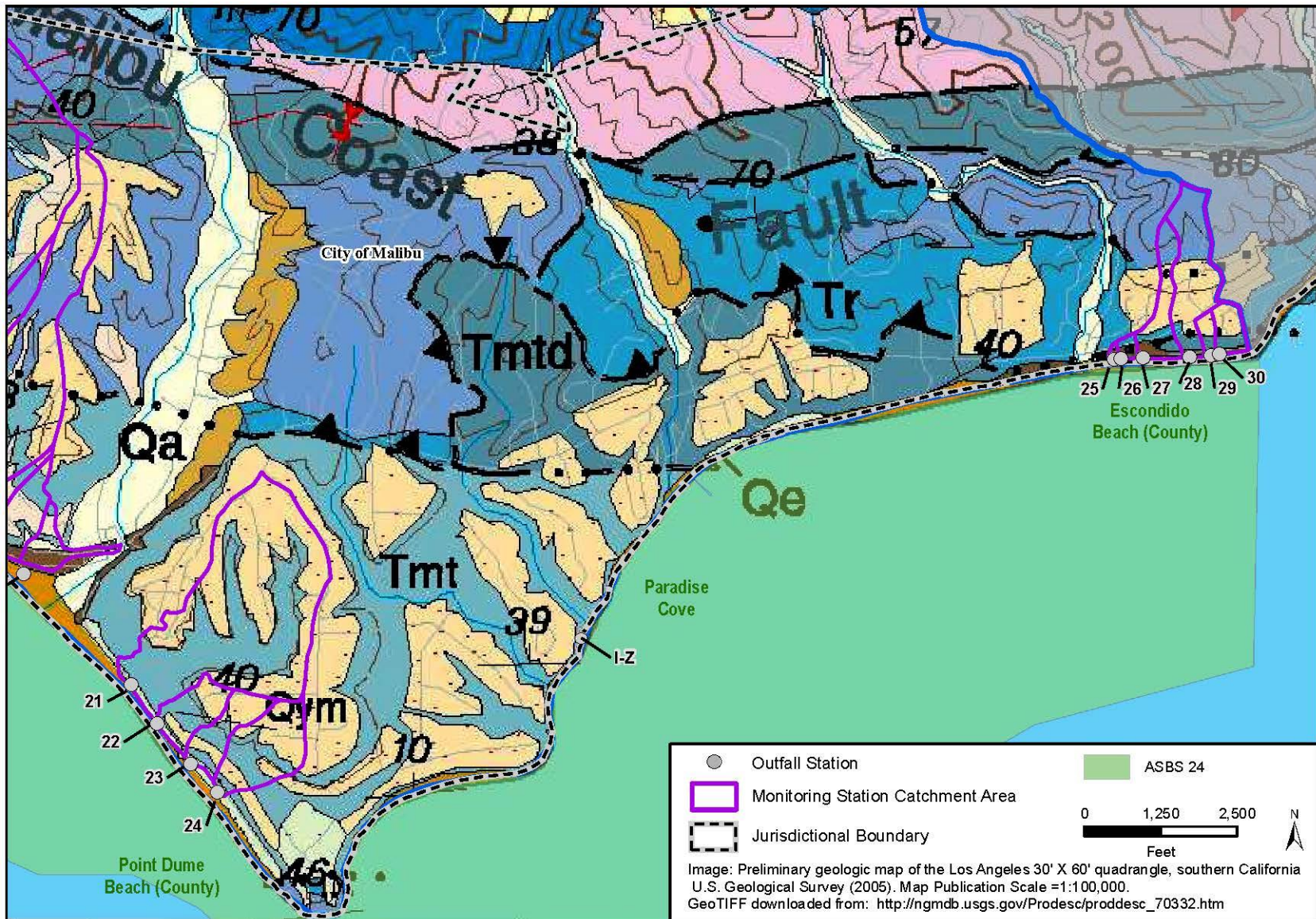


Figure 7-3. Geology of Outfall Drainage Areas, Point Dume Beach to Escondido Beach



7.2.2 Assessment Area Land Use

In general, land use within the drainage area tributary to the Parties' identified outfalls that discharge to ASBS 24 consists of various categories of residential and vacant land with relatively small amounts of commercial, transportation, and specialized (e.g., school, water storage) land uses. Table 7-1 summarizes the jurisdictional land uses for each catchment area.



Table 7-1. Outfall Drainage Area Land Use Summary

Land Use Designation	Catchment Outfall Designation													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
City														
Beaches (Vacant)		0.1	0.3											
Horse Ranches													0.8	2.0
Nurseries		3.4	1.5											
Duplexes, Triplexes, and 2- or 3-Unit Condos and Townhouses (THs)														
Low-Rise Apartments, Condos, and THs	0.2		3.7											
High-Density, Single-Family Residential	2.7	1.3	0.3	2.9					0.3		0.4			
Low-Density, Single-Family Residential	1.2	0.3	1.5	2.5	8.7	2.0	4.9	14.3	10.1		18.9	2.5	1.6	2.5
Rural Residential, High-Density	1.9	2.0	36.3	1.6	36.0	4.9	0.8	45.3	55.2	0.7	110.2	2.5	2.2	5.2
Rural Residential, Low-Density			18.4											
Trailer Parks and Mobile Home Courts, High-Density														
Retail Centers (Non-strip)														
Senior High Schools											14.5		0.3	
Transportation Rights-of-Way (ROWs)	0.6	0.4	0.9	1.3	4.7		0.1	4.3	2.7		8.9		0.2	0.1
Transportation ROWs – Pacific Coast Highway (PCH)	0.9	0.7	1.5	0.7	1.0	1.1	0.4	1.9	0.5	0.6	0.9	0.8	1.1	1.0
Vacant Undifferentiated	2.1	2.6	52.0		9.7	1.2	1.4	19.0	9.4		11.4		2.4	
Water Storage Facilities					0.5			1.1			0.8			
Undeveloped Reg. Parks and Rec. (U.S. Government)					4.1			27.2			86.3			
City Subtotal	9.6	10.8	116.4	9	64.7	9.2	7.6	113.1	78.2	1.3	252.3	5.8	8.6	10.8
County														
Beach Parks				0.7	1.1	1	0.3	1.6	0.4	1.1	1.4	1.3	1.7	1.4
Rural Residential, Low-Density														
Transportation ROWs														
Vacant Undifferentiated			95.8								2.8			
Vacant Undifferentiated (U.S. Government)			41.3								47.0			
County Subtotal	-	-	137.1	0.7	1.1	1	0.3	1.6	0.4	1.1	51.2	1.3	1.7	1.4
Total	9.6	10.8	253.5	9.7	65.8	10.2	7.9	114.7	78.6	2.4	303.5	7.1	10.3	12.2



Table 7-1. Outfall Drainage Area Land Use Summary (Continued)

Land Use Designation	Catchment Outfall Designation													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
City														
Beaches (Vacant)														
Horse Ranches														
Nurseries														2.9
Duplexes, Triplexes, and 2- or 3-Unit Condos and THs							3.3		0.2	1.7			0.5	1.0
Low-Rise Apartments, Condos, and THs							6.1							0.0
High-Density, Single-Family Residential		0.5							0.1		0.2	0.4	1.5	0.7
Low-Density, Single-Family Residential		14.5	0.4	2.2	4.4		19.7	5.4	4.8	6.7	0.1	0.3	2.7	1.4
Rural Residential, High-Density	1.2	26.5	2.8	4.7	7.9	3.7	86.2	8.4	9.2	22.2			9.0	13.1
Rural Residential, Low-Density														
Trailer Parks and Mobile Home Courts, High-Density							38.8							
Retail Centers (Non-Strip)						0.1	0.7							
Senior High Schools		38.2												
Transportation ROWs		8.1		0.3	0.5		4.4	1.8	1.1	1.8			0.5	
Transportation ROWs - PCH	0.6	0.5	1.7	0.7	1.7	3.1					0.6	0.7	1.9	5.0
Vacant Undifferentiated		24.1	1.4	1.3	3.7	2.5	4.6	1.8	1.8	1.7		1.0	2.8	11.8
Water Storage Facilities														
Undeveloped Reg. Parks and Rec. (U.S. Government)		2.1												
City Subtotal	1.8	114.5	6.3	9.2	18.2	9.4	163.8	17.4	17.2	34.1	0.9	2.4	18.9	35.9
County														
Beach Parks	1.2	0.6	2.6	0.9	2.6	2.8	1.9	1	1.1	0.7				
Rural Residential, Low-Density														
Transportation ROW							4.2							
Vacant Undifferentiated														
Vacant Undifferentiated (U.S. Government)														
County Subtotal	1.2	0.6	2.6	0.9	2.6	2.8	6.1	1	1.1	0.7	-	-	-	-
Total	3.0	115.1	8.9	10.1	20.8	12.2	169.9	18.4	18.3	34.8	0.9	2.4	18.9	35.9

Table 7-1. Outfall Drainage Area Land Use Summary (Continued)

Land Use Designation	Catchment Outfall Designation						
	29	30	31	BB01	BB02	BB03	Total
City							
Beaches (Vacant)							0.4
Horse Ranches							2.8
Nurseries							7.8
Duplexes, Triplexes, and 2- or 3-Unit Condos & THs						2.1	8.8
Low-Rise Apartments, Condos, and THs							10.0
High-Density, Single-Family Residential	0.3	0.7		0.3			12.6
Low-Density, Single-Family Residential				5.7	3.1	8.6	151.0
Rural Residential, High-Density	3.5	6.5	0.3			19.3	529.3
Rural Residential, Low-Density			5.4				23.8
Trailer Parks and Mobile Home Courts, High-Density							38.8
Retail Centers (Non-Strip)				0.7			1.5
Senior High Schools							53.0
Transportation ROWs		0.9		1.3	0.8	2.4	48.1
Transportation ROWs – PCH	0.1	0.1	2.3	1.1	1.3	0.9	35.4
Vacant Undifferentiated		0.8	13.5	10.6	8.6	89.0	292.2
Water Storage Facilities							2.4
Undeveloped Reg. Parks & Rec. (U.S. Government)							119.7
City Subtotal	3.9	9	21.5	19.7	13.8	122.3	1337.6
County							
Beach Parks			9.5				36.9
Rural Residential, Low-Density						0.7	0.7
Transportation ROW						0.1	4.3
Vacant Undifferentiated						4.5	103.1
Vacant Undifferentiated (U.S. Government)							88.3
County Subtotal	-	-	9.5	-	-	5.3	233.3
Total	3.9	9.0	31.0	19.7	13.8	127.6	1,570.9

7.2.3 Imagery Review

Aerial and other photographic imagery data were reviewed using Google Earth® software and Environmental Systems Research Institute® (ESRI) GIS imagery sources to determine the types of land cover within the Parties’ outfall drainage areas. The review showed that areas occupied by residential lots along the coast typically consisted of single-family dwellings, each surrounded by large areas of well-maintained landscaping that included grass, shrubs and brushes, and trees. Further inland, north of the PCH, residential lots were occupied by single-family dwellings and either well-maintained landscape and/or open space, natural type vegetation. The Google Earth® street view tool imageries were reviewed, which showed the residential lots and secondary roadways as having well-maintained vegetated areas with very little non-vegetated (bare) areas.

Caltrans’ PCH right-of-way and highway traverses several of the Parties’ outfall drainage areas. Although Caltrans is not a responsible applicant included under this Compliance Plan, the area within the Caltrans right-of-way drains to the Parties’ outfall and thus, was evaluated to determine if the area has the potential to contribute anthropogenic sedimentation to ASBS 24. The desktop review showed that some cuts (excavations) were made into native soils along the roadway. The review did not reveal obvious areas of excessive erosion and sedimentation. However, due to the common historic erosion problems associated with similar roadways

throughout the state, the areas where cuts were potentially made during roadway construction were flagged for further detailed evaluation during the field reconnaissance phase.

7.2.4 General Sedimentation Risk Assessment

In order to estimate the general sediment risk for the areas that drain to the Parties' outfalls, a sediment risk was determined for a hypothetical site based on the procedures detailed in the *NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities* (Construction General Permit). The intent of this assessment is to determine the potential sediment for areas where minor improvements (e.g., landscaping) or other circumstances may result in bare soil that would not be considered construction activity. The assessment completed as part of this plan is not performed for the purpose of assessing construction activities, which are permitted and inspected through applicable County and City programs, and which require that risks be determined and mitigated through the proper implementation of BMPs.

7.2.4.1 Sedimentation Risk Assessment Methodology

The risk determination procedure detailed in the Construction General Permit includes determining both the "project sediment risk" and the "receiving water risk." The two risks are then used in combination to determine the overall project risk. However, for this plan (assessing potential sedimentation), only the sediment risk was evaluated.

The Construction General Permit describes two options for determining sediment risk: 1) GIS Map Method – EPA Rainfall Erosivity Calculator and GIS map, and 2) Individual Method – EPA Rainfall Erosivity Calculator and individual data. Both of these methods include using available EPA resources to estimate a rainfall-runoff erosivity factor. Depending on the method selected, the soil erodibility, project length, and slope parameters are estimated either from a map (Method 1) or from site-specific data applied to an erodibility factor nomograph and length-slope factor table (Method 2). For both methods, the data are applied to the Universal Soil Loss Equation (USLE) to estimate a sediment load for the applicable period (SWRCB, 2010). The USLE is detailed as follows:

$$A = R * K * LS * C * P$$

Where:

- A = the computed soil loss (sheet and rill erosion) (tons/acre).
- R = the rainfall erosive factor for the given period.
- L = the slope length factor.
- S = the slope gradient factor.
- C = cover factor (1.0 for bare ground conditions).
- P = management operations & support practice (1.0 for bare ground conditions).

Based on the computed soil loss (sediment load), the site is classified as having either a low-, medium-, or high-sediment risk (SWRCB, 2010). Table 7-2 summarizes the risk levels associated with the various soil loss quantities.

Table 7-2. Sediment Risk Levels



Soil Loss	Risk Level
<15 tons/acre	Low
15 – 75 tons/acre	Medium
>75 tons/acre	High

Source: SWRCB, 2010.

7.2.4.2 Sedimentation Assessment Calculations

To assess the general sediment risk for the area, a hypothetical site was evaluated using the methods described in the Construction General Permit. The time period was estimated to be 2 months in duration, from December 1st through January 31st.

The rainfall erosivity factor, or R factor, is calculated as a product of the Erosivity Index (EI) percentage and the average annual R value. These two parameters were obtained from the *Storm Water Phase II Final Rule Construction Rainfall Erosivity Wavier*. The R factors are used as surrogate measures of the impact that rainfall has on erosion and have been mapped using isoerodent contours (USEPA, 2012b). The R values are based on the analyses of data which indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-minute intensity (I). The numerical value of R is the average annual sum of EI for storm events during a rainfall record of at least 22 years, and the isoerodent maps were developed based on R values calculated for more than 1,000 locations in the western United States (SWRCB, 2010). The average annual R value, based on the referenced isoerodent contour maps for the area, was estimated to be between the values of 60 and 80 (80 selected), with units of hundreds $\text{ft.} \cdot \text{tonf} \cdot \text{in} \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$.

Next, it was determined that the area is within EI distribution zone 25. Based on this zone, the percentages of the EI distributions throughout the year were determined and are summarized on Table 7-3.

Table 7-3. Erosivity Index, Annual Distribution for Zone 25

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun
Day	1	16	31	15	1	16	31	15	30	15	30	14	29
EI (%)	0	9.8	20.8	30.2	37.6	45.8	50.6	54.4	56.0	56.8	57.1	57.11	57.2
Month	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec	
Day	14	29	13	28	12	27	12	27	11	26	11	31	
EI (%)	57.6	58.5	59.8	62.2	65.3	67.5	68.2	69.4	74.8	86.6	93	100	

Source: USEPA, 2012b.



The final R factor calculation is summarized on Table 7-4.

Table 7-4. R Factor Calculation Summary

Parameter	Value
EI % (Oct. 1 – Dec. 31)	11.7%
EI % (Jan. 1 – Mar. 30)	20.8%
Total EI %	32.5%
Average Annual R Factor	80 (100* $\text{ft.} \cdot \text{tonf} \cdot \text{in} \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$)
Computed R Factor	26.0 (100* $\text{ft.} \cdot \text{tonf} \cdot \text{in} \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$)

7.2.4.3 GIS Map Method for KLS Factor

The Construction General Permit details the use of the EPA Monitoring & Assessment Program (EPA EMAP) map to assist with determining the combined K, L, and S parameters for use in the USLE equation.

The soil erodibility factor K represents the susceptibility of soil or surface material to erosion, transportability of the sediment, and the amount and rate of runoff given a particular rainfall input (or lack of absorption and infiltration), as measured under a standard condition. Fine-textured soils that are high in clay have low K values (approximately 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured sandy soils also have low K values (approximately 0.05 to 0.2) because of high infiltration resulting in low runoff. Medium-textured soils (e.g., silt loam) have moderate K values (approximately 0.25 to 0.45) because they are moderately susceptible to particle detachment and produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and be as large as 0.65 (SWRCB, 2010).

The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a slope length factor, L, and the slope gradient factor, S. Typically, as slope length and/or slope gradient increase, soil loss increases.

Figure 7-4 shows the EPA EMAP map. Based on this map, a KLS value of 1.6 was selected for the ASBS 24 drainage area.

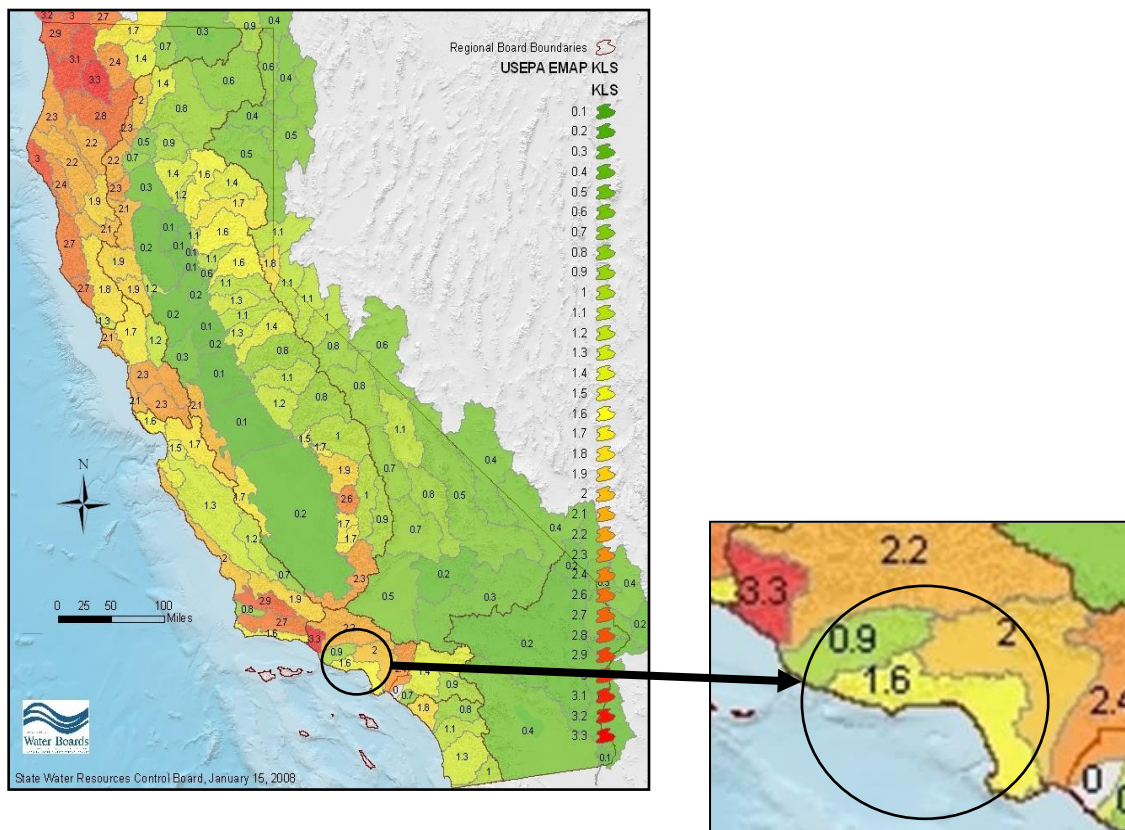


Figure 7-4. EPA EMAP (SWRCB, 2010)

The soil loss was calculated based on the assumptions made and values determined in this assessment. The soil loss for the hypothetical site was calculated to be 41.6 tons per acre. Based on the Construction General Permit sediment risk matrix (summarized on Table 7-2) and this value, disturbed areas (e.g., bare soil) draining to the ASBS would have, in general, a medium-level sediment risk.

7.2.4.4 Individual Method for KLS Factor

The Construction General Permit allows for site-specific data to be used in determining the KLS factor for the USLE equation. This includes performing soil analysis to determine the soil grain size distribution, site length, and average slope. This method was performed with the assumption that the soils consist of 60% sandy, 20% silty, and 20% clayey materials, which is reasonable for mountain formations and coastal bluffs. Based on an area of 0.25 acres (square), a length of 100 ft. was estimated. Based on the topography in the developed areas with slopes of approximately 2 to 10%, the higher end of the range was selected (10% slope).

Using the Soil Erodibility Factor Nomograph provided in the Construction General Permit, the K factor for the assumed soil composition was determined to be 0.19. Based on the LS Factors Table provided in the Construction General Permit and the stated assumptions, the LS factor was determined to be 1.46. Combining these parameters, it was determined that KLS is 0.277, the soil loss would be 7.2 tons per acre. Based on the Construction General Permit sediment risk matrix (summarized on Table 7-2), this value is considered a low-sediment risk for the applicable disturbed area.



7.2.4.5 Sediment Risk Assessment Summary

The assessment of the general sediment risk for disturbed areas with the ASBS 24 drainage area indicates that an area of disturbed soils without controls during the two relatively high rainfall months (December and January) during average conditions would have a potential sediment load of 7.2 tons per acre (per Method 2, individual site data calculations) or 41.6 tons per acre (per Method 1, GIS map data calculations). Smaller areas would have proportionally lower potential yields, as would disturbed areas with controls and/or disturbed areas that do not have a direct connection to the storm drain inlets (e.g., small area of disturbance above turf vegetation). Based on guidance found in the Construction General Permit, this equates to a low- (Method 1) to medium- (Method 2) sediment risk.

The difference between methods is based solely on the method used to calculate the KLS factor. The GIS map shows a large area with the same value, including the Santa Monica Mountains. Including the steep mountain terrain in the weighted average (by area), the slope calculation for the GIS map appears to have overestimated the KLS for the areas along the ASBS coast where developed areas are located. Additionally, the GIS map may overestimate the project slope length factor and slope gradient factor (LS factor). As such, the Method 2, site-specific data method seems much more accurate for the applicable area.

This assessment provides a general estimate of the sediment yield potential for disturbed (or bare) soil cover for the stated assumptions. The results of this assessment were used to aid in the evaluation of the drainage areas during field reconnaissance. Considering the soil loss calculations, the R factor is fixed for the area and the K factor may change slightly in the different geology across the drainage areas. However, the slope length (L) and slope gradient (S) vary greatly when areas with the potential to be prone to sedimentation are evaluated. The field reconnaissance was performed with a focus on the implications that the length and slope parameters have on the potential soil loss for areas of bare soil or sparse vegetation. Table 7-5 provides annual soil loss calculations performed for various typical sloped small areas with bare soil or sparse vegetation cover throughout the year.



Table 7-5. Annual Soil Loss Calculations for Sloped Areas

Slope Length (ft.)	Slope Height (ft.)	Slope Gradient (%)	Width (ft.)	Area (acres)	KLS Factor	Annual Soil Loss (tons/year)
10	0.2	2	100	0.023	0.025	0.05
20	0.4	2	100	0.046	0.029	0.10
30	0.6	2	100	0.069	0.032	0.18
40	0.8	2	100	0.092	0.036	0.27
50	1	2	100	0.115	0.040	0.37
10	1	10	100	0.023	0.072	0.13
20	2	10	100	0.046	0.093	0.34
30	3	10	100	0.069	0.122	0.67
40	4	10	100	0.092	0.146	1.1
50	5	10	100	0.115	0.173	1.6
10	2.5	25	100	0.023	0.160	0.3
20	5	25	100	0.046	0.247	0.9
30	7.5	25	100	0.069	0.338	1.9
40	10	25	100	0.092	0.424	3.1
50	12.5	25	100	0.115	0.507	4.7
10	5	50	100	0.023	0.268	0.5
20	10	50	100	0.046	0.458	1.7
30	15	50	100	0.069	0.638	3.5
40	20	50	100	0.092	0.809	5.9
50	25	50	100	0.115	0.980	9.0

$R = 80 (100 \text{ ft.} \cdot \text{tonf} \cdot \text{in}) \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$.

$K = 0.19$.

Relative to the 50% (2:1 [horizontal: vertical]) gradient slope, the 2% slope gradient is estimated to lose only 4% as much soil for a 50-ft slope length, and the 10% slope gradient is estimated to lose approximately 18% as much. This relationship is non-linear, and as the slope gradient increases, the potential soil loss significantly increases. Similarly, as the slope length increases, the potential soil loss significantly increases. The 50-ft slope length calculation for the 2% slope gradient is estimated to have approximately seven times the soil loss of the 10-ft slope length for the same gradient. The 50-ft slope length calculation for the 50% slope gradient is estimated to have approximately 1,400% the soil loss of the 10-ft slope length for the same gradient. These typical calculations indicate that in areas where disturbance has created unnatural sloped areas, the potential for soil loss exponentially increases as the slope gradient and/or the slope length increase.

7.3 Sediment Assessment Field Reconnaissance

A field reconnaissance was conducted to confirm the desktop analysis and evaluate the ASBS 24 outfall drainage areas prone to erosion and sedimentation. All areas draining to outfalls that discharge to the ASBS 24 were observed for indications of existing or potential anthropogenic sedimentation. The field reconnaissance included driving the length of ASBS 24 as well as performing reconnaissance on foot within each outfall drainage area to perform a thorough evaluation. In general, the areas of developed land use evaluated were observed to be residences with associated hardscape (e.g., driveways, walkways) and well-maintained landscaping. Some areas were observed to have partially exposed (sparse vegetation) natural bluff materials. Vegetation within the bluff areas consisted of a mixture of native scrubs and non-native species (e.g., ice plant). However, signs of erosion (e.g., rills, sloughing) were not observed on these



exposed bluff materials, indicating that bluff material consisted of dense siltstone and/or sandstone formations consistent with a desktop geology evaluation performed as part of this plan. The field reconnaissance is presented, starting at the northerly most identified outfall located at Nicholas Canyon County Beach, moving south, and finishing at the southeast limits of ASBS 24 and the Escondido Beach area.

The photograph depicted in Figure 7-5 was taken looking west and downward towards the Nicholas Canyon County Beach parking lot. The up-gradient area between PCH and the parking lot is shown to have fairly good vegetation cover. A narrow foot/animal path leads down the sloped area. Signs of erosion were not observed in the area. Compared to natural cover, a parking lot with an impervious surface located on a mesa, such as the case here, increases storm water runoff quantity and velocity resulting in the potential to erode soils if not properly designed. The parking lot was observed to have several storm drain inlets with associated piping to convey collected storm water down to the ocean without the potential to increase erosion of the bluffs (i.e., outfall located at sea level along rocky shoreline).



Figure 7-5. Nicholas Canyon County Beach Parking Lot

Figure 7-6 shows the area east of the PCH up-gradient from Nicholas Canyon County Beach. PCH and a residence occupy the area, where it appears that the highway and residential access driveway were constructed by cutting away (excavating) some the native materials and creating 2:1 (horizontal: vertical) slopes. These slopes are shown with vegetation cover and without evidence of active erosion.



Figure 7-6. Nicholas Canyon Beach Upper Watershed Area

The photograph depicted in Figure 7-7 was taken above Broad Beach and shows the bluff area located between PCH and the residences that are situated along the shoreline. During the field reconnaissance, the majority of the bluff appeared to have vegetation cover. Some steep portions were exposed, resembling natural bluffs observed in the area where development has been restricted (e.g., the nearby El Matador State Beach). Signs of erosion from these bare areas were not observed in the bluff along Broad Beach Road.



Figure 7-7. Bluff Area Above Broad Beach

The photograph depicted in Figure 7-8 shows the area along PCH and directly above Broad Beach. Similar bluff materials, but having lower height, were observed at this location with similar vegetation cover as the bluffs located along Broad Beach. Thick vegetation was observed at the bottom of the bluff material adjacent to the roadway.



Figure 7-8. Directly Above Broad Beach Area

The east end of Broad Beach Road has thicker vegetation cover and a lower bluff height compared to the west area. Figure 7-9 shows the typical street composition of residences and associated improvements along the south (seaward) side and off-street parking area along the north side followed by a vegetated sloped area.



Figure 7-9. East Portion of Broad Beach

Further up the watershed to Broad Beach the geology changes to that of the Santa Monica Mountains with hills and valleys. Figure 7-10 shows the residential development and associated landscaping in this area.



Figure 7-10. Area Up-Gradient of Broad Beach

The photograph depicted in Figure 7-11 shows the area across from the southeast side of Zuma County Beach, north of PCH. Field reconnaissance observed a large vertical bluff. This bluff appears to be Miocene age Modelo Formation that may have been a naturally formed vertical wall or a result of grading associated with the construction of PCH. Evidence of erosion was not observed during the reconnaissance. The materials appeared to be very hard and resistant to erosive forces of nature.



Figure 7-11. Vertical Bluff Across from Zuma Beach

As with the other areas evaluated, away from the coast the geology was observed to be Santa Monica Mountains in the watersheds upstream of the Zuma County Beach shoreline. Good vegetation cover was observed in the sloped areas around the existing improvements, which included residences and a water tank (Figure 7-12). Thick native vegetation was observed above the developed areas.



Figure 7-12. Up-Gradient of Zuma Beach Area



Figure 7-13 shows a residential property located east of the intersection of Birdview Avenue and Bluewater Road. Typical of residences in the area, the landscaping included a mixture of brushes and trees on the sloped areas and turf in the flatter areas.



Figure 7-13. Residence Near Birdview Avenue & Bluewater Road

The photograph depicted in Figure 7-14 shows the area above Escondido Beach. This area was observed to have more gentle slopes of approximately 4:1 (horizontal: vertical) compared to the bluff areas observed near Zuma County Beach and Broad Beach. East of Escondido Creek and north of PCH, thick vegetation cover was observed, consisting primarily of ice plant, palm trees, and eucalyptus trees.



Figure 7-14. Pacific Coast Highway Near Escondido Beach



7.4 Anthropogenic Sedimentation Assessment Summary and Conclusion

The assessment included a review of the topography, geology, land use, and imagery to determine potential areas prone to anthropogenic sedimentation. This review indicated that the topography, geology, and land use are related. Geologic processes, beginning as far back as 80 million years, formed the sedimentary formations predominantly found along the coast shoreline and Point Dume upland mesa area, which include siltstone and sandstone. Approximately 16 million years ago, seismic activity began and continued for 3 million years to form the Santa Monica Mountains, which are composed of a combination of sedimentary and igneous rock formations (City, 1995). Land use zoning and development have occurred predominantly along the coast within the flatter areas at lower elevations. Some development has occurred inland within the Santa Monica Mountains, but for the most part, development in the mountainous areas of the ASBS 24 watershed has been restricted due to the conservation of the area at the federal, state, and local levels.

The desktop analysis included determining the general sediment risk for the area based on the procedures outlined in the Construction General Permit. These procedures included determining the rainfall erosivity (R factor), which is based on data collected over several years to determine the annual storm kinetic energy, on average, for the area. That factor, combined with properties of common soils and various slopes (up to 50%) and heights (up to 50 ft.), were used to determine the potential annual soils for disturbed loose soil areas within the watershed. Calculation results indicated that the potential for soil loss within disturbed areas increases rapidly for areas having slopes greater than 10% and heights of greater than a few feet. These results were used during the field reconnaissance to aid in determining if areas have the potential to contribute anthropogenic sedimentation to ASBS 24.

Field reconnaissance was performed in the areas with a focus on the areas that drain to the identified outfalls that discharge to the ASBS 24. In general, the drainage areas primarily consisted of larger lots (0.25 to approximately 1 acre) with existing residential structures, hardscape improvements, and landscaping. Landscape vegetation of sloped areas within developed areas, including residential properties and roadway rights-of-way, were observed to have fairly good cover. No signs of erosion (e.g., rills, gullies) were observed in sloped areas or alongside secondary roads or PCH.

The conclusion of this sediment identification assessment is that currently there are no areas prone to anthropogenic sedimentation within the drainage areas tributary to the identified outfalls that discharge to ASBS 24. Land use in the drainage areas consists predominantly of residential and vacant (open space) designations with associated roadway connections. The sloped areas associated with residential properties were observed to have good vegetation cover and appeared to be regularly maintained by landscaping professionals. Areas where cuts (excavation) were made during the construction of roadways were observed to have either good vegetation cover that has been maintained by responsible property owners or consist of hard coastal bluff materials resistant to erosive forces (e.g., large bluff along the southeast portion of Zuma County Beach, as shown in Figure 7-11). Therefore, at this time, no additional sediment BMPs are required by this plan.



8.0 IMPLEMENTATION SCHEDULES

8.1 General Exception Schedule

The General Exception (Resolution No. 2012-0012) was adopted and became effective on March 20, 2012. Resolution No. 2012-0031 amended the General Exception to revise some of the sections to be consistent with other sections. The two documents collectively are referenced to as the General Exception with Resolution No. 2012-0012, establishing the effective date and Resolution No. 2012-0031 providing referenced content. Table 8-1 provides a summary of the key milestones specified in the General Exception. The General Exception states that the Draft Compliance Plan shall be submitted to the State Board within 18 months of the effective date of the General Exception. However, due to the limited number of monitoring opportunities during the 2012-2013 wet season, the Parties requested and were granted an extension of 12 months in order to perform additional wet weather monitoring. This timeline extension is included in the summary table.

Table 8-1. General Exception Schedule of Milestones

Description	Duration	Date
Resolution No. 2012-012 (General Exception)		Adopted March 20, 2012
Resolution No. 2012-021 (Amended General Exception)		Adopted June 19, 2012
Non-authorized non-storm water discharges prohibited	Effective date of the General Exception	March 20, 2012
Nonstructural controls necessary to comply shall be implemented	18 months after the General Exception effective date	September 20, 2013
Draft Compliance Plan	*30 months after the General Exception effective date	September 20, 2014
Final Compliance Plan	*42 months after the General Exception effective date	September 20, 2015
Structural controls identified in Compliance Plan necessary to comply shall be operational	*7 years after the General Exception effective date	March 20, 2018
All discharges comply with the General Exception requirements	*7 years after the General Exception effective date	March 20, 2018

*Additional 12 months added to duration based on Draft Compliance Plan extension granted by State Board to allow for additional wet weather core monitoring.

8.2 Nonstructural Controls Implementation Schedule

The Compliance Plan uses adaptive management to plan (Figure 3-2. Adaptive Management Process), implement, assess, and refine nonstructural solutions implemented by the Parties in the ASBS 24 tributary drainage area. The initial assessment included special studies and existing PIPP, enforcement, and O&M nonstructural programs (see Appendix B); the Parties are currently meeting the compliance requirements detailed in the General Exception. The steps forward listed in this section include nonstructural programs that will allow the Parties to continue to be in

compliance and may reduce wet weather pollutant loading. These steps forward include the following:

- Continue to implement, track, and refine effectiveness assessment protocols for nonstructural programs, as discussed in Section 3.0.

Table 8-2. Milestones and Schedule for Implementation of Enhanced Nonstructural Programs and Key Steps Forward

Timeline	Objective	Nonstructural Program(s) & Key Steps Forward
<u>Initial Phase:</u> 2005–2012	<ol style="list-style-type: none"> 1. Understand baseline conditions in ASBS. 2. Identify/address dry-weather and storm water runoff. 3. Progress towards zero dry weather runoff. 	Progressed towards existing nonstructural programs identified in Section 3.2.
Before September 20, 2013	<ol style="list-style-type: none"> 1. Zero discharge of non-authorized non-storm water to ASBS 24. 2. Inspection Policies in compliance with General Exception. 	<ul style="list-style-type: none"> ▪ Public Outreach (see Section 3.2). ▪ Outfall inspection program. ▪ Catch basin program re-evaluated. ▪ Amended Inspection Program (see Section 3.3).
09/20/2013	Compliance with ASBS Special Protections for Dry Weather	
09/20/2014	Submit Draft ASBS Compliance Plan for ASBS 24	
<u>Wet Weather:</u> 2014–2015	<ol style="list-style-type: none"> 1. Maintain zero dry weather runoff to ASBS 24. 2. Evaluate nonstructural BMPs that may provide wet weather load reductions. 	<ul style="list-style-type: none"> ▪ Evaluate aggressive street sweeping on City streets. ▪ Feasibility assessment and initial outreach for metal building materials ordinances.
09/20/2015	Submit Final ASBS Compliance Plan for ASBS 24	
<u>Wet Weather:</u> 2015–2018	<ol style="list-style-type: none"> 1. Maintain zero dry weather runoff to ASBS 24. 2. Evaluate nonstructural BMPs that may provide wet weather load reductions. 	<ul style="list-style-type: none"> ▪ Enhanced aggressive street sweeping on PCH, if feasible. ▪ Evaluate metal building materials ordinances and metal building material management incentive programs. ▪ Evaluate enhanced collaborative environmentally friendly alternative services program(s).



9.0 COST ESTIMATES

The Parties have implemented numerous nonstructural controls and related programs in order to eliminate non-authorized discharges to ASBS 24. The Parties continue to maintain these measures, and the annual estimated costs associated with the key programs, which are detailed in Section 3.0, are provided on Table 9-1. For more information on existing nonstructural measures, see Appendix B.



Table 9-1. Annual Nonstructural Program Costs

Program Type	Program Name	Approximate Cost (\$/year)
Public Information & Participation Programs (PIPP)	Rethink L.A.	¹ \$10,000
	Los Angeles County Materials Exchange (LACoMAX)	Costs in Rethink L.A.
	Water District #29 Tiered Water Rates Based on Increased Usage	N/A
	Water Conservation Program – Water Saving Devices Rebate Program	¹ \$5,000
	Cash for Grass	¹ \$5,000
	Landscape Irrigation Efficiency Program (LIEP)	¹ \$5,000
	Ocean Friendly Garden (OFG) Program	Included in ASBS Focused Outreach Program
	Pepperdine Business School OFG Partnership	Included in ASBS Focused Outreach Program
	Solid Waste Management Program	\$167,450
	Coastal Preservation Specialist (CPS)	² \$35,957
PIPP Sub-total		\$228,407
Operations & Maintenance (O&M)	City Curb & Gutter Cleaning & Repair Program	³ \$295,000
	City Storm Drain/Culvert Facilities Maintenance	³ \$25,000
	City Street Sweeping Contract	³ \$42,500
	Los Angeles County Street Sweeping	¹ \$435,000
	City Trash Collection	³ \$25,000
	County Beaches Trash Collection	¹ \$360,000
	County Beaches – Sanitation Program	Included in Trash Collect.
	Environmentally Preferable Purchases and Practices Policy (EPPP), Recycled Products Purchasing Policy (RCPP)	N/A
O&M Sub-total		\$1,182,500
Enforcement	City IC/ID Elimination Program	\$11,395
	County IC/ID Program	¹ \$20,000
	City Pollution Prevention Hotline	\$600
	Pollution Prevention Hotline, 1(888)Clean LA	¹ \$3,000
	Coastal Preservation Specialist (CPS)	² \$35,957
	Outfall Inspections	⁴ \$10,800
	City Commercial & Industrial Inspection Program	⁴ \$8,000
	Clean Bay Restaurant Certification Program	Included in Inspection
	Santa Monica Bay Regulations Review	N/A
	City Local Coastal Program	Included in Inspection
	City Construction Inspection Program	Included in Inspection
	Los Angeles County Construction Inspection Program	⁴ \$2,000
	Smoking at Beaches Ban	¹ \$20,000
Enforcement Subtotal		\$111,752
Total		\$1,522,659

Note 1: Cost estimated based on fraction of regional program total cost (approximately 5%).

Note 2: Coastal Preservation Specialist cost divided evenly between PIPP and enforcement.

Note 3: Cost estimated based on fraction of City wide program total cost (approximately 50%).

Note 4: Cost estimated based on staff time to complete associated tasks.



10.0 REFERENCES

- Bight 2013 ASBS (Areas of Special Biological Significance) Planning Committee. 2013. *ASBS Workplan 2nd Draft*, October 2012.
- Brown et al. (Brown, C., J. Kearns and S. Huber.). 2010. *Where Science Meets Reality – Implementing Effective Street Sweeping Supported by the Public*. California Stormwater Quality Association (CASQA) Conference. November 2010.
- Cac and Ogawa (Cac C. and M. Ogawa). 2010. *Beyond Inspections – Evaluating Properties and Businesses*. California Stormwater Quality Association (CASQA) Conference. November 2010.
- Chang et al. (Chang, M., M. McBroom, and R. Beasley). 2004. *Rooftops as a Source of Nonpoint Water Pollution*. Journal of Environmental Management, v73.
- City (City of Malibu). 1995. *City of Malibu General Plan*. November, 1995.
- City. 2012. *Los Angeles County Municipal Storm Water Permit (Order 01-182) Individual Annual Report Form*. Accessed July 2013 at:
<http://ladpw.org/wmd/npdesrsa/annualreport/2012%5CAppendix%20H%20-%20Malibu%20Ck%20&%20Rural%20Santa%20Monica%20Bay%20WMA%5CMAL%5C11-12%20MBU%20AnnualReport.pdf>
- City of Palo Alto. 2011. *Clean Bay Pollution Prevention Plan 2011 – The Pollution Prevention Plan for the City of Palo Alto's Regional Water Quality Control Plant*. February 2011.
- City of Portland. 2006. *Technical Memorandum Nonstructural Stormwater BMP Assessment Work Order 14531043*. Prepared for the City of Portland by Herrera Environmental Consultants. May 2006.
- City of San Diego, 2009. *City of San Diego Aerial Deposition Study, Phase III*. Prepared for the City of San Diego by Weston Solutions, Inc., June 2009.
- City of San Diego, 2010a. *City of San Diego Targeted Aggressive Street Sweeping Pilot Study Effectiveness Assessment*. Prepared for the City of San Diego by Weston Solutions, Inc., June 2010.
- City of San Diego, 2010b. *Rain Barrel Downspout Disconnect Best Management Practice Effectiveness Monitoring and Operations Program*. Prepared for the City of San Diego by Weston Solutions, Inc., June 2010.
- County of Los Angeles. 2012. *Multi-Pollutant TMDL Implementation plan for the Unincorporated Area of Marina del Rey Harbor Back Basins*. Prepared for the County by Weston Solutions. August 22, 2012.



Davis et al. (Davis, A.P., M. Shokouhian, and S. Ni). 2001. *Loading estimates of lead, copper, cadmium, and zinc in urban runoff from specific sources*. Chemosphere v44.

District (Los Angeles County Flood Control District). 2012. *Los Angeles County Municipal Storm Water Permit (Order 01-182) Individual Annual Report Form*. Accessed July 2013 at: <http://ladpw.org/wmd/npdesrsa/annualreport/2012%5CAppendix%20D%20-%20Principal%20Permittee%20Annual%20Report%5CIndividual%20Annual%20Report%20%28FCD%29.pdf>

Golding, 2008. *Suggested Practices to Reduce Zinc Concentrations in Industrial Stormwater Discharges*. Washington State Department of Ecology. June 2008.

Krieger et al. (Krieger, F., M. Moran, and A. Ruby). 2010. *Implementing True Source Control – Interactive Example of Identifying Pollutant Sources & Control Strategies*. California Stormwater Quality Association (CASQA) Conference. November 2010.

LARWQCB (Los Angeles Regional Water Quality Control Board). 2012. Order No. R4-2012-0175, *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*, November 8, 2012

LACDPW (Los Angeles County Department of Public Works). 2004. *Analysis of 85th Percentile 24-hour Rainfall Depth Analysis Within the County of Los Angeles*, February, 2004.

LACDPW. 2006. *Hydrology Manual*, January, 2006.

LACDPW. 2012. *Los Angeles County Municipal Storm Water Permit (Order 01-182) Individual Annual Report Form*. Accessed July 2013 at: http://ladpw.org/wmd/npdesrsa/annualreport/dsp_ShowReport.cfm?Year=2012&Watershed=County

LARWQCB (Los Angeles Regional Water Quality Control Board). 2001. *Los Angeles County Municipal Storm Water Permit (Order No. 01-182)*.

LARWQCB. 2002. *Total Maximum Daily Load for Toxic Pollutants in San Diego Creek and Newport Bay, California*. June 14, 2002

LARWQCB. 2014. *Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program, Including an Enhanced Watershed Management Program*, March 25, 2014.

NPS (National Parks Service, Department of the Interior), 1997. *Geology of the Santa Monica Mountains*, November, 2007. Accessed at: <http://www.nps.gov/samo/naturescience/geologicformations.htm>

Schiff et al. (Schiff, K.C., B. Luk, D. Gregorio and S. Gruber). 2011. *Southern California Bight 2008 Regional Monitoring Program: Vol. II. Areas of Special Biological Significance*. Southern



California Coastal Water Research Project. Costa Mesa, CA.

Seattle Public Utilities. 2009. *Seattle Street Sweeping Pilot Study Monitoring Report*. Prepared by Herrera Environmental Consultants, April 22, 2009.

SDRWQCB (San Diego Regional Water Quality Control Board). 2007. *Total Maximum Daily Loads for Dissolved Copper, Lead and Zinc in Chollas Creek, Tributary to San Diego Bay Chollas Creek Watershed. Technical Report*. May 2007.

Surfrider. 2012. *Surfrider Foundation's Ocean Friendly Gardens Program, Gardening for Cleaner Coasts and Oceans*. Available at:

http://www.beachapedia.org/images/1/12/OFG_Brochure_2012.pdf

SWRCB (State Water Resources Control Board). 1979. *California Marine Waters Areas of Special Biological Significance Reconnaissance Survey Report: Mugu Lagoon to Latigo Point, Ventura and Los Angeles Counties. Water Quality Monitoring Report No. 79-5*.

SWRCB. 2008. *Draft Data Report General Exception to the California Ocean Plan for the Multiple Applicants of Areas of Special Biological Significance*. April, 2008.

SWRCB. 2010. *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbances Activities*, Order No. 2010-0014-DWQ. November 16, 2010.

SWRCB. 2012a. *California Ocean Plan*. SWRCB, Sacramento, CA.

SWRCB. 2012b. *Amending the General Exception to the California Ocean Plan for Selected Discharges into Areas of Special Biological Significance, Including Special Protections for Beneficial Uses*. Resolution No. 2012-0031. June 19, 2012.

SWRCB. 2012c. *Final Environmental Impact Report. Exception to the California Ocean Plan for Areas of Special Biological Significance Waste Discharge Prohibition for Storm Water and Nonpoint Source Discharges, with Special Protections*. February 21, 2012.

USEPA (United States Environmental Protection Agency). 2012a. *Parking Lot and Street Cleaning National Pollutant Discharge Elimination System Fact Sheet*. Last Updated on November 28, 2012. Available at:

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=99>

USEPA. 2012b. *Stormwater Phase II Final Rule Construction Rainfall Erosivity Waiver*. March, 2012.



USEPA. 2013. *Nonpoint Source Pollution, Chapter 3, How to Conserve Water and Use It Effectively*. Last Updated on May 09, 2013. Available at:
<http://water.epa.gov/polwaste/nps/chap3.cfm>

UWE (University of Wisconsin-Extension). 1997. *Polluted Urban Runoff – A Source of Concern*. Available at: <http://clean-water.uwex.edu/pubs/pdf/urban.pdf>

Weston (Weston Solution, Inc.). 2004. *Bacteriological Data Evaluation for City of San Diego Recreation Beaches, 1999 through 2003*. Prepared by Weston Solutions Inc. (formerly MEC Analytical). May 2004.

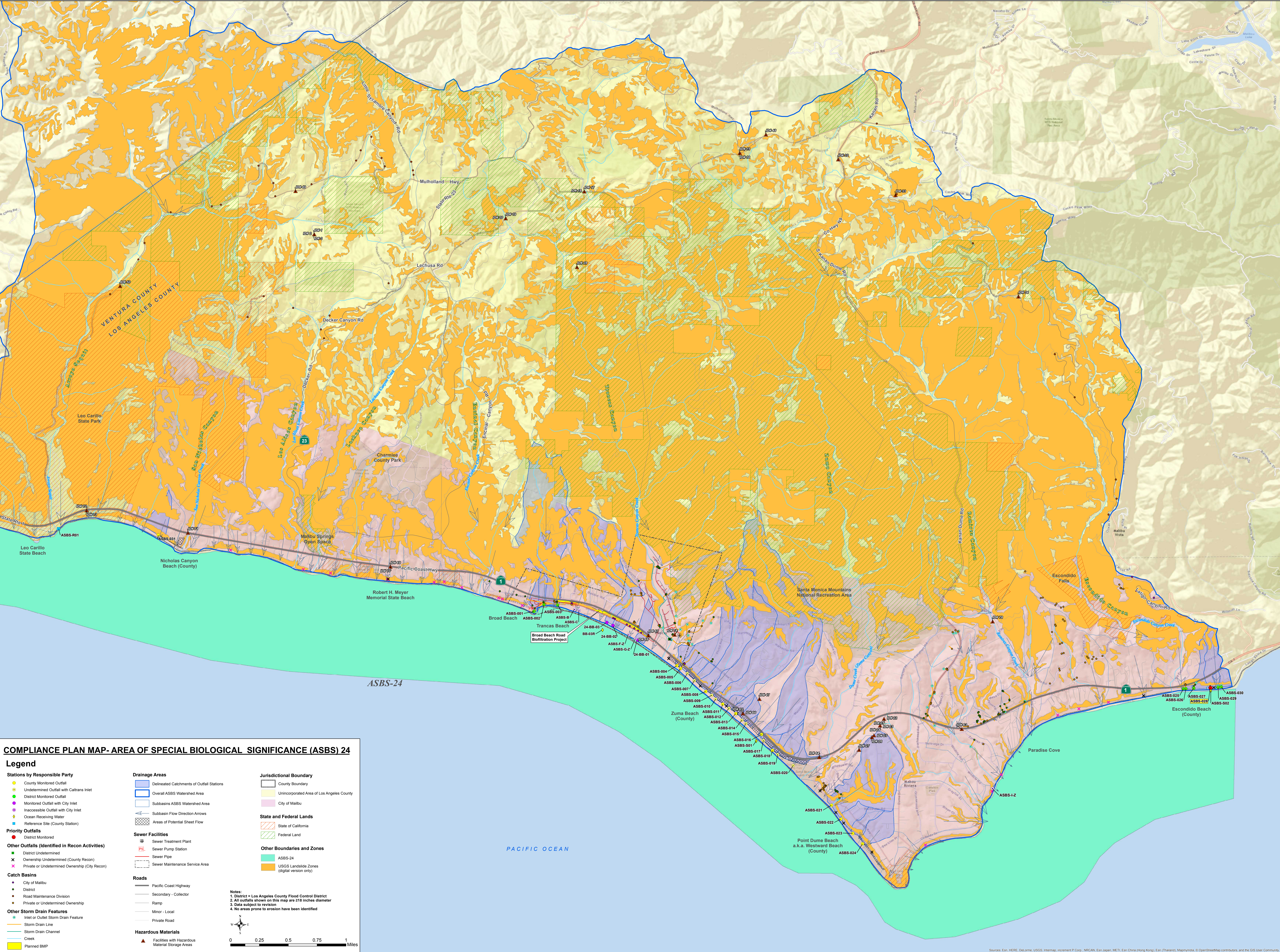
Weston. 2006. *East Mission Bay Summer 2006 Bacterial Contamination Assessment*. Prepared for the City of San Diego. July 2006.

Yerkes and Campbell (Yerkes, R.F. and Campbell, R.H.). 1979. *Stratigraphic Nomenclature of the Central Santa Monica Mountains, Los Angeles County, California*. 1979.



APPENDIX A

Compliance Plan Map



COMPLIANCE PLAN MAP- AREA OF SPECIAL BIOLOGICAL SIGNIFICANCE (ASBS) 24

Legend

Stations by Responsible Party

- County Monitored Outfall
- Undetermined Outfall with Caltrans Inlet
- District Monitored Outfall
- Monitored Outfall with City Inlet
- Inaccessible Outfall with City Inlet
- Ocean Receiving Water
- Reference Site (County Station)

Priority Outfalls

- District Monitored

Other Outfalls (Identified in Recon Activities)

- District Undetermined
- Ownership Undetermined (County Recon)
- Private or Undetermined Ownership (City Recon)

Catch Basins

- City of Malibu
- District
- Road Maintenance Division
- Private or Undetermined Ownership

Other Storm Drain Features

- Inlet or Outlet Storm Drain Feature
- Storm Drain Line
- Storm Drain Channel
- Creek
- Planned BMP

Drainage Areas

- Delineated Catchments of Outfall Stations
- Overall ASBS Watershed Area
- Subbasins ASBS Watershed Area
- Subbasin Flow Direction Arrows
- Areas of Potential Sheet Flow

Sewer Facilities

- Sewer Treatment Plant
- Sewer Pump Station
- Sewer Pipe
- Sewer Maintenance Service Area

Roads

- Pacific Coast Highway
- Secondary - Collector
- Ramp
- Minor - Local
- Private Road

Hazardous Materials

- Facilities with Hazardous Material Storage Areas

Jurisdictional Boundary

- County Boundary
- Unincorporated Area of Los Angeles County
- City of Malibu

State and Federal Lands

- State of California
- Federal Land

Other Boundaries and Zones

- ASBS-24
- USGS Landslide Zones (digital version only)

Notes:
1. District = Los Angeles County Flood Control District
2. All outfalls shown on this map are 24 inches diameter
3. Data subject to revision
4. No areas prone to erosion have been identified





APPENDIX B

Existing Nonstructural Programs Table



Existing Nonstructural Programs Within the ASBS 24 Area

Nonstructural Program	Program Subcategory	Name of Nonstructural Control	Project Descriptions for Existing Nonstructural Controls	Project Location	Target Source/ Target Audience	Targeted Water Quality Problem	Method of Measure	Program Start Date	Implementation Status/ Completion Date	Lead Agency	Approx. Cost (\$/year)
Enforcement	IC/ID	City of Malibu Illicit Connection/ Illicit Discharge (IC/ID) Elimination Program	This program involves coordination of multiple City Departments to cease and eliminate pollution by illicit connections and discharges to the storm water system. The City has an active education, response, and enforcement program.	Regional	Residential, Commercial	Urban Runoff	# IC/IDs responses/year	November 1997	Ongoing implementation	City of Malibu	\$11,395 (City Wide)
Enforcement	IC/ID	Los Angeles County (County) IC/ID Program	This program involves coordination of multiple County departments to cease and eliminate pollution by illicit connections and discharges to the storm water system. The County has an active education, response, and enforcement program. The data are tracked for the County region, as well as for the County's Road Maintenance Division (RMD), as part of its annual pre-storm season drainage inspection program.	Regional	Residential, Commercial, Industrial	Urban Runoff	# IC/IDs responses/year	November 1997	Ongoing implementation	Los Angeles County, District	\$443,500 (Regional)
Enforcement	IC/ID	City of Malibu Pollution Prevention Hotline	A 24-hour hotline was launched to enhance the IC/ID program. The goal of this program is to offer a consistent reporting tool to citizens during non-business hours for spills or runoff that may pollute streams or coastal waters. Calls are received and dispatched to the appropriate personnel for investigation and resolution. The hotline is available in English and Spanish. The community may call 310-359-8003 to report incidents.	Regional	Residential, Commercial	Urban Runoff	# Hotline calls/year # IC/ID abated/year due to hotline	June 2012	Ongoing implementation	City of Malibu	\$600 (FY 13-14, phone)
Enforcement	IC/ID	Pollution Prevention Hotline, 1(888)Clean LA	A 24-hour, bilingual hotline offers County staff, cities, and the public a means to report spills or runoff that may pollute coastal waters. Calls are received and dispatched to the appropriate personnel for investigation and resolution. The hotline is available in English and Spanish. A Chinese hotline is also available in Mandarin.	Regional	Residential, Commercial, Industrial	Urban Runoff	# Hotline calls/year # IC/ID abated/year due to hotline	November 1997	Ongoing implementation	Los Angeles County, District	-
Enforcement	Education, Inspections, Enforcement and ID	City of Malibu Water Waster Online Reporting Form	An online form to allow the community to report water waste has been introduced. All stakeholders are encouraged to make a collective effort to use water wisely, eliminate runoff, and reduce water waste, creating a culture of water conservation and water quality protection, and keep each other accountable by talking with those they see wasting water and using the reporting form. The form includes options to report issues included in the City's water conservation code. The City will provide notice, education and enforcement where needed to resolve issues. The online Water Waster Report form can be found at this link www.malibucity.org/WaterWaster	Regional	Residential, Commercial	Water Conservation, Urban Runoff	# Reports/year # Reports which included runoff abated/year	September 2014	Ongoing implementation	City of Malibu	Staff Time



Existing Nonstructural Programs Within the ASBS 24 Area

Nonstructural Program	Program Subcategory	Name of Nonstructural Control	Project Descriptions for Existing Nonstructural Controls	Project Location	Target Source/ Target Audience	Targeted Water Quality Problem	Method of Measure	Program Start Date	Implementation Status/ Completion Date	Lead Agency	Approx. Cost (\$/year)
Enforcement	Education, Inspections, Enforcement	Commercial & Industrial Inspection Program	The County and City have implemented protocols to identify commercial and industrial facilities located within the applicable ASBS 24 drainage area and currently perform inspections at these sites in accordance with the Special Protections requirements (commercial facilities twice during the rainy season and industrial facilities monthly during the rainy season) The goals of these inspections include compliance verification, enforcement as needed, and education regarding storm water and urban runoff issues, recycling, and environmental quality ordinances. The County has not identified commercial or industrial sites within the applicable unincorporated County. City Environmental Programs staff, Code Enforcement Officers, Public Works staff, and Building Safety staff are regularly trained to watch for storm water best management practice (BMP) infractions. Staff are authorized and directed to issue correction notices. Repeat offenses are subject to increased enforcement procedures ranging from cease and desist orders to administrative fines and traditional enforcement remedies (City of Malibu Ordinance 325). If commercial or industrial sites apply for permits within the applicable unincorporated County, the sites will be inspected at the required frequencies listed in the Special Protections. Additionally, an annual voluntary training is conducted for all City staff to learn about protecting water quality.	Regional	Commercial, "Industrial"	Bacteria Organics Oil/Grease Trash Urban Runoff	<u>Changes in Inspection Results for Facilities:)</u>	November 1997	Ongoing implementation	City of Malibu	\$8,000
Enforcement/ PIPP	Education, Incentives, Inspections	Clean Bay Restaurant Certification Program	The program is implemented in partnership with the Bay Foundation (also known as the Santa Monica Bay Restoration Commission & Foundation) and other bay cities. The goal is to recognize restaurants and food facilities that go above and beyond the minimum required by law to prevent pollution. Facilities are inspected annually. Only businesses with an inspection score of 100% receive certification. The City implements the rescinding policy for the Clean Bay Restaurant Certificate program, whereby a business that has been certified is subject to having its Clean Bay status rescinded for failing to maintain all of the criteria.	Regional, City of Malibu	Commercial	Bacteria Organics Oil/Grease Trash Urban Runoff	# Certified facilities <i>Rate of certification has increased 30% between 2009 & 2013.</i>	April 2009	Ongoing implementation	City of Malibu	See Commercial & Industrial Inspection Program
Enforcement	City Planning	City of Malibu Local Coastal Program	The City of Malibu Local Coastal Program, as certified by the California Coastal Commission, includes the Land Use Plan (LUP) and Local Implementation Plan (LIP) that details many environmental quality and protection standards, objectives, and implementation measures for new development and redevelopment projects. Additionally, conditions are placed prohibiting the installation of any new drains to the ASBS.	City of Malibu	Construction	Trash, Sediments, Urban Runoff, Storm Water Runoff	See Construction Inspection Program	September 1998	Ongoing implementation	City of Malibu	See Commercial & Industrial Inspection Program



Existing Nonstructural Programs Within the ASBS 24 Area

Nonstructural Program	Program Subcategory	Name of Nonstructural Control	Project Descriptions for Existing Nonstructural Controls	Project Location	Target Source/ Target Audience	Targeted Water Quality Problem	Method of Measure	Program Start Date	Implementation Status/ Completion Date	Lead Agency	Approx. Cost (\$/year)
Enforcement	Education, Inspections, Enforcement	City of Malibu Construction Inspection Program	The City has implemented protocols to identify existing and future construction sites located within the applicable ASBS 24 drainage area. Identified sites will be inspected in accordance with the Special Protections requirements (weekly during the rainy season). Grading within the City is limited to single lot development (see Ordinance No. 51U). The City engages with construction contractors throughout the construction process. At a pre-grading meeting, the contractor, deputy building official, and inspector(s) review the Storm Water Pollution Prevention Plan (SWPPP) and identify appropriate BMPs. The SWPPP is again discussed at commencement of construction, with a reminder of the repercussions (i.e., job site shut-down) of failing to comply. Project sites are visited regularly during the grading phase and construction phase. BMP implementation and maintenance is checked at each inspection.	Regional	Construction	Trash, Sediments, Urban Runoff	# of Grading Inspections # of Building Inspections	November 1997	Ongoing implementation	City of Malibu	See Commercial & Industrial Inspection Program
Enforcement	Education, Inspections, Enforcement	Los Angeles County Construction Inspection Program	The County has implemented protocols to identify existing and future construction sites located within the applicable ASBS 24 drainage area. Identified sites will be inspected in accordance with the Special Protections requirements (weekly during the rainy season). All construction permit applicants are required to prepare a Wet Weather Erosion Control Plan or Local SWPPP based on the Construction BMP Handbook. The County conducts inspections, follow-ups, and enforcement. A computer database is used to track all single-lot (non-tract) projects that are categorized by the disturbed/graded area (acres).	Regional	Construction	Trash, Sediments, Urban Runoff	Winter 10-11: 3,383 sites underwent wet weather inspections	November-1997	Program Enhancement August 2013	Los Angeles County	\$11,000 (Regional)
Enforcement	Code Enforcement	Expanded Polystyrene Packaging Ban Inspections & Enforcement	Approximately 65 food facilities are inspected each year for compliance with Ordinance No. 286, M.M.C. Chapter 9.24, Ban on Expanded Polystyrene Food Packaging.	Regional	Commercial	Trash, Urban Runoff	Approximately 80 food facilities inspected/year	October 2005	Ongoing implementation	City of Malibu	See Commercial & Industrial Inspection Program
Enforcement	Code Enforcement	Smoking at Beaches Ban	The Los Angeles County Sheriff engages Beach Patrol for enforcement of Ordinance No. 265, M.M.C. Chapter 12.05.035, Ban on Smoking at Malibu Beaches.	Regional	Residential, Commercial	Trash, Urban Runoff	21 miles of beaches patrolled	May 2000	Ongoing implementation	City of Malibu	\$482,983 (total Beach Patrol cost)
O&M	Street Maintenance	City of Malibu Curb & Gutter Cleaning & Repair Program	Contract for annual curb and gutter cleaning and repair. This service ensures proper functioning of drainage facilities.	City of Malibu	City Facilities	Trash, Metals, Sediments, Urban Runoff	# Facilities cleaned/year Pounds material removed/year	February 1987	Ongoing implementation	City of Malibu	\$590,000 (FY 13-14, City Wide)



Existing Nonstructural Programs Within the ASBS 24 Area

Nonstructural Program	Program Subcategory	Name of Nonstructural Control	Project Descriptions for Existing Nonstructural Controls	Project Location	Target Source/ Target Audience	Targeted Water Quality Problem	Method of Measure	Program Start Date	Implementation Status/ Completion Date	Lead Agency	Approx. Cost (\$/year)
O&M	Street Maintenance	City of Malibu Storm Drain/Culvert Facilities Maintenance	Contract for annual and post-storm inspection and cleaning of storm drain facilities. All storm drains are cleaned annually. Priority storm drains are cleaned at a minimum of twice annually. This program ensures that litter, debris, and pollutants are removed to prevent them getting into the local waterways and impacting beneficial uses.	Regional	City Facilities	Trash, Metals, Sediments, Urban Runoff	# facilities cleaned/year, by priority Pounds material removed/year	February 1987	Ongoing implementation	City of Malibu	\$50,000 (FY 13-14, City Wide)
O&M	Street Maintenance	City of Malibu Street Sweeping Contract	Contract for sweeping for public streets in City by means of a mechanical-type street sweeper. Street sweeping is a requirement of the NPDES permit and is intended to remove litter, debris, and pollutants from the roadways, thus preventing them from getting into local waterways. City streets are swept monthly (90 miles total, ~60 miles within the ASBS). The Pacific Coast Highway is swept weekly (54 miles total, 16 miles within the ASBS).	Regional	Streets/Parking	Trash, Metals, Sediments, Urban Runoff	Broom miles swept/year Pounds removed/year	March 2002	Ongoing implementation	City of Malibu	\$85,000 (FY 13-14, City Wide)
O&M	Street Maintenance	Los Angeles County Street Sweeping	The County sweeps parking lots along the coastal ASBS to remove litter, debris, and pollutants from the roadways, thus preventing them from getting into local waterways. Parking lots are swept with vacuum or regenerative air sweepers three times per week, based upon seasonal use rates. Sweeping occurs at: Zuma Beach (12 lots), Point Dume (1 lot), and Nicholas Canyon (1 lot).	County Beaches - Parking Lots	Streets/Parking	Trash, Metals, Sediments, Urban Runoff	Broom miles swept/year Pounds removed/year	November 1997	Ongoing implementation	Los Angeles County	\$8.7 Million <i>(Regional)</i>
O&M	Waste Management	City of Malibu Trash Collection	The City performed a needs study and subsequent implementation of placing trash receptacles at bus stops and high-use areas along the Pacific Coast Highway and City streets. Additional animal-proof containers were placed in the ASBS watershed including along PCH and in the Point Dume area. The refuse is collected weekly to prevent littering and any additional debris from getting into local water ways and drains.	Regional	Residential, Commercial	Trash, Urban Runoff	Frequency of removal	August 2003	Ongoing implementation	City of Malibu	\$50,000 (FY 13-14, City Wide)
O&M	Waste Management	County Beaches Trash Collection	County staff empty beach trash cans 7 days a week, as needed, to prevent littering and any additional debris from getting into local water ways and drains. Trash cans are donated by Adopt-A-Beach and broken cans are replaced quarterly, as needed.	County Beaches	Streets/Parking	Trash, Urban Runoff	Frequency of removal	November 1997	Ongoing implementation	Los Angeles County	\$7.2 Million <i>(Regional)</i>
O&M	Waste Management	County Beaches - Sanitation Program	County staff "sanitizes" the beach 3 days a week, provided the sand is not wet. A tractor with rake and screen system is used to collect trash and turn over the beach sand. This process removes solids and debris and allows the sun to "sanitize" the sand during the day. Operations are between 5 am and 13:30 pm daily.	County Beaches	Residential	Trash	Daily pickup	-	Ongoing implementation	Los Angeles County	See County's Trash Collection Program



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O&M	Recycled Products Purchasing Policy	Environmentally Preferable Purchases and Practices Policy (EPPP), Recycled Products Purchasing Policy (RCP)	In accordance with Administrative Guideline No. 7.1.3 and M.M.C. 2.63.100, a policy was established to reduce waste by instituting new office practices that emphasize purchase of environmentally preferable products. The policy establishes the goal for all City employees to make waste diversion and reduction a routine part of the jobs, whenever feasible.	City of Malibu	City Facilities, City Staff	Trash, Urban Runoff	-	-	Ongoing implementation	City of Malibu	-
PIPP, O&M	Education, Waste Management	Solid Waste Management Program	Solid Waste Management Program was formed to comply with AB939 (California Integrated Waste Management Act of 1989) and implement source reduction of solid waste, including recycling, composting, environmentally safe transport, and land disposal. This includes City programs for safe disposal of household hazardous waste; used oil collection/recycling events; waste management education; solid waste hauler permitting; Christmas tree recycling; brush clearance/green waste recycling events; bulky item collection; construction and demolition debris recycling; electronic and universal waste disposal; and expanded polystyrene foam recycling program (i.e., Waste to Waves program). Program is in support of the CalRecycle goals to divert municipal waste from landfills.	Regional	Residential, Commercial	Trash, Urban Runoff	Changes to Malibu's Annual Recycling Rate: 57% (2000) to 68% (2012)	March 1997	Ongoing implementation	City of Malibu	\$167,450
PIPP, O&M	Education, Waste Management	Rethink L.A.	Education and outreach program designed to encourage "rethinking" about waste management, including opportunities to implement reduction, recycling, and reuse. Program provides resources for buying recycled products and encourages carbon footprint BMPs, including a carbon footprint calculator, energy efficiency tips, and means of alternative transportation.	Regional	Residential, Commercial, Industrial	Trash, Urban Runoff	# Website visits # Workshops # Brochures # Attendees Regional Recycling Rate	-	Ongoing implementation	Los Angeles County	\$200K (Regional)
PIPP, O&M	Education, Waste Management	Los Angeles County Materials Exchange (LACoMAX)	The goal of this program is to reduce waste transported to the landfill. The LACoMAX is an on-line service where the public may find, make available, or identify an entrepreneurial opportunity for discarding resource materials. The data platform includes 15 material classifications and six regions. It is also a location where garage sales may be advertised. The data platform provides information to other County waste management programs.	Regional	Residential, Commercial, Industrial, Construction	Trash, Urban Runoff	# Website visits # Workshops # Brochures # Attendees Regional Recycling Rate	-	Ongoing implementation	Los Angeles County	See Rethink L.A. program
PIPP	Education	Malibu Parks and Recreation Quarterly Newsletter	The Malibu Recreation Guide and Quarterly Newsletter is sent to residents and includes articles related to the Clean Water Program and Solid Waste Program. The City takes the opportunity to give reminders to the community about how to prevent pollution and reduce waste, as well as local event opportunities. The newsletters are also available at City Hall. ASBS articles have been regularly contributed since 2012.	City of Malibu	Residential	Urban Runoff	4 Issues/year # Newsletters mailed	December 1995	Ongoing implementation	City of Malibu	\$33,000



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PIPP	Education	Malibu Chamber of Commerce Environmental Committee	The City is an active participant in the Malibu Chamber of Commerce Environmental Committee which aims to provide education and learning opportunities and recognition to local businesses and community through events, awards, workshops, and outreach campaigns.	Regional	Commercial, Residential,	Urban Runoff, Water Conservation, trash/recycling	# Workshops # Attendees # Brochures distributed	September 1999	Ongoing implementation	Malibu Chamber of Commerce	Not Applicable
PIPP	Education	Clean Water Act and Our Backyards Video	The Clean Water Act and Our Backyards video was produced locally in partnership with the Malibu Creek Watershed Council. It is regularly played on cable, and at local events and trainings. It gives an overview of how routine activities can affect water quality, BMPs to prevent pollution, and an explanation of TMDLs.	Regional	Residential	Urban Runoff	# Video presentations # Attendees/presentation	January 2002	Ongoing implementation	Malibu Creek Watershed Council	Not Applicable
PIPP	Education	<i>Living Lightly in Our Watersheds</i> Environmental Guide	The City and County collaborated with the Resource Conservation District of the Santa Monica Mountains in the revision and distribution of the <i>Living Lightly in Our Watersheds: A Guide for Residents of the Santa Monica Bay Watersheds</i> <www.malibuwatershed.org>. The guide was distributed to all Malibu residences and businesses. The City contributes to printing costs and distribution by mail and distributes materials at events. A new web-based and mobile platform is currently under development and is expected to launch by 2015. A new print edition of the guide is also expected in 2015.	Regional	Residential, Commercial	Urban Runoff	# Guides mailed # Visits to the website	July 2005	Ongoing implementation	Malibu Creek Watershed Council	\$3,000 (City of Malibu) \$20,000 (County of Los Angeles)
PIPP	Education	<i>Malibu Life</i> Environmental Newsletter	<i>Malibu Life</i> (formerly <i>Malibu Current</i>) Environmental Quarterly Newsletter is sent to all Malibu residences and businesses and distributed continuously to educate about ongoing environmental concerns and what the community can do to help, and provides updates on City environmental projects and programs. An ASBS article was published in Issue 2 Volume 1 in April 2007.	Regional	Residential	Urban Runoff, Water Conservation	# Articles # Newsletters mailed	April 2007	Implementation halted in 2010	City of Malibu	\$2,000 (2010, printing & postage)
PIPP	Education	Wildlife and Marine Rescue Services	The City has had a contract with the California Wildlife Center since April 1996 to provide wildlife rescue services and was later amended to include marine mammal rescue services. In 2003, the City, in partnership with the California Wildlife Center, applied for and received a John H. Prescott Marine Mammal Rescue Assistance Grant. Wild Rescue is a secondary responder. Public outreach and education are also a part of the grant.	City of Malibu	Residential	Urban Runoff, Water Conservation	# Outreach events supported	March 1992	Ongoing implementation	City of Malibu, California Wildlife Center	\$2,500 (FY 13-14) (\$1,000-\$2,500 historically)



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PIPP	Education, Inspections, Incentives/ Enforcement	ASBS Focused Outreach Program Proposition 84 Project	This began as a Proposition 84 grant program, officially titled the Wildlife Road Treatment & ASBS Focused Outreach Program Proposition 84 Project. The temporary Coastal Preservation Specialist (CPS) position was created to perform outreach to the community. The CPS conducted field work throughout the ASBS area, including coastal and inland areas, to look for dry-weather runoff and other pollution threats. When individual properties were identified as being out of compliance with ASBS regulations, letters to “cease and desist” the discharge as well as educational materials were mailed. The City, via the CPS and/or other City staff worked with the property owners to help fix the problem. The property owner was required to submit a report detailing how the problem was fixed. The CPS and/or other City staff conducted site visits, continued monitoring the site, and performed other additional actions (case-specific). General letters, including Notices to Comply, were sent to neighborhoods and individuals of high priority that were considered more likely to impact the ASBS to inform them of ASBS discharge restrictions. A general ASBS letter was mailed to every parcel within the ASBS. A database with information on every case is maintained as issues arise in the ASBS watershed and includes all communications and photos. The project also included the installation of a structural BMP on Wildlife Road. The City plans to continue this program on a modified scale.	ASBS 24 (Area in Malibu city limits)	Residential, Commercial	Urban Runoff, Water Conservation	# ASBS letters mailed # Cease and Desist letters mailed # Follow-up 1-month reports submitted % Compliance with Orders to Cease and Desist Discharge # Notices to Comply letter mailed to high-priority addresses % Change in high-priority addresses. Photo documentation	November 2011	Ongoing implementation End of grant: July 2014 City Continuing Program	City of Malibu	\$71,914 (grant)
PIPP	Education	Community Meetings and ASBS Presentations	Outreach presentations to home owner associations, property owner associations, and other community groups about the City's Clean Water Program, including protecting water quality and conserving water have been conducted. Recent outreach by the CPS was about urban runoff and the ASBS.	ASBS 24 (Area in Malibu city limits)	Residential	Urban Runoff	# Presentations	October 2007	Ongoing implementation End of grant: July 2014	City of Malibu	See ASBS Focused Outreach Program
PIPP	Education	Point Dume Marine Science School Assembly and Science Projects	The City has collaborated with the Point Dume Marine Science School on various programs since 2005. An assembly to grades K-5 was conducted including a presentation on the water cycle, urban runoff, and how to prevent pollution from reaching the ASBS. Each grade level then completed a science project related to some component of the assembly at the appropriate grade level. A video of the science day was filmed and posted on the City's YouTube channel. The assembly and project was implemented by the CPS as part of the ASBS Focused Outreach Program.	Point Dume Marine Science School	Students (Residents)	Urban Runoff	# Students # Science day projects # Video views/year	2005	Completed May 2012	City of Malibu	See ASBS Focused Outreach Program



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PIPP	Training	In-House ASBS Training	City staff has been trained about the ASBS. The most recent training in November 2012 discussed what to look for in the field, and how to work on ASBS cases. Binders with inspection report forms and educational handouts were created and placed in each City vehicle.	City of Malibu, City Hall	City Staff	Urban Runoff	# Staff trained	2007	Ongoing Implementation	City of Malibu	See ASBS Focused Outreach Program
PIPP	Education	ASBS Webpage	An ASBS section is on the City of Malibu website. The webpage provides interactive maps and information about ASBS, including many educational resources to help residents, businesses, and visitors understand and comply with ASBS regulations. Events, rebates, and other incentive programs are also posted. The web-page section can be viewed at this link www.malibucity.org/ASBS .	City of Malibu, Website	Residential, Commercial, Visitors	Urban Runoff, Water Conservation	# ASBS page views/year	May 2012	Ongoing implementation	City of Malibu	See ASBS Focused Outreach Program
PIPP	Education	Keep it Clean, Malibu Campaign	As part of the Proposition 84 State funding, an outreach campaign was developed (as an item in the CPS scope of work) to educate people about the issue and the result was Keep it Clean, Malibu – a multi-platform educational campaign designed to positively and proactively teach about the ASBS, and make people think about storm drains and what goes into them. The campaign contains five main elements: storm drain art murals and associated educational video, 4 public Service videos, a robust social media campaign, special events, and collateral materials giveaways that featured the campaign slogan and ASBS logo. The campaign can be viewed on this web-page www.malibucity.org/keepitclean .	City of Malibu, Website, Social Media	Residential, Commercial, Visitors	Urban Runoff, Water Conservation, Pollution Prevention	# of “likes” # of tags on social media # ASBS video views # of pledges signed/year	April 2014	Ongoing implementation	City of Malibu	See ASBS Focused Outreach Program
PIPP	Education	Malibu Green Room Webpage	This is an overview of City's sustainability practices, environmental projects, ordinances, and regulations, including coastal water protection and water drought response. Rebates and incentives provided by partner agencies are included on this web-page. The Green Room can be accessed from the Environmental Programs main page from this web-page www.malibucity.org/environmentalprograms .	Regional, City of Malibu, Website	Residential, Commercial	Urban Runoff, Water Conservation	# Malibu Green Room views/year	June 2012	Ongoing implementation	City of Malibu	Staff Time
PIPP	Education	City of Malibu Clean Water Program and Clean Water Team	The City's Clean Water Program and Team were formed with the ultimate goal of reducing or eliminating dry weather flow to the City's storm drains. It includes education of the businesses, residents, and visitors on water quality issues and BMPs and encourages participating in the team. It is the overlying program that manages regulatory compliance (e.g., NPDES, TMDLs), education, training, inspections and incidents response, and public agency activities. Outreach is provided on the City's website, at public speaking events, on local cable stations, at community events, and on distributed materials.	City of Malibu	Residential, Commercial	Urban Runoff, Storm Water Runoff	See other activities for defined metrics.	July 2002	Ongoing implementation	City of Malibu	Staff Time and Professional Services



Existing Nonstructural Programs Within the ASBS 24 Area

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PIPP	Education, Incentives	Malibu Area Conservation Coalition	The Malibu Area Conservation Coalition (MACC) is a partnership of local government agencies, utilities, resource districts, and community stakeholders working within Malibu and the North Santa Monica Mountains that share the common goal of empowering local communities to conserve and protect natural and economic resources and habitat. Recognizing that watersheds, oceans, water, and power generation and delivery systems do not stop at jurisdictional boundaries, the coalition is dedicated to providing effective programs, environmental education, and outreach. MACC members work on joint projects and also cross-promote individual organizations' programs. Recent programs included Ocean Friendly Garden Program, Landscape Irrigation Efficiency Program, Cash for Grass, Earth Day festivals, and the Wild and Scenic Film Festival.	City of Malibu	Residential, Commercial	Trash, Urban Runoff, Water Conservation	# Participants # Events (certain programs will have more defined metrics)	August 2009	Ongoing implementation	City of Malibu	Staff Time
PIPP	Education, Incentives	Ocean Friendly Garden (OFG) Program	The OFG Program targets residences and businesses to promote water conservation and eliminate non-point source pollution from landscaping. It was implemented locally as a partnership of West Basin Municipal Water District and the Surfrider Foundation as part of a Proposition 50 Grant from the State. The program includes educational workshops, training events, irrigation controller rebates, and the design/build of demonstration gardens. The Bluffs Park OFG was redesigned and rebuilt (February-March 2013) into a demonstration garden. Outreach Events included: * Ribbon cutting ceremony (3/20/2013) * OFG Workshop (6/2013) * Urbanite Workshop * Chumash Day PowWow (4/13-14/2013) The overall OFG Program of the Surfrider Foundation offers additional resources.	Regional, Bluffs Park OFG	Residential, Commercial	Urban Runoff, Water conservation, Pollution prevention	# Events/year # Attendees/event # Demonstration gardens constructed	April 2009	Ongoing implementation	Surfrider, West Basin Municipal Water District, City of Malibu	See ASBS Focused Outreach Program for education. OFG cost not included
PIPP	Education, Incentives	CA Friendly Landscaping Program	The CA Friendly Landscaping Program targets residences and businesses to promote water conservation and eliminate non-point source pollution from landscaping. It is a reimagining of the OFG Program by the Metropolitan Water District in an attempt to engage a broader audience statewide. Similarly to the OFG Program, it is promoted by its local water Districts and agencies. The program includes educational workshops, training events, and incentives such as landscape water efficiency rebates. The City hosted two CA Friendly Landscaping Workshops from 2013-2014.	Regional	Residential, Commercial	Urban Runoff, Water conservation, Pollution prevention	# Events/year # Attendees/event # Participants/incentive program	2013	Ongoing implementation	West Basin Municipal Water District, Los Angeles County Waterworks District 29, City of Malibu	Staff Time



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PIPP	Education	Pepperdine Business School Sustainability Project	Pepperdine business students created urban runoff and ASBS outreach materials, including posters and videos (available in English and Spanish). Materials are available on the Protect the Coast section on the Malibu City website. The students also mapped the process to develop a potential OFG Program on campus, created a guide for a green business certification program, and researched compliance and opinion of a local water ordinance as part of a project management class.	Pepperdine University	Residential, Commercial	Urban Runoff	# Videos created (2) # Posters created Pepperdine OFG guide	January 2012	Completed March 2012	Pepperdine University, City of Malibu	See ASBS Focused Outreach Program
PIPP	Incentive	Water District #29 Tiered Water Rates Based on Increased Usage	Los Angeles County Water District 29 has implemented tiered water rates based on increased usage to encourage water conservation and reduce water waste to provide economic incentive to reduce landscape irrigation runoff.	City of Malibu	Residential, Commercial	Urban Runoff, Water Conservation	Regional change in water usage over time	February 2003	Ongoing implementation	Los Angeles County Water District #29	-
PIPP	Education	Water Conservation Program	This program is an education and incentive program promoting water conservation. Educational information on water conservation is provided on the website and distributed at workshops. An education program targeted at students (3rd-12th grade) has also been developed.	Regional	Residential, Commercial	Urban Runoff, Water Conservation	# Site visits # Workshops	April 2009	Ongoing implementation	Los Angeles County Waterworks	Regional Program Cost
PIPP	Education, Incentives	Water Conservation Program – Water Saving Devices Rebate Program	Rebates are offered for water saving devices, including high-efficiency washing machines, sprinkler nozzles, and irrigation controllers. Rebates of \$25 to \$100 per irrigation controller, depending upon Water District and property (capped at \$235/applicant), are provided.	Regional	Residential, Commercial	Urban Runoff, Water Conservation	# Rebates obtained <i>Assumed up to 15% runoff reduction per site</i>	April 2009	Ongoing implementation	Los Angeles County Waterworks	Regional Program Cost
PIPP	Incentives	Cash for Grass (and other turf removal program iterations)	Through this program, residents are offered a rebate of \$1 per square foot of grass replaced with water-efficient landscaping (i.e., native plants, mulch, un-grouted stepping stones, permeable hardscape, and crushed rock). The goal of this program is to encourage water conservation for outdoor landscaping methods, including native plantings, using mulch, and installing permeable pavers.	Regional	Residential, Commercial	Urban Runoff, Water Conservation	# Applications # Completed projects \$ Rebates	April-09	Ongoing implementation	Los Angeles County Waterworks	Regional Program Cost
PIPP	Incentives	Landscape Irrigation Efficiency Program (LIEP) (and other water efficiency evaluation programs)	This grant funded program consisted of free water use surveys of properties by a certified landscape professional. The program also included free installation of efficient irrigation controllers (i.e., rotator sprinklers in place of conventional spray heads) for qualified sites. Programs of this type are ongoing and evolving as funding arises.	Regional	Residential, Commercial	Urban Runoff, Water Conservation	# Surveys # Sprinklers exchanged <i>Assumed up to 70% runoff reduction per site</i>	April 2009	Ongoing implementation as funding and resources allow	West Basin Municipal Water District	Regional Program Cost
PIPP	Education	Billboard Educational Campaign	This program was a countywide, 8-week billboard campaign designed to promote protective waste management practices. A used motor oil educational advertisement was displayed on 20 billboards throughout Los Angeles County.	Regional	Residential, Commercial	Bacteria, Oil, Urban Runoff	Route of advertisements # Impressions	February 13, 2012	Completed April 2012	District, Los Angeles County	-



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Compliance Monitoring	Compliance Monitoring	Santa Monica Bay Comprehensive Monitoring Program	The Santa Monica Bay Beaches Bacteria TMDL includes a coordinated shoreline monitoring program with regular monitoring of 9 sites within the City boundaries of the ASBS and 1 in the Unincorporated County (25 sample sites in North Santa Monica Bay total), and adoption of a wet Weather Implementation Plan to eliminate exceedances of bacteria above contact recreation standards in local waters, but specifically Santa Monica Bay beaches.	Santa Monica Bay	Water quality data	Recreational waters beneficial use	Annual compliance monitoring data	April 2000	Ongoing implementation	Los Angeles County, City of Malibu, Caltrans	County: \$35K - \$190K City: \$112,000
Special Study	Compliance Monitoring/ Special Study	Assessment of Subtidal Rocky-Reef Resources in Santa Monica Bay	Assessment determined the status of algal, invertebrate, and fish communities in the Subtidal Rocky-Reef Resources in Santa Monica Bay, Malibu ASBS. The study provided baseline information on the condition of subtidal rocky reef habitats and established a monitoring program to track changes in the condition of subtidal rocky reef habitat over time, per the Santa Monica Bay Comprehensive Monitoring Program.	Santa Monica Bay	Biological assessments data	ASBS Assessment	Final Report	August 2003	Completed March 2005	SMBRC, SCCWRP	-
Special Study	Special Study	Marine Habitat Gaps in Santa Monica Bay	Compared existing data with the lists of key habitats and species of concern and identified information gaps and study needs.	Santa Monica Bay	Water quality data	ASBS Assessment	Final Report	January 2003	Completed July 2004	SCCWRP, SMBRC	-
Special Study	Special Study	Santa Monica Bay Marine Habitats and Living Resources Inventory	The Santa Monica Bay Marine Habitats and Living Resources Inventory was a literature review to identify gaps in existing studies of habitats and species in the region. Upon update of the inventory, data summary reports from the inventory by site location, habitat type, and taxa were generated.	Santa Monica Bay	Data assessment	ASBS Assessment	Final Report	July 2003	Completed February 2004	SCCWRP, SMBRC	-
Special Study	Database Management	Santa Monica Bay Spatial Database & Santa Monica Bay Data Evaluation	Data collected under existing monitoring protocols used throughout Santa Monica Bay were evaluated to determine their applicability in the Marine Life Protection Act (MLPA) process (complete January 2003-February 2004). A spatial database was developed to be compatible with the GIS database for the central coast marine-protected areas and has been populated with data for Santa Monica Bay (complete January 2003-July 2004).	Santa Monica Bay	Data assessment	ASBS Assessment	Database	July 2003	Completed July 2004	SCCWRP, SMBRC	-
Special Study	Special Study	Oceanographic Information for Trend Analysis in Santa Monica Bay	In collaboration with the Southern California Coastal Ocean Observing System (SCCOOS), collect and compile historical physical and biological oceanographic information for trend analysis in Santa Monica Bay.	Santa Monica Bay	Data assessment	ASBS Assessment	Final Report	October 2003	Completed July 2004	SCCWRP, SMBRC	-
Special Study	BIGHT '03; BIGH '08; BIGHT '13	Marine Habitat Study of Santa Monica Bay and ASBS	Collaboration with southern California Bight partners to identify key types of marine habitats and develop a master list of species of concern for Santa Monica Bay & the Southern California Bight. In 2008, the State Water Resources Control Board (SWRCB) worked with ASBS dischargers to collaboratively conduct a statewide ASBS regional monitoring program to provide better scientific information to the SWRCB for regulation of the ASBS	Santa Monica Bay & ASBS 24	Biological assessments data, Water quality data	Urban Runoff, Storm Water Runoff	Monitoring Data, Final Report	Jan. 2003, Nov. 2008, Sept. 2013	July 2004, April 2009, July 2014	SCCWRP, City of Malibu and Los Angeles County as partners	\$35,000 (2003) \$74,087 (2008) \$74,087 (2013)



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			and in drafting the special protections for the ASBS. The City of Malibu and County contributed to scientific analysis of data for pre and post storm monitoring events in 2008 and 2013- 2014. The City will continue the wet weather monitoring program in 2014-2015 wet seasons in order to meet the obligations of the Special Protections.								
Special Study	Special Study	Malibu Creek Bacteria TMDL Reference Watershed Study	Monitoring of dry weather, dry winter weather, and wet weather for one year to develop representative numeric target for bacteria exceedance days. This study was conducted in Arroyo Sequit, a watershed which outlets at Leo Carillo State Beach in the ASBS.	Arroyo Sequit	Water quality data	Urban Runoff, Storm Water Runoff	Final Report	June 2006	Completed July 2007	SCCWRP	\$1,594
Special Study	Special Study	Source ID Study of Ramirez and Escondido Creek	North Santa Monica Bay Bacteria Source Identification Study of Ramirez and Escondido Creeks conducted by the County of Los Angeles. The City was a participant and served on the technical advisory committee to develop a methodology to track sources of bacteria indicators. The County of Los Angeles halted this study in 2008 study due to low bacterial levels measured. Monitoring resumed in 2009. Study ended in 2011, after no exceedances were observed.	Ramirez and Escondido Creeks	Water quality data	Urban Runoff, Storm Water Runoff	Final Report	March 2007	Completed July 2011	Los Angeles County, SCCWRP	-
Special Study	Special Study	Low-Flow Diversion Task Force	The low-flow diversion task force recommended management actions that optimize operations for the District. The task force completed a pilot project in June 2010 to test new technologies for low-flow diversion monitoring that would be used to better operate the system and characterize the sources of dry weather flows. This pilot project was successful and the District is pursuing a project implement these improvements at all of its low-flow diversions.	Regional	Dry Weather Flow	Urban Runoff	Low-Flow Diversion Structure Improvement List	2009 (start pilot program) June 2010	June 2010 (end of pilot program) Ongoing task force efforts	District	Staff Time



APPENDIX C

Potential Enhanced Nonstructural Programs Table



Potential Nonstructural Program Enhancements to Achieve Additional Wet Weather Load Reductions

Nonstructural Program	Program Sub-Category	Name of Nonstructural Control	Project Descriptions for Enhanced Nonstructural Controls	Target Source/ Target Audience	Targeted Water Quality Problem	Method of Measure	Lead Agency	Implementation Cost (Approx.)
O&M	Street Maintenance	Infrastructure Priority Re-Evaluation Program	This activity is a review and re-evaluation of existing inspection/cleaning priorities assigned to the catch basins, street, parking lot and other systems located in the ASBS 24 watershed. Prioritization criteria are based on the NPDES permit and are typically based upon historic trash and debris loading to a given system. This prioritization does not take into account the watershed or receiving water body that may be impacted by a given piece of infrastructure. Increased cleaning may be appropriate to meet the requirements of the ASBS Special Protections and General Exception or to provide a streamlined, efficient and effective implementation program for ASBS 24.	Residential, Commercial	Trash/Debris, Sediment	Existing Catch Basin Program Assessment, Other Program Assessments, Inspection Data, Pounds Removed / year	City of Malibu, County	\$10K, +\$25K/Year, maintenance per existing program
PIPP	Education, Incentives	Enhanced Collaborative Environmentally Friendly Alternative Services Program	This program would look for opportunities to enhance existing environmentally friendly services programs. For example, the LACoMAX could include an ASBS-specific region search and/or the City of Malibu could provide a link to via the Malibu Green Room webpage, with information related to local exchanges, a list of consignment facilities, etc. Programs that may also be enhanced in the future include the Clean Bay Restaurant Certification Program, City of Malibu's EPPP and RCP, and Los Angeles County's Rethink LA Program.	Residential, Commercial	Urban Runoff, Trash	Program-specific metrics will be developed	Los Angeles County, City of Malibu, Malibu Chamber of Commerce	\$5K / Year
PIPP	Education	ASBS Signage at Beaches	Educational placards describing the ASBS would be developed and installed along the board walk and/or main public beach accesses along the ASBS. This signage would describe unique features of the ASBS, as well as highlight recommended BMPs for trash management, sediment management, irrigation control, etc.	Residential, Public	Urban Runoff, Trash	# placards installed, # beach visits/year	Los Angeles County, State of California	\$20K
O&M	Street Sweeping	Increased Sweeping Frequency	This program would involve a pilot project to adjust the frequency of sweeping on City streets located within the ASBS drainage area from once per month to more frequently, paired with a runoff study to determine pollutant loading. Increasing the sweeping frequency has been shown to increase the potential load reduction associated with metals, sediments, trash, and debris.	Residential, Commercial	Metals, Sediments, Trash	Pounds of debris removed per year % reduction in pollutant loading vs. cost	City of Malibu	\$360,000
O&M	Street Sweeping	Equipment Upgrade	As of 2013, the City of Malibu sweeps city streets using motorized mechanical street sweeping equipment. This proposed nonstructural program enhancement would involve either: 1) replacing mechanical street sweepers with enhanced sweeping technologies during the standard end of the equipment life-cycle, or 2) requiring contractors responsible for local sweeping activities to only use vacuum or regenerative air sweeping technologies.	Residential, Commercial	Metals, Sediments, Trash	Increased efficiency and pollutant load reduction for machine operation.	City of Malibu	Additional cost of ~\$25K per machine.
PIPP	Education, Incentives	Architectural Copper and Metal Building Material Mitigation Program	This program would offer rebates for architectural copper and zinc mitigation measures. Rebates would be offered for existing structures and could be modeled after the Grass for Cash program. Potential mitigation measures may include: application of sacrificial paint (e.g., copper and zinc oxidation protection paints), downspout diversions, rain barrels and cisterns. Information could be incorporated into existing educational materials and through the ASBS Focused Outreach program, etc.	Residential, Commercial	Metals	# rebates offered, # facilities mitigated	City of Malibu, Los Angeles County	\$150K / Year



Potential Nonstructural Program Enhancements to Achieve Additional Wet Weather Load Reductions

Nonstructural Program	Program Sub-Category	Name of Nonstructural Control	Project Descriptions for Enhanced Nonstructural Controls	Target Source/ Target Audience	Targeted Water Quality Problem	Method of Measure	Lead Agency	Implementation Cost (Approx.)
PIPP / Enforcement	City Ordinance, Education, Enforcement	Architectural Copper Ban	Monitoring data of storm water wash off collected from metal building materials have been shown to be associated with elevated copper levels (City of San Diego, 2009 and 2010a). This ordinance would prohibit use of architectural copper for all new developments and re-development projects, especially for buildings and facilities along the ASBS and PCH. This ordinance would likely require significant education and outreach to engineers and architects, as well as residents and general public.	Residential, Commercial	Copper	# brochures distributed, # workshops, Ordinance/Policy, # facilities enforced	City of Malibu	\$5K
PIPP / Enforcement	City Ordinance, Education, Enforcement	Zinc Alternative Building Material Ordinance	It is recognized that for maintenance and durability, building materials are often specified as galvanized zinc. Monitoring data collected of storm water wash off from metal building materials have been shown to be associated with elevated zinc levels. This project would evaluate the feasibility and implement a zinc building material policy which would eliminate, reduce, mitigate or control the use of zinc building materials, based upon the findings of a feasibility analysis and stakeholder engagement process.	Residential, Commercial	Zinc	Feasibility analysis, Ordinance/Policy	City of Malibu	\$10K + \$5K/Year (outreach)



APPENDIX D

Enhanced Nonstructural Programs

Quantification Calculations

- Aggressive Street Sweeping
- Building Material Management Program

AGGRESSIVE STREET SWEEPING

Aggressive street sweeping can be highly effective in reducing metals loading (City of San Diego, 2010; Seattle Public Utilities, 2009; City of Portland, 2006) and, to a lesser extent, bacteria (Skinner et al., 2010), while continuing to address trash, debris, and sediment pollution. The County has implemented an aggressive street sweeping program at County Beach parking lots (i.e., sweeping three times per week with enhanced sweeping equipment). Given that these parking lots experience a reduced traffic load compared to the PCH and City streets and have an aggressive sweeping schedule and program, the County's existing parking lot sweeping program is considered to be appropriate for protecting water quality of the ASBS 24 (i.e., program at a high level where adding enhancements may provide diminishing returns). The City currently implements a two-part street sweeping program, including weekly mechanical sweeping along PCH and monthly mechanical sweeping along City-maintained streets. This assessment focuses on quantifying the potential additional water quality benefits that could be realized through enhancements to the sweeping programs associated with City street sweeping programs. Data from the *City of San Diego Targeted Aggressive Street Sweeping Pilot Study Effectiveness Assessment*, which evaluated the effectiveness of three types of street sweepers at two aggressive sweeping frequencies, are used in this section to evaluate the potential load reduction associated with sweeping the PCH and City-maintained streets.

The referenced 2010 City of San Diego report uses debris removal, or collection rate as a metric to assess the relative pollutant load reduction associated with the various aggressive street sweeping programs evaluated. The fine sediments collected in special study bins were weighed, sampled, and analyzed for grain size, metals, pesticides, and other constituents of concern. Daily sweeping data were translated into pounds of debris removed per linear broom mile swept, and pollutant-specific load reduction rates were estimated (City of San Diego, 2010). This method of measure was used to compare the effectiveness of different types of street sweepers at twice-per-week and once-per-week sweeping frequencies.

The 2010 City of San Diego study included detailed analysis of various routes through different types of watersheds (hilly, flat, rural, and urban), including the urban areas of Chollas Creek. The average pounds of debris removal per broom mile for mechanical and vacuum sweepers, at both once and twice a week frequencies for this particular urban route, are presented on Table D-1. The broom mileage data used to produce these sediment removal rates were extracted from the 2010 City of San Diego study (City of San Diego, 2010), which is available on the Think Blue San Diego website. Note that the frequency of sweeping implemented under a few of the existing sweeping programs implemented by the County (3 times/week) and City (once/month) do not perfectly correspond with the available data. Removal rates for these frequencies were extrapolated using the best-fit curves presented on Table D-1 and in Figure D-1.



Table D-1. Sediment Load Reductions Associated with Mechanical and Vacuum Sweeping (City of San Diego, 2010)

Sweeper Technology	Sweeping Frequency	Average Sediment Removal Rate (lb/broom mile)
Mechanical	Once/week ¹	49.4
	Twice/week ¹	30.9
	Once/month ²	63.3
	Twice/month ²	58.7
Vacuum	Once/week ¹	80.0
	Twice/week ¹	83.3
	Once/month ²	77.5
	Twice/month ²	78.4

¹ Calculated debris removal rate from referenced special study (City of San Diego, 2010).

² Calculated using interpolated values.

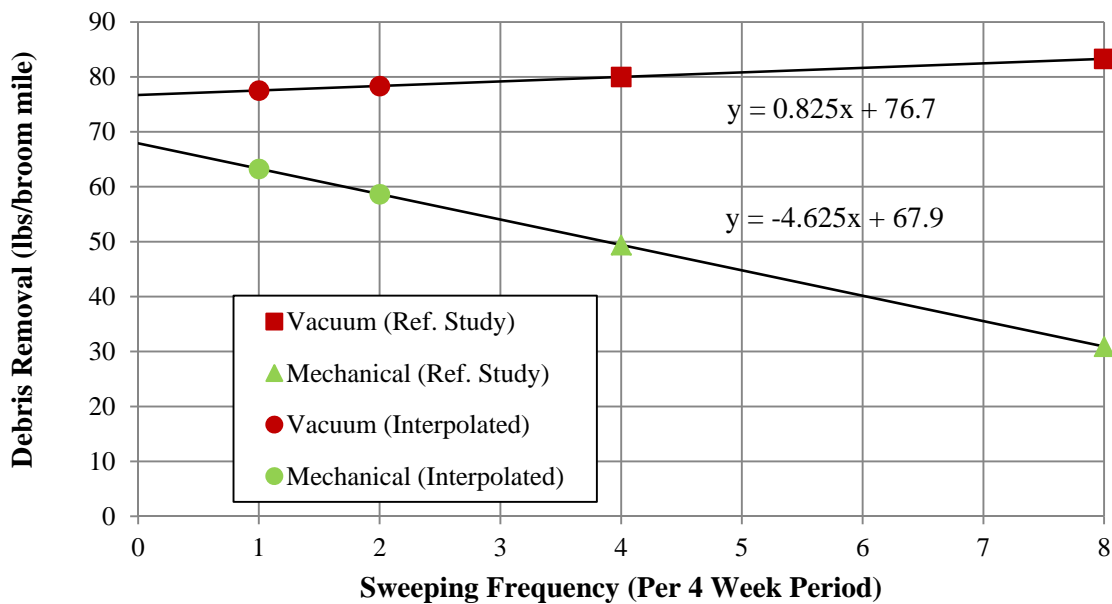


Figure D-1. Sediment Load Reductions Associated with Mechanical and Vacuum Sweeping (City of San Diego, 2010)

The potential debris reductions associated with street sweeping within ASBS 24 were calculated by determining the linear broom miles or path of travel and multiplying that length by the appropriate removal rate. The linear broom miles for each parking lot were determined using GIS information (aerial images, parcel layer, and land use data). Sweeping data for existing programs within the ASBS 24 are presented on Table D-2.

Table D-2. Existing Street Sweeping Programs Within ASBS 24

Authority	Beach Name	Acres (acres)	Single Trip Broom Miles (miles)	Yearly Broom Miles at Once/month frequency (miles/year)	Yearly Broom Miles at Twice/Month Frequency (miles/year)	Yearly Broom Miles at Once/Week Frequency (miles/year)
City of Malibu	PCH	-	16	192	384	832
	City Streets	-	59	702	1,404	3,042

The potential debris removal for each sweeping option considered was estimated by multiplying the yearly linear broom mileage by the applicable debris removal rate and results of these calculations are provided on Table D-3.

Table D-3. Potential Debris Removal Summary for Each Sweeping Method

Authority	Machine	Location	Frequency	Broom Miles (miles/year)	Debris Removal Rate (lb/miles)	Debris Removal Rate (lb/year)	Debris Removal Rate (kg/year)
City of Malibu	Mechanical	PCH	Once/month	192	63.3	12,149	5,503
			Twice/month	384	58.7	22,541	10,211
			Once/week	832	49.4	41,101	18,619
		City Streets	Once/month	702	63.3	44,419	20,122
			Twice/month	1,404	58.7	8,2415	37,334
			Once/week	3,042	49.4	150,275	68,074
	Vacuum	PCH	Once/month	192	77.5	14,885	6,743
			Twice/month	384	78.4	30,106	13,638
			Once/week	832	80.0	66,560	30,152
		City Streets	Once/month	702	77.5	54,423	24,653
			Twice/month	1,404	78.4	110,074	49,863
			Once/week	3,042	80.0	243,360	110,242

Debris removal includes sediment, organics, and trash. The 2010 San Diego study did not directly correlate debris removal to TSS removal. The potential debris removal calculations for the different street sweeping scenarios are provided to show the comparison between different types of sweepers and sweeping frequencies.

The 2010 San Diego study included monitoring the water quality for three storm events at sites located within the Chollas watershed (Route 3J). For each monitored event, three different street segments were sampled representing sites that had been swept by either a vacuum or mechanical sweeper, once per week and for the three continuous weeks prior to the storm event and an “unswept” site that had been swept once every two months prior to the event (City of San Diego, 2010). A summary of the TSS results and calculated load reductions are provided on Table D-4. .



Table D-4. Summary of Street Sweeping Water Quality Results (City of San Diego, 2010)

Storm Event	Type of Sweeping	TSS (mg/L)	TSS Percent Reduction
Mean of Three Storms	Un-swept (Once/2 months)	927.0	N/A
	Mechanical (Once/week)	243.8	73.7%
	Vacuum (Once/week)	135.8	85.3%

The TSS removal efficiencies shown on Table D-4 can be used in combination with watershed model output data to estimate the transportation land use TSS pollutant load reductions associated with enhancing programs to perform sweeping at a once-per-week frequency with these types of machinery. The estimated TSS load reduction can also be compared to the total TSS load from watershed model data to estimate the overall pollutant load reductions from the street sweeping program.

The load reductions summarized on Table D-4 are based on the 2010 San Diego study and removal efficiencies of mechanical and vacuum sweeping at a once-a-week frequency (City of San Diego, 2010). As part of this study, storm event monitoring samples (wet weather) were not collected for comparison of un-swept sites to sites that were swept at a frequency of once per month or twice per month. However, based on the debris removal data collected in the referenced study and applied to the ASBS 24 watershed (see Table D-3), sweeping less frequently (e.g., once per month or twice per month) would provide less of a load reduction, even though a specific percentage is not provided by this quantification analysis. There is a correlation between TSS and metals in urban storm water runoff (LARWQCB, 2005), and the reductions in TSS load shown on Table D-4 also represent load reductions of metals.

REFERENCES

- City of Portland. 2006. *Technical Memorandum Nonstructural Stormwater BMP Assessment* Work Order 14531043. Prepared for the City of Portland by Herrera Environmental Consultants. May 2006.
- City of San Diego. 2010. *City of San Diego Targeted Aggressive Street Sweeping Pilot Study Effectiveness Assessment*. Prepared for the City of San Diego by Weston Solutions, June 2010.
- Seattle Public Utilities. 2009. *Seattle Street Sweeping Pilot Study Monitoring Report*. Prepared by Herrera Environmental Consultants. April 22, 2009.
- Skinner et al. (Skinner, J., J. Guzman and J. Kappeler). 2010. "Regrowth of Enterococci & Fecal Coliform in Biofilm, Studies of Street Gutters and Storm Drains in Newport Beach, CA," In *Stormwater*. July–August 2010. Accessed at: <http://www.stormh2o.com/july-august-2010/regrowth-enterococci-fecalcoliform.aspx>.

Simple Method Model to Estimate Copper Load Reduction Associated with Nonstructural BMP Program

Watershed Parameters

Area	1	ac	
Rainfall	1	inch	
Percent of Resid that have cu	25%		
w/cu material factor	25	times std EMC	
Residential Cu EMS (w/cu)	432.5	ug/L	
Residential Cu EMC	17.3	ug/L	(LARWQCB, 2005)
Open Space Cu EMC	9.1	ug/L	(LARWQCB, 2005)
Transportation Cu EMC	51.9	ug/L	(LARWQCB, 2005)

Land Use	Coverage	Impervious %	Rv Value
Residential	50%	35%	0.365
Open Space	40%	3%	0.077
Transportation	10%	75%	0.725

Base Line (Exisiting Conditions No Program)					
Calculations:					
Land Use	Coverage	Impervious %	Rv Value	Cu EMC (ug/L)	Loading (kg/(1-in*1 ac))
Residential Cu EMS (w/cu)	12.5%	35%	0.365	432.5	0.0219
Residential Cu EMC	37.5%	35%	0.365	17.3	0.0026
Open Space Cu EMC	40.0%	3%	0.077	9.1	0.0003
Transportation Cu EMC	10.0%	75%	0.725	51.9	0.0042
Total	100.0%				0.0290

With Program - Lower End of Reductions Based on Stated Assumptions					
Assumptions:			Results		
Percent of Program Utilization	20.0%		Load Reduction =		6.0%
Load Reduction	40.0%				
Calculations:					
Land Use	Coverage	Impervious %	Rv Value	Cu EMC (ug/L)	Loading (kg/(1-in*1 ac))
Residential Cu EMS (w/cu)	10.00%	35%	0.365	432.5	0.0175
Residential Cu EMS (w/cu) on Program	2.50%	35%	0.365	259.5	0.0026
Residential Cu EMC	37.5%	35%	0.365	17.3	0.0026
Open Space Cu EMC	40.0%	3%	0.077	9.1	0.0003
Transportation Cu EMC	10.0%	75%	0.725	51.9	0.0042
Total	100.0%				0.0273

With Program - Upper End of Reductions Based on Stated Assumptions					
Assumptions:			Results		
Percent of Program Utilization	20.0%		Load Reduction =		12.1%
Load Reduction	80.0%				
Calculations:					
Land Use	Coverage	Impervious %	Rv Value	Cu EMC (ug/L)	Loading (kg/(1-in*1 ac))
Residential Cu EMS (w/cu)	10.00%	35%	0.365	432.5	0.0175
Residential Cu EMS (w/cu) on Program	2.50%	35%	0.365	86.5	0.0009
Residential Cu EMC	37.5%	35%	0.365	17.3	0.0026
Open Space Cu EMC	40.0%	3%	0.077	9.1	0.0003
Transportation Cu EMC	10.0%	75%	0.725	51.9	0.0042
Total	100.0%				0.0255

LARWQCB (Los Angeles Regional Water Quality Control Board). 2005. Total Maximum Daily Load for Toxic Pollutants in Marina del Rey. October 6, 2005. EMCs were estimated based on LADPW's stormwater data from 1994 to 2000.



APPENDIX E

Preliminary Design Report

Broad Beach Structural BMPs



Prepared for:

City of Malibu
23825 Stuart Ranch Road
Malibu, CA 90265-4861

Broad Beach Road Biofiltration Project

Preliminary Design Report

Prepared by:

Geosyntec 
consultants

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Project Number LA0245

April 2011

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LIST OF ABBREVIATIONS AND ACRONYMS

BMP	Best Management Practice
CDP	Coastal Development Permit
CEQA	California Environmental Quality Act
ETWU	Estimated Total Water Usage
LACFD	Los Angeles County Fire Department
LCP	Local Coastal Program
LIP	Local Implementation Plan
MAWA	Maximum Applied Water Allowance
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
MSL	Mean Sea Level
NPDES	National Pollutant Discharge Elimination System
OWTS	Onsite Wastewater Treatment System
PAH	Polycyclic Aromatic Hydrocarbon
PCH	Pacific Coast Highway
PDR	Preliminary Design Report
POC	Pollutant of Concern
SWRCB	State Water Resources Control Board

The Broad Beach Road Biofiltration Project (Project) is funded in part by the City of Malibu (City) and in part by the State Water Resources Control Board (SWRCB) through a Proposition 84 Grant Agreement between the two parties. The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

1. INTRODUCTION

The purpose of this report is to present the design basis and the evaluation of design alternatives for the Broad Beach Road Biofiltration Project (Project). This Preliminary Design Report will form the basis for the critical evaluation and selection of the Project design approach.

The Preliminary Design Report (PDR) is intended to document all the relevant studies, evaluations, and calculations for the Broad Beach Road Biofiltration Project and to produce two conceptual design alternatives for the Project. The Project scope of work requires that the PDR include the following:

- Hydrology studies and soils report;
- Groundwater mounding analyses;
- Utility maps and identification of utility interferences;
- Development of two conceptual design alternatives presented at the 10 percent design level;
- Site plans showing proposed improvements, landscaping, and best management practices (BMPs);
- Performance and maintenance for the proposed alternatives;
- Construction cost estimate; and
- Final design recommendations.

This report is presented in 10 sections. Section 1 is this report and Project introduction. Section 2 reviews the existing Project site conditions, including topographic maps and utility maps. Section 3 reviews various regulations and approvals considered in the development of the Project conceptual design. Section 4 presents the results of the soil and groundwater investigation, including the infiltration study and groundwater mounding analysis. Section 5 introduces the Project hydrology evaluation, including a review of site drainage and development of the Project site design capture volume. Section 6 reviews the Project objectives, introduces the proposed BMPs and site improvements, and develops two stormwater improvement alternatives. Section 7 presents construction cost estimates for the two alternatives. Section 8 includes a discussion of the two alternatives, with recommendations. Section 9 defines the

limitations on use of this report. Section 10 presents pertinent references cited in this report.

1.1 Project Description and Background

The city of Malibu was awarded a Proposition 84 grant by the State Water Resources Control Board (SWRCB) for the Broad Beach Road Biofiltration Project. The stated purpose of this grant is for “diverting dry-weather and some stormwater runoff from a series of eight (8) storm drains onto permeable surfaces and into a biofiltration system along a one (1) mile stretch of Broad Beach Road to prevent discharges to Broad Beach.” [SWRCB, 2011]. The City of Malibu has contracted with Geosyntec Consultants to prepare studies, develop design documents, provide community outreach, and support the City during construction of this Project.

The Project includes various stormwater BMPs, landscape, and other improvements to eliminate or greatly reduce dry-weather flows, improve stormwater quality through treatment, reduce erosion and sediment tracking, and possibly capture and use stormwater. Overall, the Project will improve runoff quality and reduce wet weather and dry weather flows to Broad Beach.

1.2 Project Objectives

The Project objectives are:

- Eliminate dry weather flows to the storm drain;
- Reduce wet weather flows to storm drain (as feasible);
- Improve water quality of wet weather flows to storm drain (i.e., storm water treatment, pollutant reduction) to the maximum extent practicable (MEP);
- Reduce potable water use for irrigation (as feasible);
- Restore habitat above Broad Beach Road (as feasible);
- Reduce slope erosion (as feasible); and
- Preserve street and visitor parking.

1.3 Terms of Reference

This report was prepared for the City of Malibu (City) by Geosyntec Consultant Team (Geosyntec) in support of the Broad Beach Road Biofiltration Project in the City of Malibu, California. This work was authorized under Agreement executed on October 27, 2011; this report satisfies Task 1.11 of the scope of services. This report was written by Jan Coward and Patrick Galvin, PE, with senior review conducted by Ken Susilo, PE, in accordance with Geosyntec's quality review procedures.

The City project manager for the Project is senior civil engineer Rob DuBoux, Esq., PE.

The Project is funded in part by the City of Malibu and in part by the State Water Resources Control Board through a Proposition 84 Grant Agreement between the two parties.

2. EXISTING SITE CHARACTERISTICS

2.1 General Site Condition and Location

Broad Beach Road, situated between Broad Beach and Pacific Coast Highway (PCH) in Malibu, California, runs parallel to the coastline with a general orientation within the Project area of southeast to northwest. Broad Beach Road is a paved two-lane residential street providing residents access to their homes along the south side of the road and providing parking and beach access for residents and visitors. A mostly unpaved strip along the northern edge of Broad Beach Road varying in width from 10 to 20 feet provides public parking on the north side of the road. This parking strip is separated from PCH by a vegetated hillside which varies in slope from slightly steep to nearly vertical bluffs where the elevation difference between the two roadways is at its greatest. The Project area is located in the western end of Malibu approximately three miles northwest of Point Dume (see Vicinity Map, Figure 2-1).

The Project drainage area encompasses approximately 4,500 linear feet of Broad Beach Road between PCH and Victoria Point Road and extends for the most part from the center line of Broad Beach Road to the top of the hillside between Broad Beach Road and PCH. The total Project drainage area is 12.3 acres.

The Project area is located at the mouth of Trancas Canyon (see Figure 2-2). Trancas Canyon Creek, which drains the 6,233 acre Trancas Canyon watershed, runs to the east of the Project area culminating in a small disturbed coastal lagoon adjacent to the commercial center at the intersection of Trancas Canyon Road and Pacific Coast Highway. The area north of the Project area and west of Trancas Canyon Road drains to Caltrans-owned catch basins along the northern edge of PCH. The Trancas Canyon watershed drainage is not addressed by this Project. With the exception of one area located on PCH, the drainage from PCH is not addressed by this Project.

2.2 Site Topography

The site topography is fairly consistent along the length of Broad Beach Road varying mainly in the elevation difference between Broad Beach Road and PCH and the steepness of the hillside. The Project area, corresponding to the drainage area, encompasses 12.3 acres, approximately 1.6 acres of which is asphalt and concrete paved roadway and parking area. A topographic survey was performed for the Project. The topographic maps are presented in Appendix A.

Broad Beach Road is paved with asphalt and has two lanes, each lane approximately 10 feet wide. The road is crowned at the center line with a lateral slope of roughly two percent. Thus, storm water runoff that lands on the south side of the road flows toward the private residence drains and storm water from the north side of the road flows to the city-owned catch basins. The roadway undulates but is relatively flat except for the western end which reaches a slope of up to five percent. The stretch of road within the Project area has four low points and the roadway elevation varies from 18 to 64 feet above mean sea level measured at roadway center line.

A shoulder area varying in width from roughly 10 to 20 feet lies on the north side of the road along the entire stretch, separating it from the hillside –this area is used for parking by visitors and residents. This area is mostly unpaved, covered by varying materials including gravel, decomposed granite, compacted dirt, sand, and patches of asphalt and concrete. The parking strip follows the same undulating gradient as the roadway in the longitudinal direction and slopes slightly from the toe of the hillside toward the edge of the roadway pavement.

The hillside that separates the parking area and the shoulder along the south side of PCH is relatively steep and in certain areas nearly vertical. The elevation difference from the top of the hillside to the bottom of the hillside varies between 20 and 60 feet. The vertical bluff sections coincide with where the shoulder along PCH is widened to allow for roadside parking.

The entrances to the properties along the south side of Broad Beach Road generally lie at the same elevation as the roadway, or lower.

Existing drainage patterns are described in *Section 5 Hydrology*.

2.3 Utilities

The major utilities within the Project area consist of storm drains, sanitary sewer, potable water, electricity, communication, and natural gas. In support of the development of this preliminary design, the Geosyntec team performed utility research and located existing utilities in the Project area. This work was done using available utility maps and by requesting utility owners to mark their utilities at the Project site. No independent field verification of utilities was conducted. The utility maps are presented in Appendix B.

2.4 Biology

In support of the development of this preliminary design, the Geosyntec team performed a preliminary Biological Assessment of the Project area. The intention of the Biological Assessment was to provide an objective preliminary evaluation of potential impacts of the Project on existing biological resources. The information presented below is a summary of the conclusions and recommendations from this assessment. The preliminary draft of the Biological Assessment report is presented in its entirety in Appendix C.

Based on review of historic vegetation maps, the site is significantly degraded from its historic condition prior to development of Broad Beach. Field surveys found that the vegetation was heavily invaded by naturalized and planted exotic species. The vegetation classifications described below were determined to best characterize the assessment area.

- *Coastal Bluff Scrub (3.1 acres)* - Coastal bluff scrub consists primarily of native plant species, although exotic invasives are present throughout. This vegetation occurs on the upper, steeper bluff slopes between Pacific Coast Highway and the lower landscaped zone along Broad Beach Road.
- *Ornamental Landscaping (4.2 acres)* - Ornamental landscaping consists primarily of exotic vegetation that has been planted and irrigated, including pines, junipers, eucalyptus, bamboo, bougainvillea, and invasive species such as pampas grass. This vegetation dominates the lower slope of the assessment area along Broad Beach Road.
- *Ornamental Landscaping/Coastal Bluff Scrub (1.1 acre)* - This classification represents an integration of native and planted vegetation, with invasive exotics such as iceplant also present throughout.
- *Ornamental Landscaping (Planted Sycamores) (0.2 acre)* - Planted and irrigated sycamores occupy a localized, small area between Broad Beach Road and artificial terraces upslope. These trees may fall under the protection of the City's Native Tree Protection Ordinance because they are native to California.

In general, the area has relatively few wildlife species present or expected to occur, due to its condition as fragmented habitat surrounded by high-traffic roads, frequent human disturbance, construction noise, and dominance of exotic vegetation. The exotic vegetation provides cover and limited nesting habitat for birds, but few food resources for native wildlife. Certain wildlife species, especially goldfinches and crows, were

frequently observed moving between the assessment area and landscaping on residential properties to the south. After the Project design is further advanced, an additional biological assessment will be conducted to specifically address the proposed activities and their potential biological impact on the final Project areas.

2.5 Climate

The climate characteristics of the site reflect the general Mediterranean climate of central coastal regions of California. This climate regime is characterized by cool, wet winters and warm, dry summers with occasional periods of fog. Although infrequent, Malibu is periodically subjected to intense coastal storms.

The average daytime summer temperatures in the area are usually in the 70s to 80s (Fahrenheit). Nighttime low temperatures during the summer are typically in the high 50s to low 60s, while the winter high temperature tends to be in the 60s. Characteristic of Malibu's marine microclimate, the winter low temperatures are in the low 50s. The annual average rainfall in Malibu is about 20 inches. Winter months tend to be wetter than summer months. The wettest month of the year is January with an average rainfall of about 5 inches.

2.6 Hardscape and Landscape

Many Broad Beach Road residents have created gardens across from their residences on city property. These gardens include many non-native invasive or ornamental plants and shrubs. On several parcels, numerous potted plants are also stored along the roadway. Although this property is owned by the city, many homeowners have installed private irrigation systems plumbed back to their residential water services. Irrigation piping runs under the road and was also observed within existing storm drain pipe. The private irrigation of gardens creates uncontrolled and unmanageable dry-weather flows which have been observed during recent site visits.

Residents have also constructed several garden and retaining walls along the hillside. These walls are constructed of a myriad of materials including cobbles, broken concrete, masonry brick, and cast-in-place concrete. Some walls appear to have served as a means of disposal of waste broken concrete from driveway replacements. The parcel-specific variable hardscape and landscape elements have created an inconsistent environmental theme for the neighborhood.

Examples of existing hardscape, landscape, and irrigation systems are presented in Figures 2-3 through 2-9.

3. REGULATORY REQUIREMENTS

3.1 Water Quality

The City storm drains within the Project area ultimately discharge through private drains to private beaches. After passing through a wave wash mixing zone in the Pacific Ocean, flows reach the Pacific Ocean and a designated Area of Special Biological Significance (ASBS 24). The California Ocean Plan [SWRCB, 2009] defines water quality objectives for ocean waters including all ASBS. Since compliance with Ocean Plan's stringent objectives is not always economically feasible nor in the public interest, the Ocean Plan allows the State Water Board to grant exceptions to its provisions as long as the public interest will be served and beneficial uses are protected.

As part of an application for a general exception to Ocean Plan requirements, Special Protections [SWRCB, 2012] have been proposed to fulfill the state mandate for protection of water quality in ASBS and to address the requirements identified in the Ocean Plan. On March 20, 2012 these Special Protections were recommended by the State Water Board as part of an Ocean Plan Exception. According to these Special Protections, the design storm for treatment control BMPs is defined as follows:

“Design storm – For purposes of these Special Protections, a design storm is defined as the volume of runoff produced from one inch of precipitation per day or, if this definition is inconsistent with the discharger's applicable storm water permit, then the design storm shall be the definition included in the discharger's applicable storm water permit.”

The applicable storm water permit in this case is the Los Angeles County National Pollutant Discharge Elimination System (NPDES) Municipal Storm Sewer Systems (MS4) Permit. Since under this permit the Broad Beach project is not considered a new development or a redevelopment, the permit requires that pollutants in stormwater discharge be reduced to the maximum extent practicable (MEP). In Los Angeles County the 0.75 inch design storm event is generally accepted as equivalent to MEP per the MS4 permit. This is also in compliance with the design storm requirements in the proposed revised MS4 Permit [LA RWQCB, 2012]. Since the one inch event is inconsistent with the applicable permit, the conclusion of this study is that the Broad Beach treatment control BMPs should be designed for the 0.75 inch design storm event.

3.2 Environmental Review

The Project is subject to the requirements of the California Environmental Quality Act (CEQA). CEQA requires that all projects be reviewed and that their environmental impacts be evaluated. The lead agency for the Project is the city of Malibu. On behalf of the city of Malibu, Geosyntec will prepare an Initial Study for the project.

This Project is an environmental improvement project (stormwater quality improvement) and the new constructed facilities will likely be hardscape and landscape improvements and natural water quality treatment facilities such as vegetated swales and biofilters. It is expected that the Initial Study will result in a finding of no impact or no significant impact with mitigation, qualifying the Project for a Negative Declaration or a Mitigated Negative Declaration.

As part of the CEQA process, a Frequently Asked Questions sheet will be published and distributed to the community to inform them of the Project. A public notice will be filed in the local newspaper and a public meeting will be conducted to provide the interested public with the opportunity to comment on the Project plans.

3.3 Coastal Development Permit

The California Coastal Act of 1976 (Div. 20 CA Public Resources Code Sections 30000 et. seq.) was adopted by the California Legislature in 1976 and became effective January 1, 1977. The Coastal Act provides a comprehensive regulatory framework for all new proposed non-exempt “development” (See PRC Sec. 30106 and 30610) within the Coastal Zone of the state of California. Pursuant to Sec. 30500 et. seq. of the Coastal Act each local government is responsible for preparing and adopting a Local Coastal Program (LCP) so as to implement the policies and provisions of the Act within its jurisdictional boundaries. Prior to Certification of an LCP the California Coastal Commission generally retains jurisdiction for the processing of Coastal Development Permits (CDPs) consistent with the Act; following certification of an LCP it becomes the primary responsibility of the Local government to review and approve all new proposed development within the Coastal Zone consistent with the provisions contained within its LCP.

In 2002 the City of Malibu’s Local Coastal Program was approved by the California Legislature and became law. Any new non-exempt development proposed within the City of Malibu must apply for and receive a Coastal Development Permit prior to commencement of development (See 13.3 of the Malibu Local Implementation Plan—“LIP”). The LIP and the Malibu Municipal Code provide the primary regulatory framework for review of new development.

The Project is located within the Coastal Zone in the City of Malibu and does propose new development therein; therefore the Project is governed by the City's Certified Local Coastal Program and is required to obtain a Coastal Development Permit prior to Project commencement in addition to other requisite Project entitlements.

3.4 Water Use Guidelines

The Los Angeles County Department of Public Health has established guidelines [Los Angeles County, 2011] for harvesting of rainwater, stormwater, and urban runoff for outdoor non-potable uses such as irrigation. The guidelines have categorized rainwater harvesting systems into four classes, Tier I – IV, depending on the potential water sources, and provide requirements for minimum water quality standard and treatment processes.

- Tier I – On-site collection of rainwater in rain barrels for on-site use in gravity flow systems.
- Tier II - On-site collection of rainwater in cisterns for on-site use.
- Tier III - On-site or off-site collection of rainwater, stormwater, and urban runoff in cisterns for on-site or off-site use. (Excludes water collected from locations zoned for high use transportation corridors, industrial, agricultural or manufacturing uses).
- Tier IV - On-site or off-site collection of rainwater, stormwater, and urban runoff in cisterns for on-site or off-site use. (Includes water collected from locations zoned for high use transportation corridors, industrial, agricultural or manufacturing uses).

Any rainwater harvesting systems based on storage of runoff from Broad Beach Road in underground cisterns would most likely be regulated under Tier III, due to the presence of urban (dry-weather) runoff generated from irrigation of the hillside.

For Tier III systems, if captured runoff is to be used for spray irrigation, irrigation water must be disinfected by chlorination or an equivalent technology. For drip or sub-surface irrigation, Tier III systems require only pre-screening (sediment filtration) of irrigation water. Project biofilters are anticipated to satisfy pre-screening requirements.

4. GEOTECHNICAL AND GROUNDWATER INVESTIGATIONS

4.1 General

To support the development of the preliminary design, Geosyntec performed geotechnical and groundwater investigations for the Project area. The information presented below is a summary of the investigations and the conclusions and recommendations from the Geotechnical and Groundwater Studies Report [Geosyntec, 2012]. The report in its entirety is included on a CD in Appendix D.

4.2 Purpose and Objectives

The Geotechnical and Groundwater investigations focused on the evaluation of subgrade soils along the Project alignment for the purpose of providing design input. This included assessment of groundwater conditions and infiltration potential. Geosyntec's scope of work consisted primarily of the following tasks:

- Gathering available geotechnical and geologic information;
- Performing a geotechnical field investigation consisting of six hollow-stem auger borings and six Geoprobe soundings;
- Performing a constant head infiltration test in the vadose zone and in saturated zones at the locations of the six Geoprobe soundings;
- Constructing temporary piezometers and monitoring groundwater elevations at select Geoprobe locations;
- Conducting laboratory testing of selected soil samples obtained from the borings and analytical testing of groundwater samples; and
- Conducting geotechnical engineering analysis.

4.3 Summary of Existing Conditions

4.3.1 Surface and Subsurface Conditions

To the north, the site is bounded by a predominantly vegetated bluff slope that extends up to the relict marine terraced platform on which Pacific Coast Highway is located. However, localized portions of the adjacent slope are devoid of vegetation and expose the rilled granular material of the marine terrace bluff. Exploratory borings encountered

artificial fill, Quaternary Terrace deposits, and the Tertiary age Trancas Formation at depth.

Artificial fill deposits were encountered in five of the six explorations along Broad Beach Road. In general, the fill deposits consist of brown sands with varying amounts of gravel and clay. Within the limits of the explorations, artificial fills extended from the ground surface to maximum depths of four feet.

Quaternary-age terrace deposits were encountered within all of the 12 explorations performed for the investigation at the ground surface or underlying the artificial fill. The terrace deposits generally range in composition from brown to reddish brown, clayey to gravelly sand, to light brown to tan, silty sand. Within the older, upper terrace bluff (Qt), densities generally increase with depth from medium dense to very dense.

Along the terrace surface underlying Broad Beach Road, the densities generally ranged from medium dense to dense. A subset of these terrace deposits, identified as the “Beach Sands” or Qb is present at a number of the investigation locations along Broad Beach Road. This deposit identified separately from other terrace deposits due to its characteristic fine sand and relatively low fines content (20 percent).

At the location of Broad Beach Road, the beach sand is typically less than approximately 10 feet thick. Based on information from other investigations between Broad Beach Road and the ocean this thickness increases to 10-15 feet typically.

The Tertiary age Trancas Formation underlies the entire site at depth and was encountered in nine of the explorations –this formation generally consists of a hard, gray fat claystone. Along Broad Beach Road, the Trancas Formation was encountered beneath the terrace deposits at an elevation of +18 feet mean seal level (MSL) at the west end of the Project area and slopes down to an elevation of -5 feet MSL at the east end. It is anticipated that the erosional unconformity between the overlying terrace deposits and the Trancas Formation slopes up to the north beneath Pacific Coast Highway and slopes down towards the beach on the south.

Dozens of single family residences are present along the south side of Broad Beach Road along the Project alignment. Review of numerous foundation reports for these structures indicates that while some are founded on the Trancas formation using deep foundations other structures and appurtenances may be founded on the beach sands using shallow foundations.

4.3.2 Groundwater

The investigations performed by Geosyntec indicate that the groundwater gradient in the Beach Sands is typically from north to south (i.e., toward the ocean). It is expected that water that infiltrates at the surface along Broad Beach Road will flow within the Beach Sands toward the ocean along the sloping unconformity between the Trancas formation and Beach Sand. Additional flow infiltrated by this Project may raise groundwater elevations within the Beach Sand.

The measured static groundwater elevation varied along the alignment of Broad Beach Road from approximately 7.0 to approximately 20.5 ft above MSL. In general, the observed groundwater elevations are assumed to represent a dry-weather condition although “wet year” and “wet-weather” conditions are assumed to be within a few feet of these conditions as indicated by observations. The groundwater elevations recorded remained fairly constant over the monitoring period, suggesting that there is no significant tidal influence at these locations.

In conversations with Broad Beach residents, concerns were expressed regarding making changes that potentially increase infiltration and consequentially raise groundwater levels. Some homes have basements and at least one homeowner has observed water, presumably groundwater, leaking into the basement.

4.3.3 Onsite Wastewater Treatment Systems

Onsite wastewater treatment systems (OWTS), such as septic systems, for the residences along the south side of Broad Beach discharge to leach fields that are in some areas located in the backyards between the homes and the dunes, in the courtyard area between the garage and the house, or between the house and Broad Beach Road. Based on analysis of groundwater samples carried out for this Project, it appears that the locations sampled are generally unaffected by the operation of the OWTS's.

4.4 Findings

The California Department of Transportation (Caltrans) Stormwater Quality Handbook: Project Planning and Design Guide [Caltrans, 2007] and the Los Angeles County Department of Public Works Stormwater Best Management Practice Design and Maintenance Manual [LADPW, 2009] both present guidelines related to the siting of infiltration BMPs. The criterion for selection of an appropriate site for infiltration trenches contained in these documents were used as primary screening criteria for selection of appropriate locations for Project infiltration features.

Based on the results of the investigations and evaluations, from a geotechnical viewpoint, the proposed stormwater best management practices and streetscape improvements are feasible as long as direct infiltration is not included as a Project feature. While infiltration rates in some areas are within the acceptable ranges, the following design criteria restrict the use of infiltration:

- The shallow groundwater and a shallow confining layer will impose significant constraints on the geometry of infiltration facilities.
- Typically the invert of infiltration features would be approximately five feet below grade, which in areas of shallow groundwater would violate the criteria of a 10-foot separation from groundwater provided in Caltrans [2007] and CASQA [2003].
- Dozens of OWTS are potentially present within 50 feet of the proposed infiltration facilities. Operation of infiltration facilities within 100 feet of septic system or a leach field violates the Caltrans [2007] criteria.
- Structural foundations are present within 100 feet down gradient of the location of the proposed features. This violates the Caltrans [2007] criteria. Infiltration will produce an increase in groundwater elevations (however minor or temporary) in the beach sand unit where some unknown number of these foundations is located. Evaluations indicate that, for some areas, there is potential for liquefaction in the current groundwater configuration and an increased risk for liquefaction under mounded groundwater conditions. This is of particular concern for foundations within the beach sand. The impact on individual structures is difficult to assess given that they are so numerous and have such a variety of foundation systems and soil conditions.

The following proposed Project components are feasible from a geotechnical perspective:

- Biofiltration with underdrains and impermeable geo-membranes;
- Permeable pavements with no infiltration to subgrade; and
- Vegetated swales.

The following proposed Project components are not feasible from a geotechnical perspective:

- Biofiltration including infiltration; and
- Permeable pavements with infiltration to subgrade.

Limited equilibrium slope stability analyses indicate that existing slopes are stable under current conditions and are not a constraint on Project design in their current configuration.

With the stated limitations on infiltration and given the presence of only minimally liquefiable deposits along the alignment of the proposed BMPs, liquefaction of subgrade soils is not a constraint on the design of proposed drainage features and appurtenant structures.

4.5 Design and Construction Recommendations

The Geotechnical and Groundwater Studies Report includes geotechnical recommendations for proposed construction in the following areas:

- (1) Drainage features, including biofiltration features and permeable pavements;
- (2) Foundation design; and
- (3) Earthwork.

A copy of the Geotechnical and Groundwater Studies Report is included as Appendix D.

5. HYDROLOGY

5.1 General

This section presents an analysis of the existing Project area hydrologic conditions and is intended to:

- Describe the existing hydrologic conditions including drainage infrastructure, catchment boundaries, soils, climate, and flow pattern; and
- Present the hydrologic basis for proposed stormwater BMPs.

5.2 Existing Hydrologic Conditions

5.2.1 General

The watershed associated with the Project site is roughly bounded on the north by the top of the hillside along the south side of PCH and on the south by the center line of Broad Beach Road, and has a total area of 12.3 acres. The watershed encompasses approximately 4,500 feet of Broad Beach Road. The total impervious area is estimated to be 1.5 acres consisting mainly of the asphalt pavement on Broad Beach Road area and PCH; however, there are also patches of concrete and asphalt along the roadside parking strip. There are eight catchment areas and ten City catch basins within the Project area. Drainage maps showing the catchment boundaries, drainage infrastructure, flow patterns, and pervious and impervious areas are presented in Appendix E.

5.2.2 Drainage Infrastructure and Flow Patterns

Broad Beach Road has local depressions and is crowned so that runoff from the northern half of the roadway flows toward the hillside, and runoff from the southern half flows toward the homes where it is typically collected in trench drains at the top or bottom of each resident's driveway. Hillside runoff (in which gullies and surface erosion were observed) and roadway runoff comeingle on the mostly unpaved roadside parking strip to the north. The parking area is typically at its lowest elevation closest to the roadway. This directs the surface runoff along the road edge towards the catch basins.

The catch basins for Catchments 1 to 7 are located along the north side of Broad Beach Road are recessed into the hillside with a local depression in the area immediately in front of the inlet. Catchment 8 drains to a storm drain inlet, and although technically not a catch basin, it is referred to such in this report (see Appendix E).

As shown in Appendix E, within the vicinity of the low point of Catchment 5A there are three City catch basins; CB5A, CB5B, and CB5C. The outfalls from all three catch basins feed to the same storm drain. CB5A drains Catchment 5A. CB5B receives only flow from a non-City-owned storm drains that run down the hillside and no direct runoff from the Project area. CB5C drains only an area of a few hundred square feet of the southern half of Broad Beach Road.

The catch basin curb inlets typically have approximately 17 inch openings with varying widths. The distance from inlet invert to catch basin bottom varies from 2 to 4 feet.

Runoff from PCH and adjacent roadside areas flows toward slope drain inlets on both sides of PCH. With one exception, slope drains along the southern side of PCH drop directly into the catch basins along the northern side of Broad Beach Road. These flows are conveyed in Caltrans-owned buried pipes (slope drains) to the below-grade catch basins. As this is not part of the City MS4, it is not addressed by this Project. From the catch basins, water flows through storm drain pipes that cross under Broad Beach Road and tie into private storm drains at the residential property lines prior to discharge to the outfall points on the ocean side of the homes.

The exception to the description above is one slope drain in the western end of the Project area that drains 0.6 acres of PCH, including the road shoulder. This drain daylight at the bottom of the embankment slope; runoff from PCH comingles with surface runoff from Broad Beach Road prior to entering the catch basin.

Delineation of the eight catchment boundaries was carried out based on the following information:

- Topographic maps based on a survey performed for the Project;
- Topographic data (GIS) and aerial photos from Los Angeles County; and
- Field observations and measurements.

5.3 Stormwater Quality Design Volume

5.3.1 Technical Approach

The stormwater quality design volume per catchment was calculated using the methodology described in the Los Angeles County Department of Public Works' *Development Planning for Stormwater Management, A Manual for the Standard Urban Stormwater Mitigation Plan, Appendix A, Volume and Flow Rate Calculations*, issued

on September 2002. The design storm event is the 0.75 inch 24-hour storm event which complies with the sizing requirements in the Los Angeles County NPDES MS4 Permit for structural and treatment control BMPs for new development and redevelopment projects. This is consistent with the recommendations in the *City of Malibu Local Coastal Program Local Implementation Plan* and in the Special Protections of the proposed General Exception to the Ocean Plan. Although the Project is a storm water quality improvement project and does not formally qualify as new development or redevelopment, this design criterion was selected for the Project.

The catchments correspond to the tributary areas for the catch basins.

The runoff coefficient curve for the pervious surfaces within the tributary area was selected based on soil maps from Los Angeles County Department of Public Works Water Resources Division. The soils in the Malibu area are identified as soil ID No. 038 [Los Angeles County GIS Data Portal, 2011].

5.3.2 Stormwater Quality Design Volume Calculation

Stormwater Quality Design Volume (SWQDV) was calculated using the following equation:

$$SWQDV (ft^3) = (2,722.5 ft/acre) * [(A_I)(0.9) + (A_P + A_U)(C_U)]$$

Where:

A_C = Catchment Total Area (acres) = $A_I + A_P$

A_I = Impervious Area (acres)

A_P = Pervious Area (acres)

A_U = Contributing Undeveloped Upstream Area (acres)

C_U = Undeveloped Runoff Coefficient (-)

Values for A_I , and A_P were determined using the available topographic maps and aerial photos. A_I includes all paved area and A_P includes the remaining area. A_U was determined to be zero for all catchments. C_U was assigned the value of 0.1 based on the runoff coefficient curve for soil no. 038 [LADPW, 2006]. The calculated design volumes are presented in Table 5-1.

6. CONCEPTUAL DESIGN ALTERNATIVES

This section begins with a review of the Project objectives and a discussion of how those objectives are satisfied. Following this, each proposed stormwater BMP or improvement is presented. Finally, two stormwater alternatives are developed and described in detail.

6.1 Project Objectives and Stormwater Alternatives Development

As stated in Section 1, the goals for the Project are to:

1. Eliminate dry-weather flows to the storm drain;
2. Reduce wet weather flows to storm drain (as feasible);
3. Improve water quality of wet weather flows to storm drain (i.e., storm water treatment, pollutant reduction) to the maximum extent practicable (MEP);
4. Reduce potable water use for irrigation (as feasible);
5. Restore habitat above Broad Beach Road (as feasible);
6. Reduce slope erosion (as feasible); and
7. Preserve street and visitor parking.

In addition, feedback from the residents has indicated a preference that the constructed project should not create or perpetuate the existing condition of highly variable parking and landscape/hardscape elements. The Project should be consistent with the rustic natural environment that currently exists along portions of Broad Beach Road. Therefore, we have created an additional objective (new Objective 8) which is to ensure that proposed improvements are consistent with the neighborhood landscape theme of a rustic natural environment.

To address these objectives, Geosyntec developed two stormwater management alternatives. A discussion of each objective and how it is satisfied by the alternatives is provided below.

Objective 1: Eliminate dry-weather flows to the storm drain. It is assumed that the primary dry-weather flows that occur within the Project area are related to irrigation runoff. All the residences are located on the south side of Broad Beach Road and any residential runoff from irrigation, pavement cleaning, car washing, etc. is captured by

private drains owned by each residence. Many residents have installed separate private irrigation systems on the north side of the street, on city of Malibu property and within the Project area. To eliminate dry-weather flows, these irrigation systems will be removed and city-operated water-efficient irrigation will be installed in place of these private systems. High-water-use ornamental and exotic plants will be removed and replaced with drought-tolerant native species, reducing the need for frequent irrigation during the dry season.

Objective 2: Reduce wet-weather flows to storm drain (as feasible). This objective is focused on water storage, use, and/or infiltration as a means of reducing discharge to the storm drains. Alternative 2 includes a water use option to reduce wet-weather flow. The soil and groundwater investigation specifically recommended no infiltration for this project, primarily due to the proximity to OWTS, low depth to groundwater, and concern for water intrusion in basements; therefore, infiltration is not considered an option for wet-weather flow reduction.

Objective 3: Improve water quality of wet-weather flows to storm drain (i.e., storm water treatment, pollutant reduction) to the MEP. This objective is met by several proposed Project elements. First, the roadway parking strip is proposed to be paved using concrete interlocking pavers. The construction of these pavers will not enhance stormwater infiltration (see Objective 2 above) but will reduce tracking of sediment from the currently soil/gravel parking strip to the proposed paved parking strip. Second, the parking strip area between the road and the toe of the embankment would be regraded to direct stormwater sheet flow away from the road and to vegetated swales located at the toe of the embankment. Vegetated swales will provide stormwater quality improvement. Third, garden walls (slough walls) and retaining walls are planned for various areas along the toe of the embankment, reducing erosion from the hillside and improving stormwater quality. Fourth, biofilters are proposed to treat wet-weather flows prior to discharge to the existing catch basins. Fifth, for Alternative 2, stormwater capture, storage, and use for irrigation are proposed. This provides a viable use option for a portion of the Project stormwater, if site conditions warrant use for irrigation. If site conditions do not support irrigation, the water will be discharged to and treated by the proposed biofilters, improving stormwater quality prior to discharge.

Objective 4: Reduce potable water use for irrigation (as feasible). This objective is satisfied by the removal of the numerous privately-owned irrigation systems on city property and installing a city-managed low water use irrigation system. The removal of non-native exotic plant species and replacement with native drought tolerant species also reduces potable water use for irrigation. Finally, for Alternative 2, captured

stormwater is proposed to be used to replace potable water, for a portion of the Project area irrigation needs.

Objective 5: Restore habitat above Broad Beach Road (as feasible). The Project budget will support removal of invasive and non-native exotic species for portions of the Project area and planting of native species in areas disturbed by construction. These plantings will provide partial habitat restoration of the areas above Broad Beach Road, reducing water usage and reducing hillside erosion.

Objective 6: Reduce slope erosion (as feasible). As stated under Objective 5 above, the partial habitat restoration included in the Project will reduce slope erosion. The proposed garden walls and retaining walls will further reduce slope erosion.

Objective 7: Preserve street and visitor parking. Currently, the only visitor parking available for beach-goers or residential visitors is along the north side of Broad Beach Road. The proposed storm water improvements (i.e., swales and biofilters) have been set back from the road such that the parallel parking opportunities along the full stretch of Broad Beach Road are unchanged.

Objective 8: Proposed Project improvements should preserve and enhance the rustic landscape/hardscape theme for the neighborhood. This objective is met by the proposed landscape and hardscape elements. The landscape architect has developed a rural neighborhood theme which is carried through all the proposed stormwater improvements including pavers, garden and retaining walls, vegetated swales, biofilters, and plantings.

6.2 BMPs and Stormwater Improvements

6.2.1 General

This section provides descriptions of the proposed stormwater BMPs and stormwater improvements and identifies how they would function to meet the Project objectives. An overview of proposed BMPs and improvements to be included in each alternative is presented in Table 6-1.

6.2.2 Biofiltration

Biofiltration systems will be used as the primary treatment control BMP for treatment of stormwater and dry-weather runoff from the Project area. Biofiltration systems, sometimes referred to as bioretention systems, are landscaped shallow depressions that capture and filter stormwater and dry-weather runoff. These facilities function as soil-

and plant-based filtration devices that remove pollutants through a variety of physical, biological, and chemical treatment processes. Biofilters typically consist of a surface ponding area, mulch layer, planting soils, and plantings. As water flows across the plantings and passes down through the organic-rich planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. These systems provide a fairly high level of treatment. Because infiltration is unacceptable for this Project, biofilters will be designed with a lower impermeable membrane and a perforated underdrain to collect the treated water. The underdrain will connect to a collector pipe which will convey the treated water to a nearby catch basin. The outlet of the collector pipe in the catch basin will be located to facilitate sampling of biofilter effluent. Alternatively, an access point will be installed along the collector pipe to allow for effluent sampling. Typical cross-sections and details for the biofilters proposed for Broad Beach are shown in Figure 6-1.

Where sediment, trash and debris is expected in site runoff and a vegetated swale is not provided for water pretreatment, a pretreatment forebay will be included upstream of the biofilters. A forebay will reduce the rate of clogging of the biofilter and facilitate maintenance.

For this Project, the biofilters will not be designed to retain and infiltrate water - most water will flow through the filters and be discharged. However, low flows (i.e., dry-weather flows) may be partially or fully retained in the filter media. These relatively small water volumes are expected to be ultimately reduced by evapotranspiration.

The Project biofilters are designed to capture and treat the design capture volume during a storm event. A description of the biofilter sizing methodology for this Project is included in Appendix F. The calculated values for the required biofilter media surface area (A_{media}) for the two alternatives described later in this section are presented in Table 6-1.

6.2.3 Vegetated Swales

At present, stormwater flows off the embankment and towards a low elevation flow line between the street and the parking strip. The area between the edge of road pavement and the toe of the embankment will be graded to cause stormwater to flow off the road and off the parking strip to the embankment toe. A vegetated swale will be installed along the embankment toe, parallel to the road and will convey stormwater to storage or biofilter treatment facilities. Vegetated swales are an effective stormwater pretreatment BMP to filter out trash, debris, and coarse sediments - they also provide aesthetic enhancement for the area. The installation of vegetated swales will reduce pollutant loading and clogging on the downstream biofilters, extending the biofilter media life.

Vegetated swales are sloped and are not designed to pond water. Therefore, infiltration of water through vegetated swales is insignificant and it should not be necessary to install impermeable liners under the swales.

6.2.4 Water Collection, Storage, and Use or Treatment

Stormwater runoff can be collected in below-ground enclosed storage facilities (cisterns) and used for landscape irrigation, as required. Runoff would be conveyed in swales and gravity drain into systems of vaults, tanks, or pipes to store the water until needed. When needed, the water can be pumped from the underground storage and conveyed in pressurized pipes for use in drip irrigation. Drip irrigation is selected as the most viable use option. This site would be classified as a Tier III system under Los Angeles County requirements for rainwater and stormwater harvesting systems. Drip irrigation requires only sediment filtration prior to water use. Spray irrigation requires water disinfection, which adds an unattractive level of complexity to this stormwater use application.

If stored water cannot be used for landscape irrigation due to lack of irrigation water demand, the water would be pumped and discharged to biofilters after the storm peak had passed and the surface stormwater had been filtered and discharged. In this way, the biofilters can be used to filter stored water during times when the filters are otherwise not in use.

Local residents have expressed concern regarding underground storage of stormwater and the potential for leakage and infiltration of this water, possibly exacerbating a high groundwater condition in the neighborhood. Should stormwater storage be implemented, various technologies such as impermeable lining systems could be employed to provide additional assurance against leakage of stored water.

6.2.5 Concrete Pavers

The majority of the parking strip that runs parallel to Broad Beach Road is unpaved – the existing surface varies, including sand, soil, decomposed granite, and various types of gravel. This parking strip is commonly used for parking by residential visitors, workers, and beachgoers. Surface erosion of the unpaved parking surfaces can reduce stormwater quality. Sediment tracking from parking areas to the roadway mobilizes sediment and can reduce stormwater quality. This condition is exacerbated by muddy and wet conditions during storm events. The installation of pavers from the edge of road to form an approximately 10 foot wide parking strip is proposed. Pavers would provide a uniform surface for parking and greatly reduce erosion and sediment tracking. Paver selection and design will be made to reduce stormwater infiltration to the extent

possible. In any event, the minor infiltration through paver system is expected to be significantly less than the existing condition where stormwater infiltrates through unpaved ground.

6.2.6 Retaining and Garden Walls

Retaining walls (structural walls) and garden walls (non-structural slough walls) are proposed for various locations along the hillside. The walls fulfill three purposes. First, installation of walls in designated locations will allow for the embankment to be cut back, opening up needed areas for biofilter installation. Second, the walls reduce soil erosion and sloughing from the hillside, which is a key contributor to sediment in stormwater. Third, the installation of walls creates a uniform hardscape theme across the neighborhood. Existing retaining walls are not engineered, are often ineffective for erosion reduction, and are constructed of a myriad of materials including cobbles, broken concrete, masonry brick, and cast-in-place concrete.

6.2.7 Irrigation System Removal/Replacement

A key element to reducing or eliminating dry-weather flows is the removal of privately-owned irrigation systems on the north side of the road. Although this property is owned by the city, homeowners have installed private irrigation systems plumbed back to their water services and have created private gardens and landscapes on city property. The private irrigation of gardens creates uncontrolled and unmanageable dry-weather flows which have been observed during recent site visits. Private systems would be removed and replaced with water-efficient low-volume irrigation controlled by city-controlled, automated evapotranspiration controllers. Water would be provided by the city and water use would be managed by the city. We recognize the communication efforts that will be required to implement the removal of these private irrigation systems. An estimate of annual water use for Broad Beach Road irrigation is provided in Appendix G.

6.2.8 Habitat Restoration

As mentioned above, many Broad Beach Road residents have created gardens across from their residences on city property. These gardens include many non-native invasive or ornamental plants and shrubs, most which require frequent irrigation. To reduce irrigation requirements and reduce the erosion potential, high water-demand ornamental plants and shrubs within 20 feet of the toe of embankment slope would be removed and replaced with more drought-tolerant, native species plants and shrubs. This will allow the city to manage irrigation (and reduce or eliminate dry-weather flows) and reduce potable water use on the hillside. Areas disturbed by construction will be revegetated

with appropriate species. Other ornamental or exotic species will be removed, depending on proximity to the roadway and the plant-specific water consumption requirements. The creation of a more uniform native species plant/shrub environment furthers the objective of creating a more uniform landscape theme for the neighborhood. Again, we recognize the communication efforts that will be required to implement the removal of nonnative species that were planted by residents.

6.3 Stormwater Alternative 1

Stormwater Alternative 1 is comprised of a combination of BMPs and improvements including stormwater conveyance and treatment BMPs, retaining and garden walls, parking strip pavers, irrigation, and landscape improvements. Alternative 1 is differentiated from Alternative 2 in that Alternative 1 contains no stormwater storage or use options – in Alternative 1, all stormwater up to the design storm event is captured, treated, and discharged. A flow diagram illustrating the stormwater management principles for Alternative 1 is presented in Figure 6-2. In the subsections below, the specific application of these BMPs and improvements are addressed, as are issues related to parking, utilities, and operation and maintenance. The general layout and features of Alternative 1 are shown on Figures 6-4 through 6-14.

6.3.1 Stormwater Management Improvements

For Catchments 2 to 7 runoff will be collected from the road, parking strip and embankment and transported in vegetated swales that drain to biofilters located upstream of the catch basins. The swales will provide pretreatment while primary treatment will occur in the biofilters.

The swales will run along the toe of the hillside slope intercepting hillside runoff. The parking area will be regraded such that both the road and the parking area drain toward the swales. The swales will serve to channelize flow to the biofilters and will widen at the biofilters entrance to create sheet flow into the biofilter.

Biofilters will be located between the toe of the slope and the paved parking area. In some cases cuts will be made into the hillside to create more available filter area. Filtered water will be collected in underdrains that connect to collector pipes, discharging to the existing catch basins, or to the storm drains if more feasible. When the ponding capacity of the biofilters is exceeded, overflow will occur over a weir located at the end of the biofilter closest to the catch basin and then surface flow to the catch basin inlet. The top of weir elevation will be the same as the water surface elevation corresponding to the biofilter design ponding depth.

Locating adequately sized biofilters in Catchment 1 and the eastern part (east of CB8) of Catchment 8 was not deemed feasible due to lack of area and other logistical constraints such as utilities, parking, and steep slopes. For these two catchments, runoff is diverted to other areas where adequate area for treatment is available.

Runoff from Catchment 1 is diverted via gravity flow from catch basin CB1 to a biofilter in Catchment 2. The diversion structure will be designed to divert low flows while during high runoff events (in excess of design storm) water will overflow to catch basin CB1.

Runoff from Catchment 8 will be captured in a new wet sump adjacent to storm drain inlet CB8 and pumped to a biofilter in the western end of Catchment 8. The wet sump will be designed to receive and pump flows up to the design storm – events in excess of the design storm will overflow to CB8. A submersible pump can be used for this application. Noise levels outside of the sump are expected to be imperceptible to residents.

In general, the biofilters are sized for the design capture volume generated in their immediate tributary area. However, the biofilters in Catchment 2 and 8 are sized for both direct catchment runoff as well as the diverted runoff from other areas.

The proposed stormwater system improvements do not significantly alter the existing drainage patterns. Hillside and roadway runoff patterns are generally unchanged; however, regrading of the Broad Beach Road parking strip will concentrate flow along the toe of the slope instead of along the road pavement edge. Biofilters and swales are sited in order to maintain flood paths to existing catch basins.

6.3.2 Landscape, Hardscape, and Irrigation

Alternative 1 includes construction of garden and retaining walls and parking strip pavers, removal/modification of some of the existing garden and retaining walls, removal of all private irrigation systems and replacement with city-controlled, water-efficient irrigation systems, and replacement of exotic, ornamental, and invasive plant species. This alternative also includes replanting in areas disturbed by construction. The general plan indicating the Project areas where hardscape, irrigation, and planting improvements will be made is shown on Figures 6-4 through 6-14.

Selective plant material will be removed from the Project area to help create consistent landscape theme, reduce irrigation water use, and facilitate Coastal Bluff Scrub Habitat Restoration. The specific criteria applied to each area to determine which existing ornamental, exotic, or invasive plant species should be replaced are as follows:

- Invasive plant species will be removed from the first 20 feet of the Project slopes and parkway to the extent practical;
- Vegetation will be removed from existing utility setbacks;
- Vegetation will be removed from Project improvement areas including biofilter areas, vegetated swales, retaining walls, garden walls, parking areas, and concrete swales and gutters;
- Vegetation will be removed in locations where conflicts occur with the proposed slope irrigation improvements and proper system operations;
- Native vegetation that constitutes a high fire risk per Los Angeles County Fire Department Fuel Modification Plan will be removed;
- Trees with invasive roots will be removed that are located within 10 feet of proposed Project retaining walls, garden walls, and biofiltration areas; and
- Selective ornamental vegetation that is high water use will be removed.

The proposed irrigation system for the Project will be a low water use system featuring a smart weather based controller combined with low volume drip, bubbler and overhead rotary stream spray heads. The smart controller will allow for daily automatic adjustments to the watering schedule based on real time weather data. Flow sensing devices allow for system shut-down and delays in response to rain events and system failures. Low volume point to point irrigation using drip and bubbler systems provide for maximum water use efficiency. Rotary stream heads provide additional water savings with 30% increased efficiency over traditional spray heads. The estimated total water usage (ETWU) for the Project is approximately 740,000 gallons per year. This represents about 50% of the maximum applied water allowance (MAWA) for the proposed design.

Feedback from a conversation with one of the Broad Beach homeowners indicates that some of the existing irrigation systems may have been installed to serve as fire protection. This has not been confirmed but the need for fire protection will be evaluated during the design phase and more information will be solicited from the Broad Beach homeowners. The final design will comply with existing code and fuel modification requirements including the following:

- All proposed landscape and irrigation improvements will be implemented per the Los Angeles County Fire Department (LACFD) Fuel Modification Plan

Guidelines [LACFD, 2011] to create the desired defensible space around all combustible structures in a fire environment.

- All proposed landscape improvement plant species are subject to LACFD approval and will be inherently fire resistant and spaced appropriately.
- Existing native vegetation and ornamental plantings within the project fuel modification zones will be modified by thinning and removal of species constituting a high fire risk (refer to the LACFD Undesirable Plant List).
- Routine fuel modification maintenance will be regularly performed in all zones. Maintenance includes irrigation, pruning, thinning and annual removal of weeds, dead materials and other undesirable flammable vegetation required to keep the area in a fire safe condition. (Refer to the LACFD Fuel Modification Plan Maintenance and Long Term Maintenance sections)

The proposed planting for the Project will consist of native and drought tolerant grass species for the biofilter areas and vegetated swales. This vegetation provides water quality improvements for Project runoff and creates a distinct theme for the Project parkway. The slope planting will consist of a combination of drought-tolerant shrubs to enhance the existing plant material to create a more consistent landscape theme combined with Coastal Bluff Scrub species to facilitate native slope habitat restoration.

The proposed hardscape improvements for the project will include an interlocking concrete paver parking area, concrete veneer retaining walls and dry stacked boulder garden/slough walls. These elements will be installed throughout the project construction limits creating a consistent rural neighborhood theme and materials palette for the project. Miscellaneous existing garden/slough walls will be removed and either omitted or replaced with project theme walls as needed to construct the proposed biofiltration areas and vegetated swales. Existing retaining walls that are required due to existing grade and are structurally sound will remain and be enhanced with the project theme veneer so that all walls are consistent.

A plant palette exhibit and a materials exhibit for pavers and wall veneers are included in Appendix H. The exhibits present several different options.

6.3.3 Parking Considerations

The proposed improvements will allow for parallel parking along the entire stretch of roadway within the Project boundaries, similar to the current-day parking locations.

The installation of pavers will improve parking conditions in several areas where the surface is uneven due to ditches and erosion.

6.3.4 Utility Considerations

Existing utilities have been identified both by review of historical maps and by marking on Broad Beach Road by the utility owners. The preliminary design of BMPs and improvements has been developed in consideration of all known utilities and no significant utility conflicts are known. Prior to construction of the Project, the city of Malibu's contractor will be required to mark and locate all utilities within the Project area and to field verify locations of utilities that could be threatened by the work.

Los Angeles County owns a sewer line that runs along Broad Beach Road, between the road edge and the embankment. A sewage pumping station is located in Catchment 1. In some areas, this sewer line will be located under the proposed location of parking strip pavers. The depth of this utility will need to be verified to ensure it is protected during grading and subgrade improvement work.

The Gas Company owns a gas line that also runs parallel to the road between the sewer line and the road. Similar to the sewer line, this gas line will be under the parking strip where pavers are proposed. The depth of this utility will also need to be field verified to ensure it is protected during construction.

There are electrical transformers owned by Southern California Edison located along the north side of Broad Beach Road within the Project area. Electrical laterals traverse the parking area. We have not identified any significant conflicts between the electrical lines and the proposed construction. Locations and depths can be verified prior to construction. Vegetation will need to be removed around the existing transformers.

Charter Communications owns communications lines that primarily run along the south side of the road, outside of the Project area. We have identified several communications lines that cross the road to roadside amplifier boxes. These crossings are within the Project area but do not pose a conflict for the proposed work.

The Los Angeles County Waterworks owns a water main that is located near the road centerline and provides water to residents and to two hydrants located along the north side of the road within the Project area. These water supply lines are marked and do not pose a conflict for the proposed work. During design, coordination with the local fire department will be required to identify parking restrictions in front of fire hydrants. Currently, there are no posted parking restrictions in this area; however, we expect that

the fire department may impose parking prohibitions in certain areas to ensure emergency hydrant access.

No telephone utilities were identified in the Project area.

6.3.5 Performance

The proposed configuration of treatment control BMPs and improvements will be designed to treat 100% of the runoff generated within the Project tributary area for storm events equal to or less than the design storm. Using vegetated swales and biofilters, pollutant removal treatment effectiveness is predicted to be medium to high. It is our expectation that, barring an unforeseen water line break, all dry-weather runoff will be treated by the biofilter system. Dry-weather runoff should be substantially reduced or even eliminated by the removal of private irrigation systems and the installation of new water efficient irrigation with smart controllers. Other than irrigation runoff, there are no other known sources of dry-weather runoff within the Project area.

Retaining walls, garden walls, and parking strip pavers will all reduce erosion and sediment transport in runoff. Pavers will also reduce sediment tracking from the parking strip to the roadway. New plantings of native species will also reduce erosion.

Potable water use will be reduced by elimination of the numerous private irrigation systems and installation of new water-efficient irrigation and smart irrigation controllers.

6.3.6 Operation and Maintenance

The following is a description of anticipated operation and maintenance requirements for the proposed BMPs and improvements.

Vegetated swales will require periodic removal of accumulated trash and debris. Removal of accumulated sediment and revegetation may also be required. Weed removal, trimming, and pruning are also necessary. Vegetated swales will require some minimal irrigation during dry months.

Biofilters will require periodic removal of accumulated trash and debris. If sediment removal is required, replacement of mulch and vegetation may also be necessary. Occasional pruning of shrubs and cleanup of leaves and organic waste may be required. Periodic replacement or addition of planting material and mulch will be needed to sustain the biofilter's treatment effectiveness. Minimal biofilter irrigation will be

needed, especially during dry months. Irrigation needs will significantly diminish after plants become established.

Irrigation system maintenance will include periodic inspections of system performance and verification that dry weather flows are eliminated. Damaged sprinkler piping, sprinkler heads, and drip emitters will require replacement. Verification of proper operation of irrigation controllers will be required. The total water usage for the first year is estimated at 740,000 gallons. The yearly cost for this water usage is roughly \$5,500 based on current water rates (see water usage and cost calculations in Appendix G). Water usage, and consequentially water costs, can be reduced after plants are established.

Areas that have been revegetated due to replacement of inappropriate species or in areas disturbed by construction will require inspection and landscape maintenance to ensure that plants are properly established and the plant health is sustained.

The wet sump in Catchment 8 and the pumping system will require periodic inspection and verification of proper operation. Pump maintenance will be minimal. Electricity to run this pump represents a trivial expense.

6.4 Stormwater Alternative 2

Stormwater Alternative 2 has many common elements to Alternative 1. The primary difference between the alternatives is that Alternative 2 includes collection and storage of runoff in underground cisterns. The collected water from the two proposed cisterns can be pumped for irrigation use or pumped to biofilters for treatment after the storm peak has passed. This storage and off-peak treatment permits more efficient use of the biofilters and results in a smaller Project biofilters footprint. In the subsections below, the proposed BMPs and improvements are presented. A flow diagram illustrating the stormwater management principles for Alternative 2 is presented in Figure 6-3. The general layout and features of Alternative 2 are shown on Figures 6-4 through 6-14.

6.4.1 Stormwater Management Improvements

As previously stated, stormwater management BMPs and improvements for Alternative 2 are similar to Alternative 1. However, Alternative 2 collects surface runoff from Catchment 1, part of Catchment 2, and Catchment 8 and stores this water in two underground stormwater cisterns. The cisterns are proposed to be constructed of a system of buried pipe that functions like a storage tank and is specifically manufactured for underground water storage. One cistern is located within Catchment 8 – all the runoff from Catchment 8 drains to swales, flows to a drain inlet, and is conveyed to the

cistern. The total storage for the Catchment 8 cistern is 520 cubic feet. When storage capacity is exceeded, runoff will overflow to the existing storm drain inlet. Refer to Figure 6-5 for the proposed location of the storage system.

Stormwater in Catchment 1 and the western portion of Catchment 2 is captured in swales and gutters and flows to two drain inlets that are routed to a cistern located in Catchment 2, for storage. The total storage for this cistern is 2,080 cubic feet. Refer to Figures 6-11 and 6-12 for the proposed location of the storage system. When storage capacity is exceeded, runoff will overflow to the existing storm drain outfall from catch basins CB1 and CB2.

Residents have expressed concern that underground water storage facilities could leak, causing groundwater mounding and potentially exacerbating a high water table condition under their homes. If the manufactured cistern system is not determined to be sufficiently reliable for water storage, a system of synthetic liners can be considered to provide additional assurance that the water storage systems do not leak and infiltrate water to the subsurface.

Each of the two cisterns will be constructed with a wet sump to evacuate the stored water. Stored water can either be directed to biofilters located in Catchments 2 and 7 or water can be used for landscape irrigation. Each wet sump would be fitted with two pumps, one for landscape (a higher pressure, higher flow application) and one for water transfer to the biofilters (a lower pressure, lower flow application). Submersible pump noise is expected to be imperceptible to residents. Pumps would be controlled by a smart stormwater controller that assesses the volume of water in the cisterns, evaluates current climatic conditions and the forecast for future storms, assesses the need for irrigation based on evapotranspiration data, and controls each pump appropriately.

For portions of Catchment 2 and Catchments 3-7, the BMPs and improvements proposed are the same as Alternative 1. Refer to Figures 6-4 through 6-14 for details.

The Project benefits of stormwater storage are that there is approximately 2,600 cubic feet (approximately 19,500 gallons) of stored water available for irrigation. If irrigation is not needed, which is often the case in the winter, the water can be stored and discharged to the biofilters after the storm peak as passed, allowing the biofilters to be used more efficiently and resulting in a reduced area footprint for the biofilters. The reduced biofilter area for Alternative 2 is nearly 1,900 square feet (refer to Table 6-1) less than Alternative 1. The layout of Alternative 2 increases vegetated swale length by approximately 300 linear feet.

6.4.2 Landscape, Hardscape, and Irrigation

Landscape elements are similar between Alternatives 1 and 2. Hardscape elements are similar between the Alternatives with the exception that Alternative 2 has a smaller Catchment 2 retaining wall, due to the smaller biofilter area required. Alternative 2 has the same irrigation plan as Alternative 1 supplemented by an additional parallel drip irrigation system to support the use of stored stormwater. To avoid cross connection concerns, it is necessary to have completely independent irrigation systems supplied by potable water and supplied by stormwater.

6.4.3 Parking Considerations

There is no difference between Alternative 1 and Alternative 2 with regard to parking on Broad Beach Road.

6.4.4 Utility Considerations

The utility considerations unique to Alternative 2 are related to the underground storage of stormwater. Stormwater from Catchment 1 and a portion of Catchment 2 will be stored in a large diameter buried pipe located in Catchment 2. The pipe will require an excavation of up to approximately eight feet in depth. We have considered the need for shoring during this installation. The pipe location should not conflict with any existing utilities. For Catchment 8, the underground storage pipe installation will require an excavation to a depth of approximately six feet. This will likely require shoring, careful location of the adjacent sewer line, and ultimately replacement of the toe-of-slope swale.

6.4.5 Performance

Stored stormwater that is used for irrigation represents a net reduction in discharge to the ocean. That is consistent with the Project objectives. Furthermore, the stored water used for irrigation replaces potable water. The proposed storage systems have a capacity to store roughly one-third of the total design capture volume for the Project area. The performance of vegetated swales, biofilters, and landscape and hardscape elements is similar to Alternative 1.

6.4.6 Operation and Maintenance

The operation and maintenance items for Alternative 2 are similar to Alternative 1 with a few minor exceptions. The parallel drip irrigation system for stormwater irrigation use would require periodic maintenance. The submersible pumps found in the cisterns

would require periodic inspection and occasional maintenance. The cost of electricity for pumping is considered trivial.

The total water usage for the first year is estimated at 715,000 gallons: 625,000 gallons for slope vegetation and 90,000 gallons for biofilter and swale vegetation.

Potable water use would be reduced for Alternative 2, due to use of stored water for irrigation. The cisterns will store approximately 2,600 cubic feet with equates to approximately 19,500 gallons. Water from the cisterns will be used to irrigate the biofilters and the vegetated swales. Although difficult to predict how much stormwater will substitute for potable water, we believe it is reasonable to expect that stormwater use for irrigation may replace between 5 and 10 percent of potable water use.

The yearly average cost for water usage is estimated to vary between \$4,400 and \$5,200 based on current water rates (see water usage and cost calculations in Appendix G). Assuming that 50% of the irrigation demand for the biofilters and vegetated swales is supplied by cistern water, the yearly average cost is estimated to be \$4,800, roughly \$700/yr less than Alternative 1. The amount of irrigation water for biofilters and vegetated swales supplied by cistern water can potentially reach 100%; however, this is unlikely since the demand will be greatest during dry periods when supply is low. These costs represent water usage for the first year. Water usage, and consequentially water costs, can be reduced after plants are established.

7. CONSTRUCTION COST ESTIMATE

Cost estimates were developed for the two proposed design alternatives for this 10 percent design level. The estimates represent solely contractor costs and do not include oversight, independent testing, construction management, or documentation. A 20 percent contingency was applied to each estimate. For this conceptual design, the costs were not escalated to spring of 2013, the predicted construction start date.

The following is a list of the various cost resources used in the development of the cost estimates:

- The Geosyntec team's experience on similar projects;
- Cost data for two recent, similar projects constructed in Malibu;
- Vendor quotes; and
- RS Means cost guide.

Through an iterative process the scope of construction was modified (reduced) in order to generally meet the Grant construction budget which is \$1,675,836. Estimated construction costs correspond only to the improvements in the Project area that fall within the limits of construction on Figures 6-6 and 6-11, unless otherwise noted on the figures.

The estimate of construction costs for the two alternatives are:

Alternative 1 - \$1,625,000

Alternative 2 - \$1,688,000

A summary table of the primary cost items is presented in Table 7-1. Detailed cost estimates are presented in Appendix I.

8. DISCUSSION AND RECOMMENDATION

Alternatives 1 and 2 both generally satisfy the Project objectives. Each alternative eliminates or at least substantially reduces dry-weather flows. Both alternatives reduce erosion and sediment tracking through hardscape and landscape improvements. Both alternatives provide stormwater treatment and associated improvements in water quality for water discharged to Broad Beach. Both alternatives provide habitat restoration and reductions in potable water use related to planting of drought tolerant species. Both alternatives include consistent hardscape and landscape themes and carry these themes throughout the Project area.

The stormwater management elements that are different between the two alternatives are:

1. Reduction of potable water for irrigation; and
2. Volume of water discharged to Broad Beach.

Alternative 2 is a partial capture and treat alternative. Alternative 2 provides storage for approximately one-third of the design capture volume of runoff and either uses that water for irrigation or treats the stored water after the storm has passed, allowing for more efficient use of biofilters. This capture and use strategy reduces potable water needed for irrigation and reduces the volume of treated water discharged to Broad Beach. The capture and use strategy is progressive and demonstrates leadership and innovation by the city of Malibu.

The challenges related to Alternative 2 are that water storage and use adds additional cost, as compared to Alternative 1. The need for pumping systems increases the Project complexity and maintenance costs are also slightly higher (primarily related to maintaining a separate irrigation system). Finally, there may be a perception by the local residents that there is a risk of stormwater leakage from the cisterns, potentially causing undesirable infiltration.

Geosyntec believes both Alternatives are viable and attractive stormwater management approaches for Broad Beach Road. However, Geosyntec believes that Alternative 2 goes further to meet the goals of the grant by promoting a greater reduction of wet weather flow to the storm drain and by reducing potable water use for irrigation; Geosyntec therefore recommends Alternative 2.

9. LIMITATIONS

This Preliminary Design Report was developed in accordance with the scope of work, purpose, terms, and conditions described in the Terms of Reference, described in Section 1.

The conclusions contained in this investigation are based on the conditions as observed by Geosyntec personnel and as reported by relevant agencies and other named sources at the time the investigation was performed.

No warranty, expressed or implied, is made regarding the professional opinions expressed in this report or concerning the completeness of the data presented to us. If actual conditions are found to differ from those described in the report, or if new information regarding the site is obtained, Geosyntec should be notified and additional recommendations, if required, will be provided.

Geosyntec is not liable for any use of the information contained in this report by persons other than the City of Malibu as intended for the subject Project.

10. REFERENCES

California Coastal Commission [2002] City of Malibu Local Coastal Program Local Implementation Plan, California Coastal Commission.

Caltrans [2007], "Stormwater Quality Handbook: Project Planning and Design Guide", California Department of Transportation.

CASQA [2003] Stormwater Best Management Practice Handbook: New Development and Redevelopment, California Stormwater Quality Association.

Geosyntec [2012] Geotechnical and Groundwater Studies Report, Geosyntec Consultants.

Grossman, Marshall and Marlene, Broad Beach Road homeowners [2012], meeting February 15 2012, City of Los Angeles.

LACFD [2011] Fuel Modification Plan Guidelines, Los Angeles County Fire Department.

LADPH [2011] Guidelines for Harvesting Rainwater, Stormwater, & Urban Runoff for Outdoor Non-potable Uses, Los Angeles County Department of Public Health.

LADPW [2002] Development Planning for Stormwater Management, A Manual for the Standard Urban Stormwater Mitigation Plan, Los Angeles County Department of Public Works.

LADPW [2006] Hydrology Manual, Los Angeles County Department of Public Works.

LADPW [2009] Stormwater Best Management Practice Design and Maintenance Manual for Publically Maintained Storm Drain Systems, Los Angeles County Department of Public Works.

Los Angeles County GIS Data Portal [2011], Shape (SHP) file, County of Los Angeles.

LA RWQCB [2012] Staff Working Proposal for Provisions Regarding Minimum Control Measures, Los Angeles Regional Water Quality Control Board.

Stormwater Best Management Practice Design and Maintenance Manual for Publically Maintained Storm Drain Systems, Los Angeles County Department of Public Works.

SWRCB [2009], California Ocean Plan, State Water Resources Control Board.

SWRCB [2012], Draft. State Water Resources Control Board Resolution No. 2012-.
Approving Exceptions to the California Ocean Plan for Selected Discharges
into Areas of Special Biological Significance, Including Special Protections for
Beneficial Uses, and Certifying a Program Environmental Impact Report, State
Water Resources Control Board.

SWRCB [2011], Proposition 84 Areas of Special Biological Significance (ASBS)
Grant Program Grant Agreement between the State Water Resources Control
Board, and City of Malibu, Broad Beach Road Biofiltration, Agreement no. 10-
411-550, State Water Resources Control Board.

TABLES

Table 5-1. Areas and Stormwater Quality Design Volume per Catchment

Catchment No.	Catchment Section	A _C (ac)	A _I (ac)	A _P (ac)	A _U (ac)	C _U (-)	SWQDv (ft ³)
1		2.34	0.53	1.81	0	0.1	1788
2	west	0.57	0.05	0.53	0	0.1	254
	east	1.61	0.15	1.46	0	0.1	766
3		0.75	0.09	0.66	0	0.1	395
4		1.48	0.11	1.37	0	0.1	644
5A	west	0.85	0.10	0.75	0	0.1	457
	east	1.70	0.13	1.57	0	0.1	734
6		1.08	0.11	0.96	0	0.1	534
7	west	0.76	0.09	0.67	0	0.1	406
	east	0.31	0.03	0.28	0	0.1	145
8		0.82	0.13	0.69	0	0.1	514
Total		12.27	1.51	10.75			6637

Table 6-1. Proposed BMPs and Improvements for each Alternative per Catchment

Catchment No.	Biofilters	Vegetated Swales (incl. grading)	Water Storage and Use or Treatment	Concrete Pavers	Retaining and Garden Walls	Irrigation System Removal/Replacement	Habitat Restoration
1			Alt. 2	Both Alt.	Both Alt. ¹	Both Alt.	Both Alt.
2	Both Alt.	Both Alt.	Alt. 2	Both Alt.	Both Alt.	Both Alt.	Both Alt.
3	Both Alt.	Both Alt.		Both Alt.	Both Alt.	Both Alt.	Both Alt.
4	Both Alt.	Both Alt.		Both Alt.	Both Alt.	Both Alt.	Both Alt.
5A	Both Alt.	Both Alt.		Both Alt.	Both Alt.	Both Alt.	Both Alt.
6	Both Alt.	Both Alt.		Both Alt.	Both Alt.	Both Alt.	Both Alt.
7	Both Alt.	Both Alt.		Both Alt.	Both Alt.	Both Alt.	Both Alt.
8	Alt. 1	Alt. 2	Alt. 2	Both Alt.	Both Alt.	Both Alt.	Both Alt.

¹ Walls are not proposed for Catchment 1. However, a concrete swale along the slope will function as a slough wall.

Table 6-2. Design Biofilter Volume (Bv) and Biofilter Media Surface Area (A_{media}) for Alternatives 1 and 2

Catchment No.	Catchment Section	Alternative 1		Alternative 2	
		Bv (ft ³)	A_{media} (ft ²)	Bv (ft ³)	A_{media} (ft ²)
1					
2	west	3063	1541		
	east	1149	541	1149	541
3		593	326	593	326
4		966	448	966	448
5A	west	685	334	685	334
	east	1101	560	1101	560
6		801	365	801	365
7	west	608	268	608	268
	east	218	107	218	107
8	west	771	350		
Total		9956	4840	6122	2949

Table 7-1. Summary of Construction Cost Estimates for Alternatives 1 and 2

Total Construction Costs	Alt. 1	Alt. 2	Notes
Biofilters	\$159,000	\$96,000	
Vegetated Swale	\$31,000	\$34,000	
Planting of Slope	\$38,000	\$38,000	
Irrigation	\$150,000	\$156,000	
Walls (new and existing)	\$169,000	\$116,000	
Concrete Interlocking Pavers	\$528,000	\$527,000	
Diversion and Storage Structures - Catchment 2	\$3,000	\$124,000	Alt. 1 does not include storage
Diversion and Storage Structures - Catchment 8	\$43,000	\$77,000	Alt. 1 does not include storage
Maintenance of planting and irrigation	\$8,000	\$8,000	3 month maintenance period
Demolition of hardscape/landscape	\$34,000	\$34,000	
<i>SUBTOTAL 1</i>	<i>\$1,163,000</i>	<i>\$1,210,000</i>	
Mobilization & Demobilization	\$116,000	\$121,000	10% of Subtotal 1
Bonds	\$35,000	\$36,000	3% of Subtotal 1
Traffic Control	\$20,000	\$20,000	
SWPPP	\$20,000	\$20,000	
<i>SUBTOTAL 2</i>	<i>\$1,354,000</i>	<i>\$1,407,000</i>	
Contingency	\$271,000	\$281,000	20% of Subtotal 2
Total Construction Cost	\$1,625,000	\$1,688,000	

FIGURES

Figure 2-1. Vicinity map of Project area

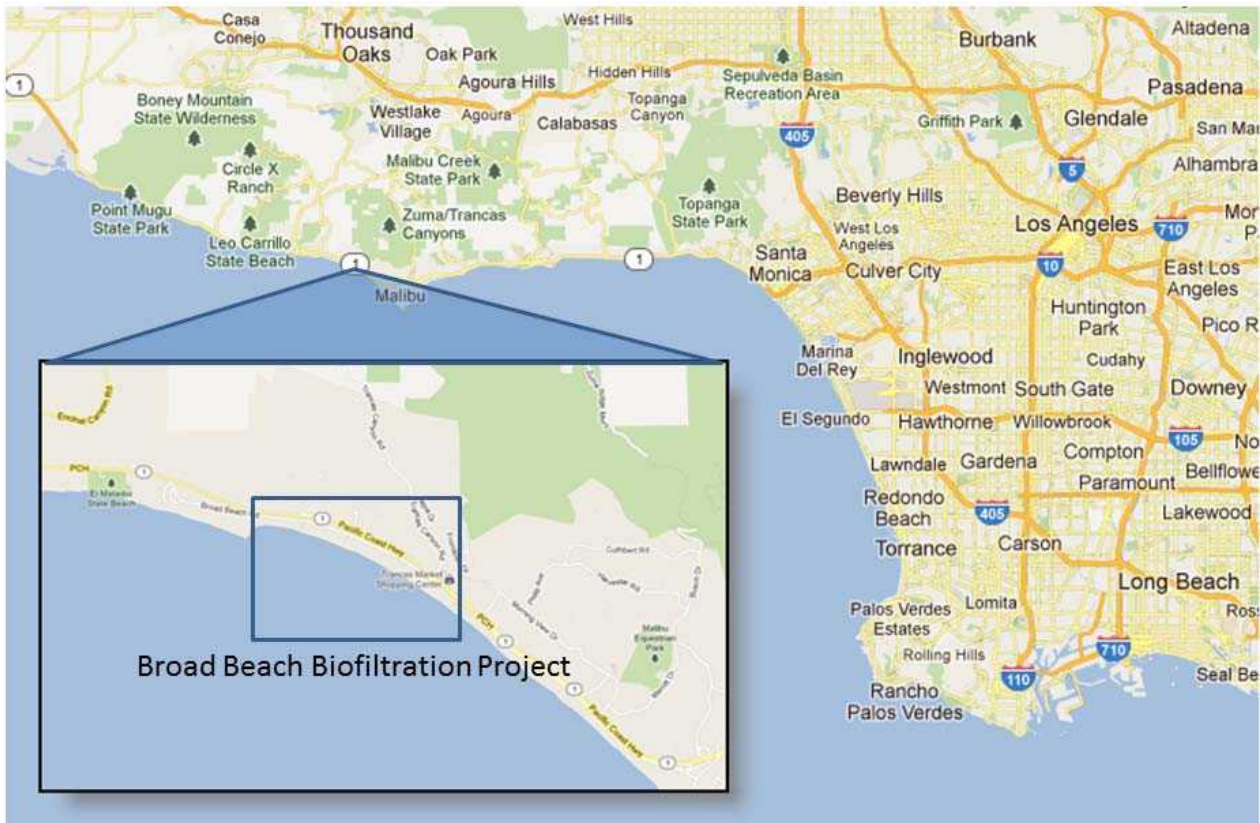


Figure 2-2. Location map of Project area



Figure 2-3. Private irrigation system contributing to dry-weather runoff



Figure 2-4. Private irrigation piping in storm drain



Figure 2-5. Unpaved parking strip with potted plants



Figure 2-6. Cast in place concrete retaining wall with parking apron



Figure 2-7. Privately constructed waste concrete hardscape



Figure 2-8. Brick retaining wall



Figure 2-9. Treated wood retaining wall



Figure 6-1. Typical biofilter cross-sections and details

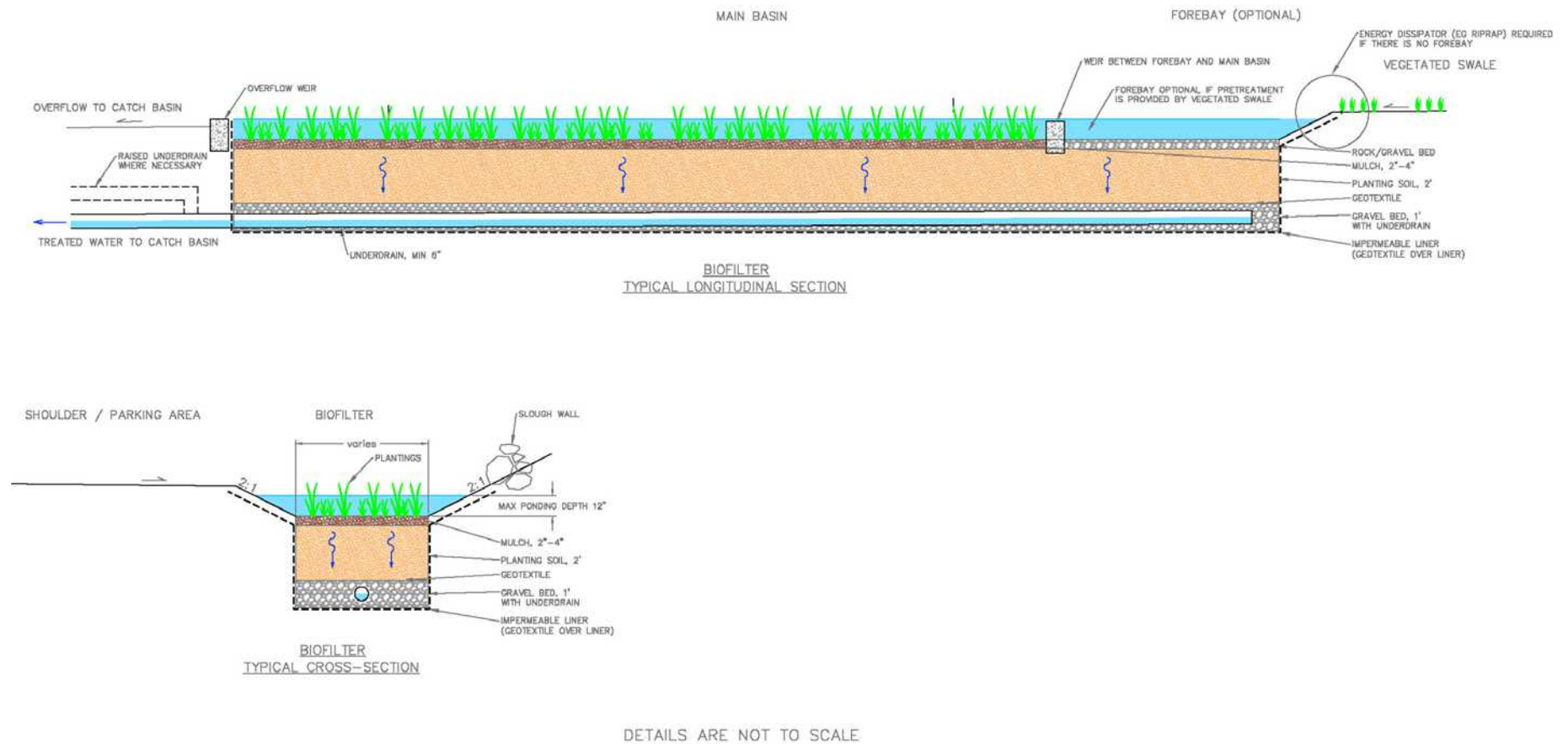


Figure 6-2. Flow diagram for Alternative 1

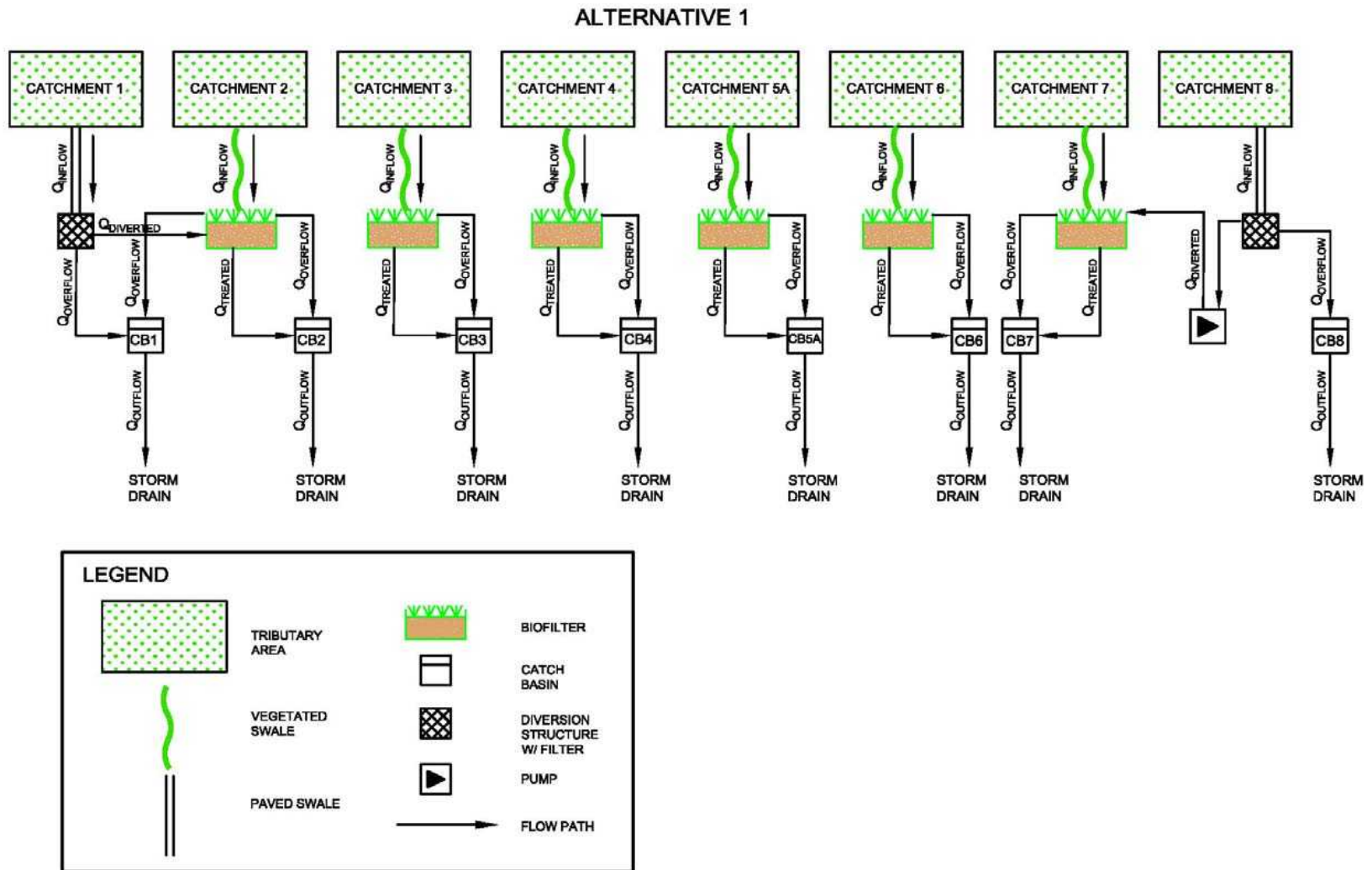
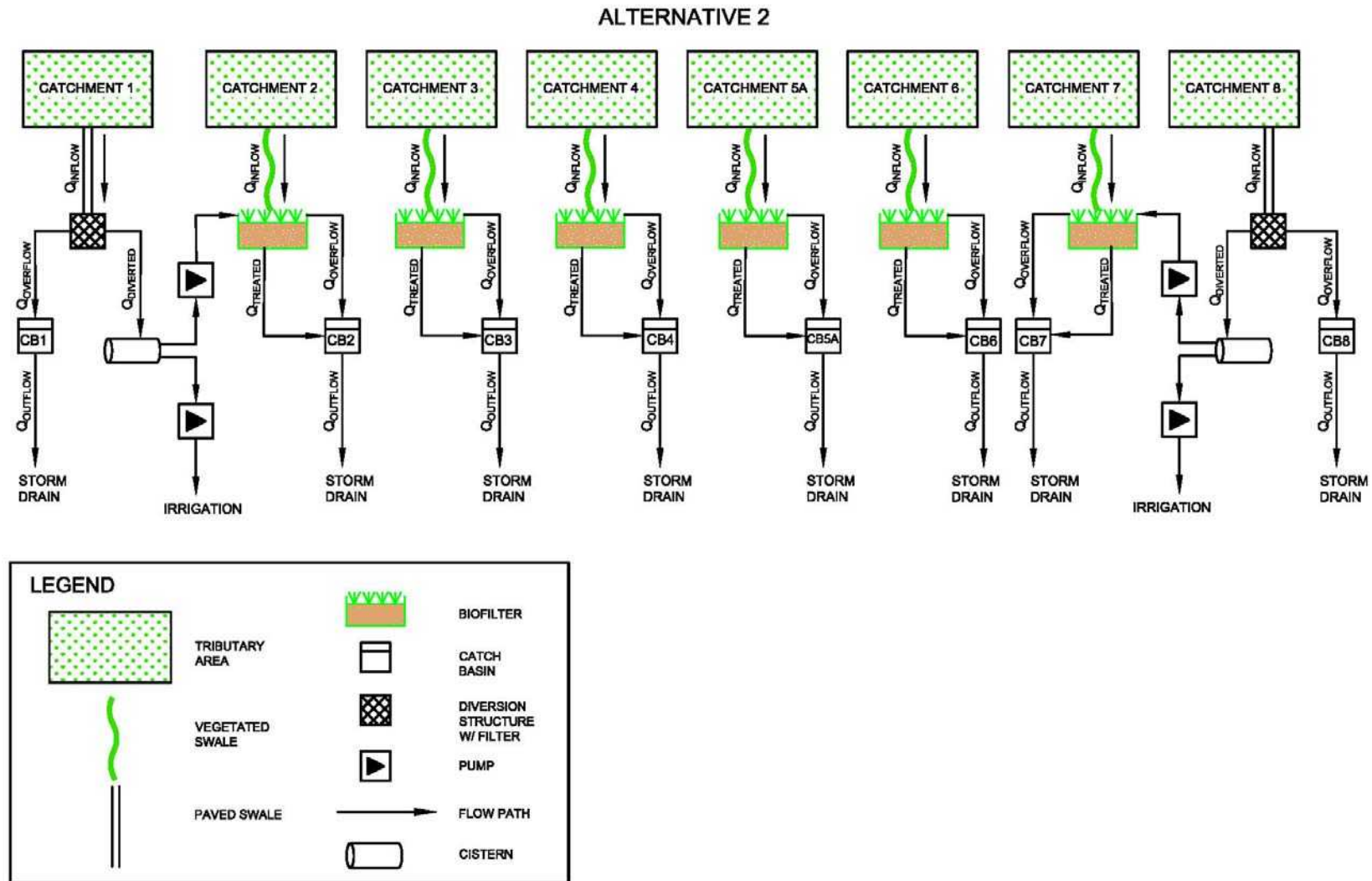
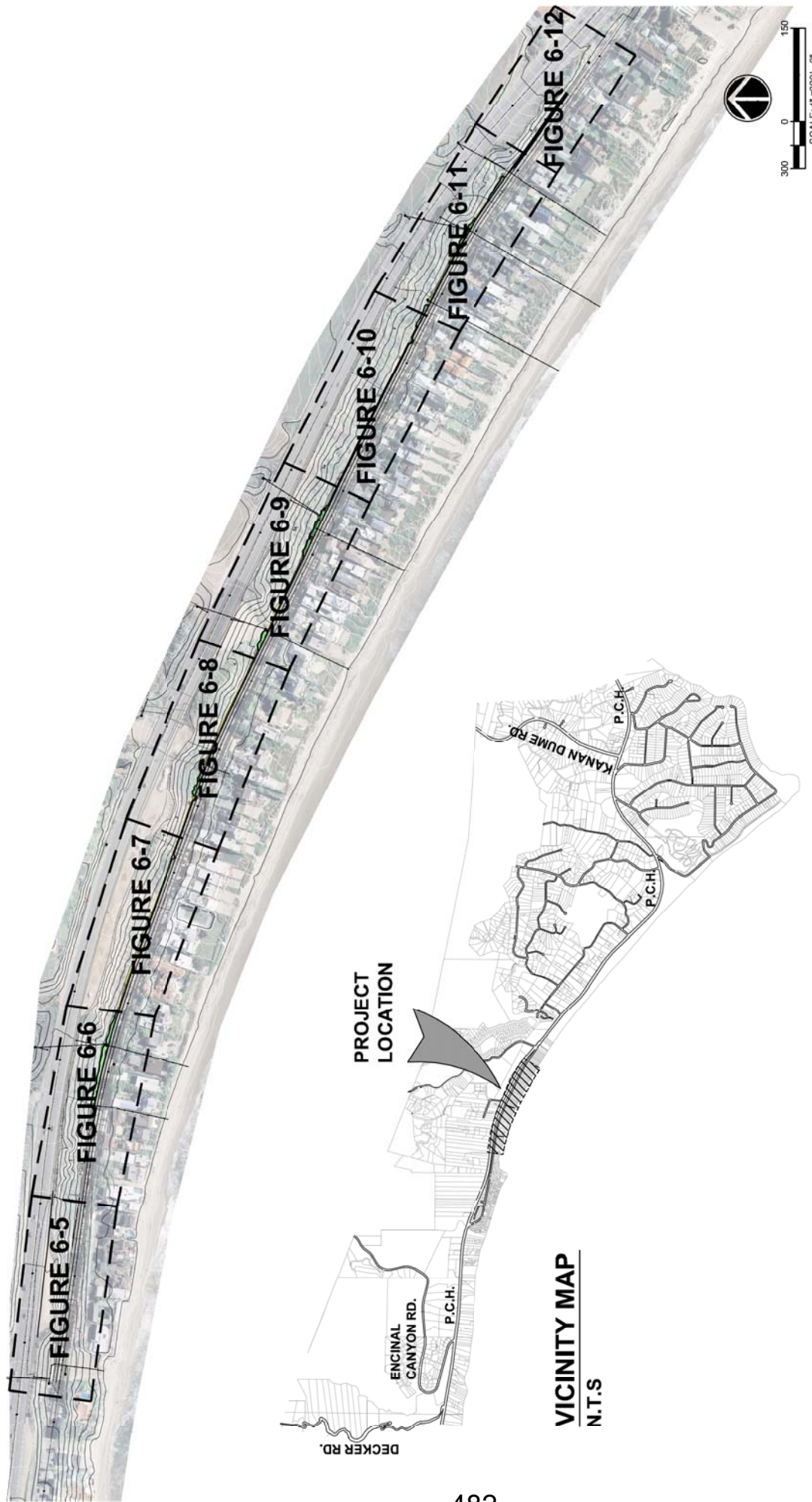


Figure 6-3. Flow diagram for Alternative 2




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Preliminary Landscape & Biofilter Plan

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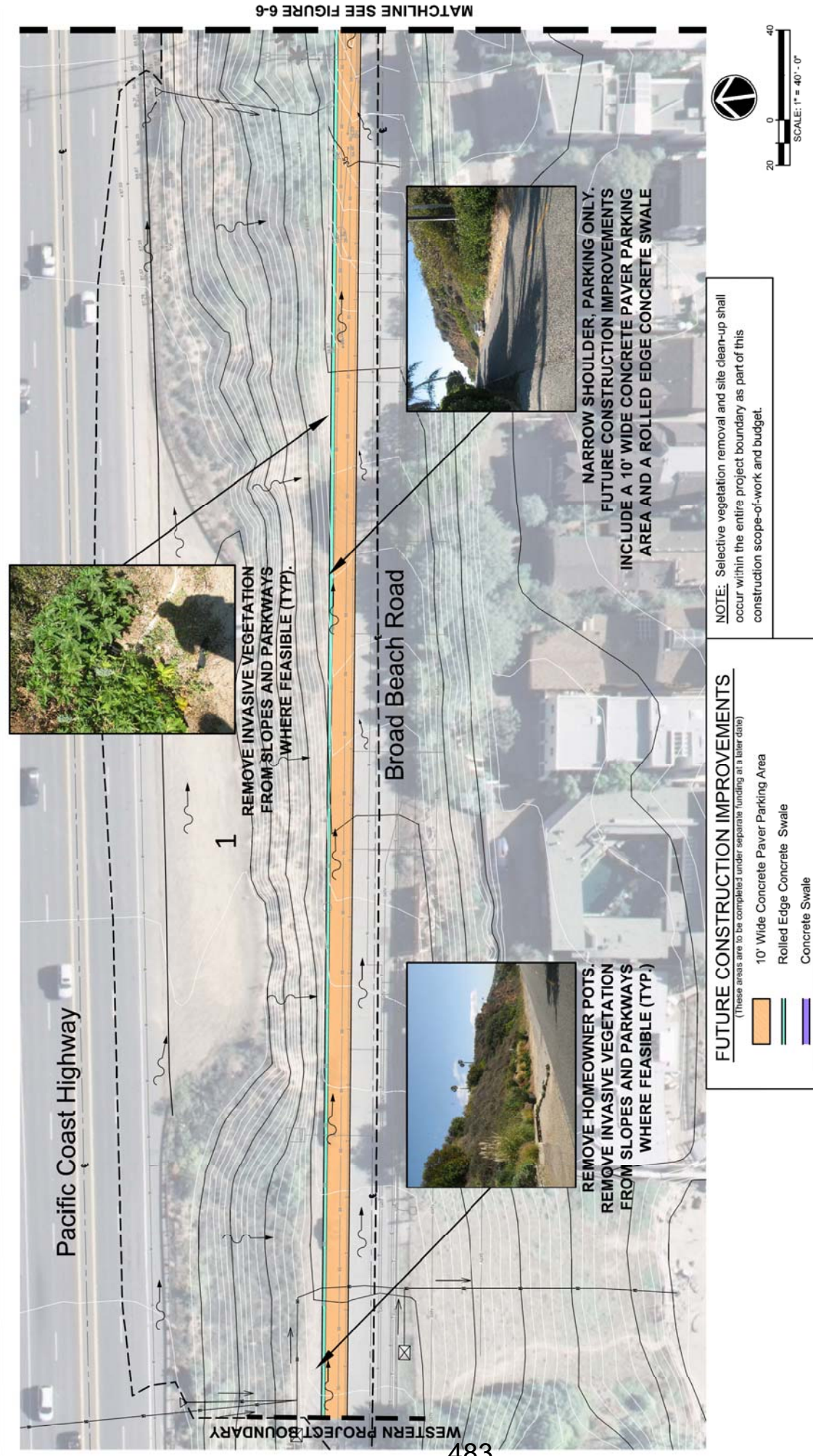
Figure 6-4

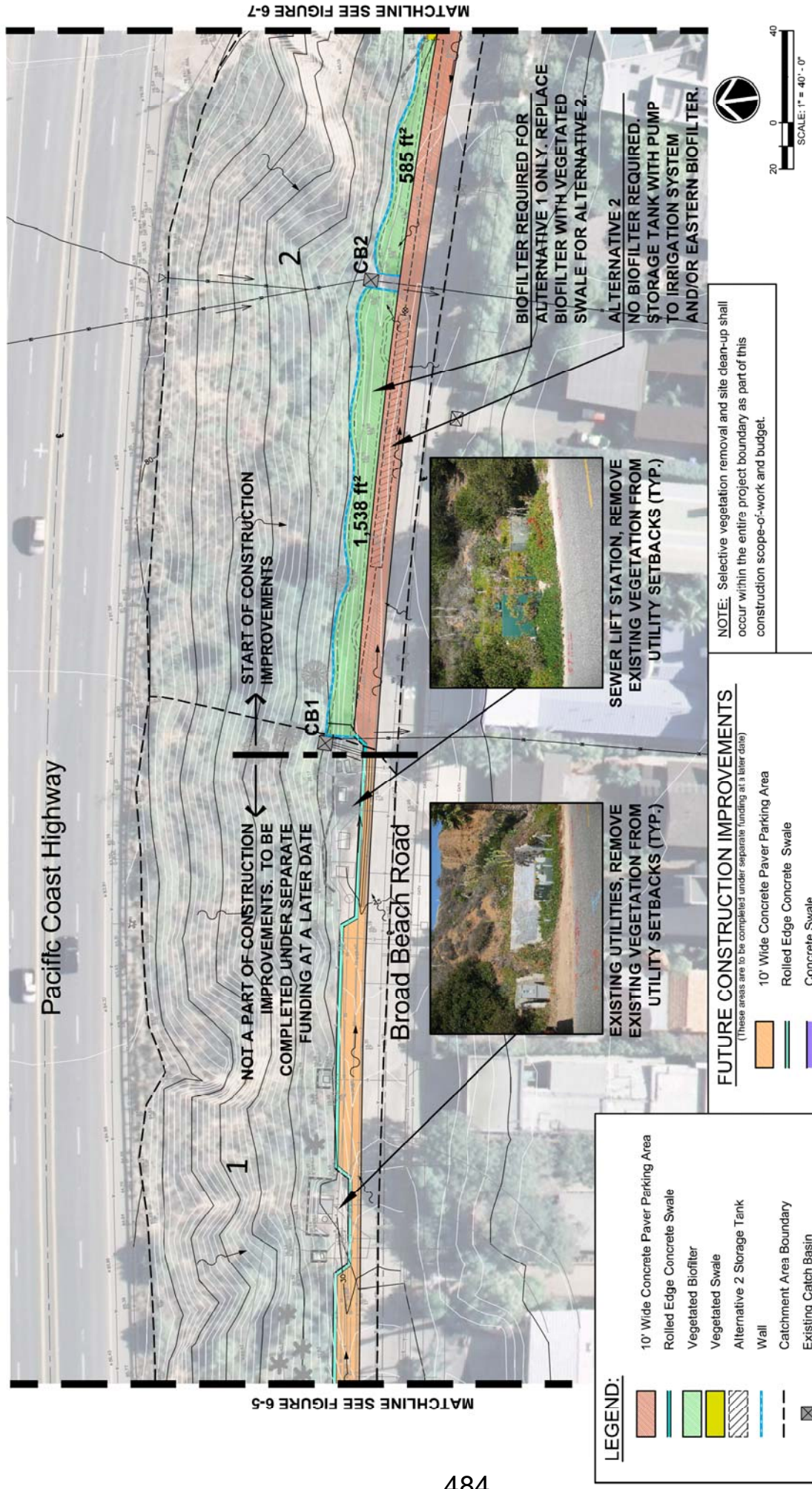
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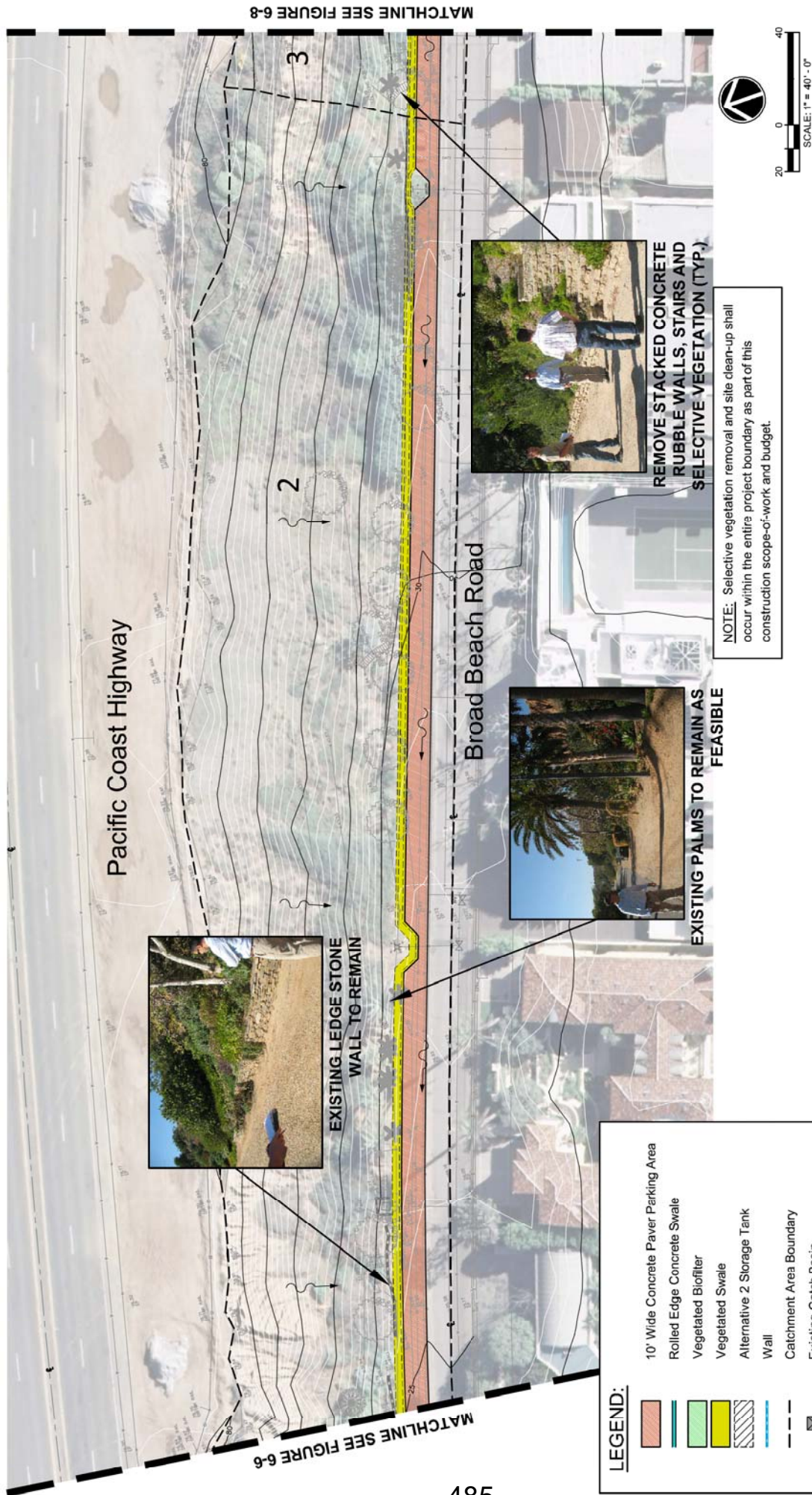


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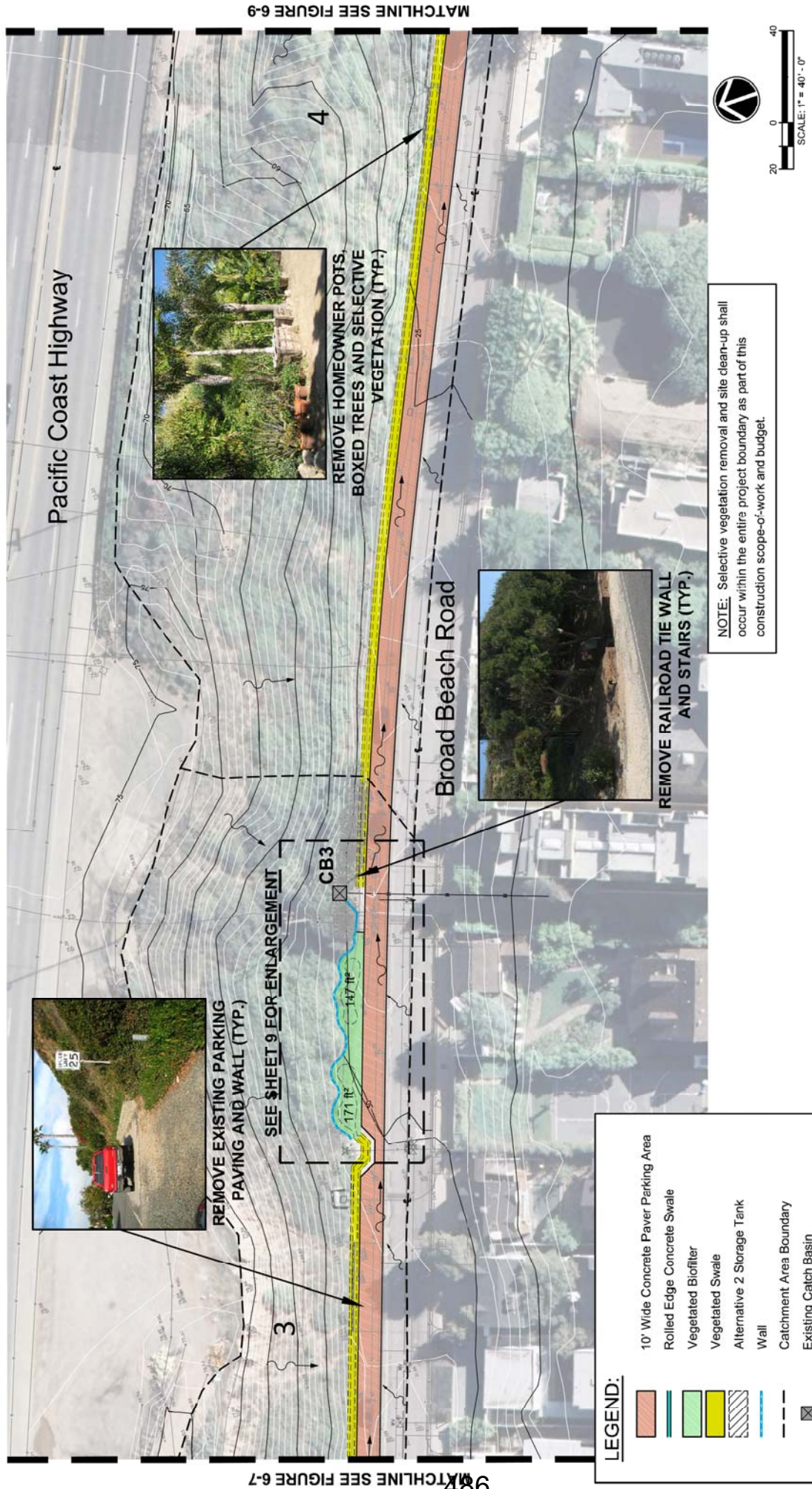
Figure 6-7

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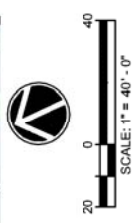
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LEGEND:

- 10' Wide Concrete Paver Parking Area
- Rolled Edge Concrete Swale
- Vegetated Biofilter
- Vegetated Swale
- Alternative 2 Storage Tank
- Wall
- Catchment Area Boundary
- Existing Catch Basin



Broad Beach Road Biofiltration Project

Preliminary Landscape & Biofilter Plan

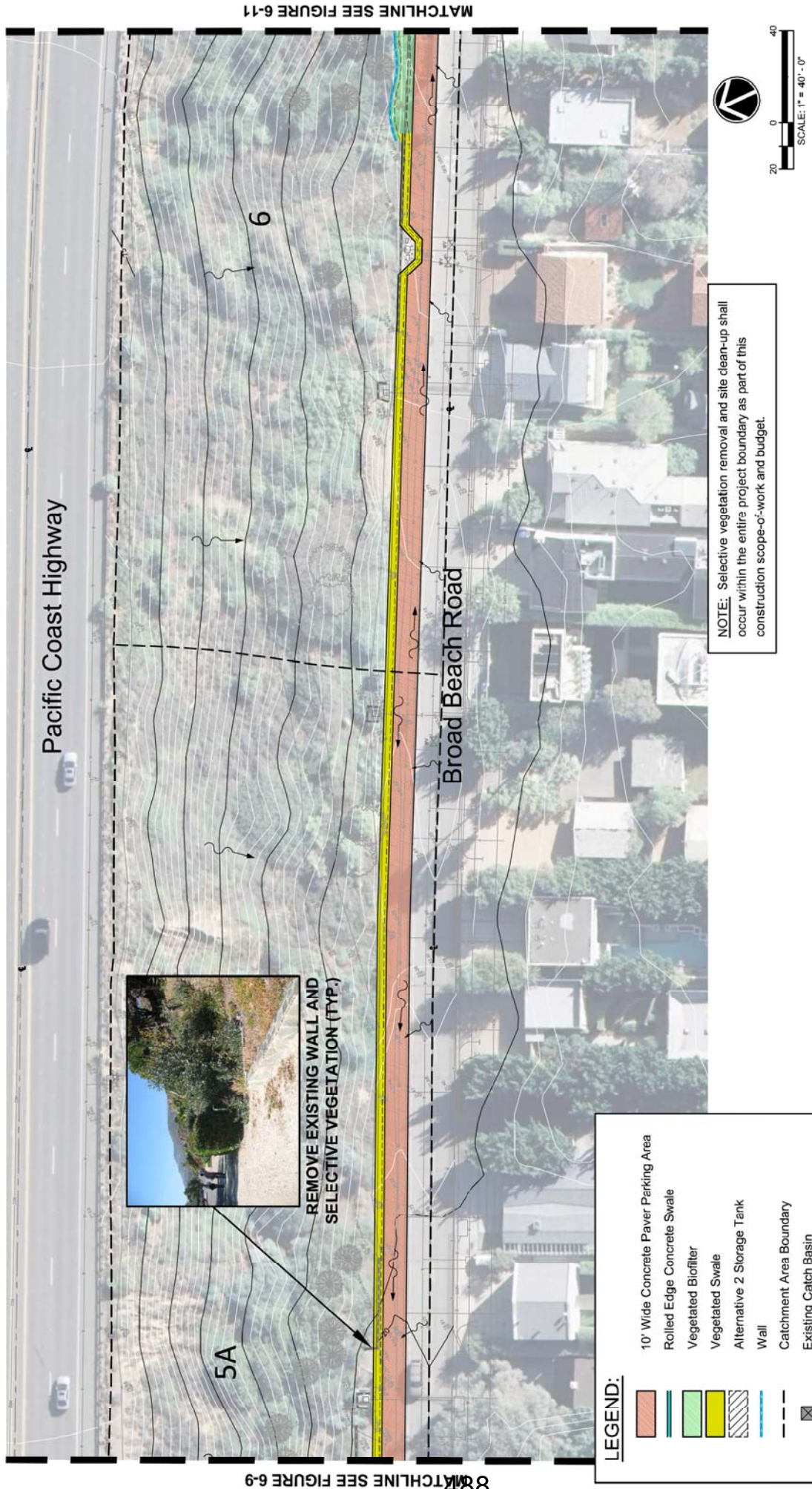
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Figure 6-9

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NOTE: Selective vegetation removal and site clean-up shall occur within the entire project boundary as part of this construction scope-of-work and budget.

LEGEND:

- 10' Wide Concrete Paver Parking Area
- Rolled Edge Concrete Swale
- Vegetated Biofilter
- Vegetated Swale
- Alternative 2 Storage Tank
- Wall
- Catchment Area Boundary
- Existing Catch Basin



REMOVE EXISTING WALL AND SELECTIVE VEGETATION (TYP.)

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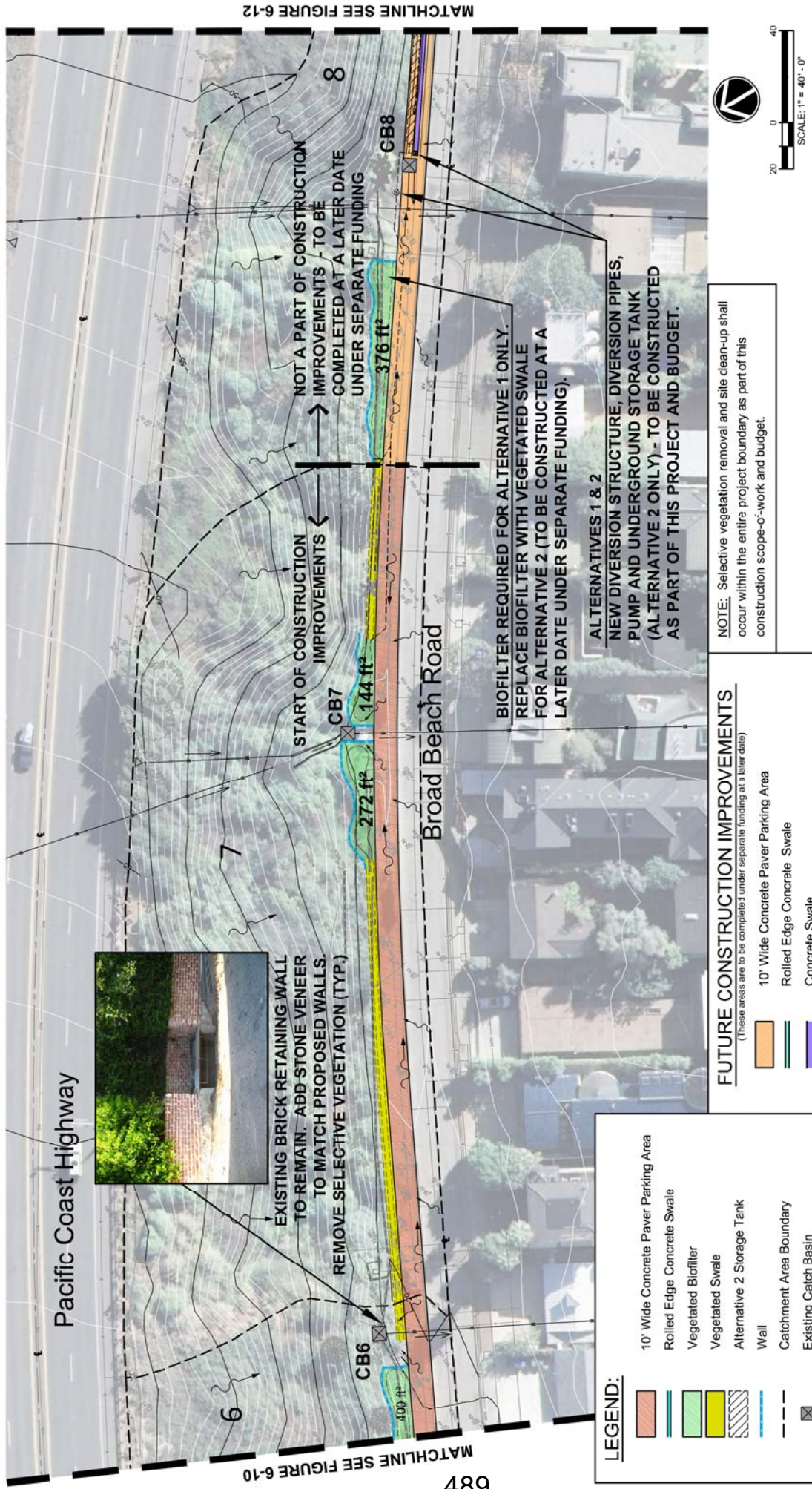
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Figure 6-10

88 MATCHLINE SEE FIGURE 6-9

MATCHLINE SEE FIGURE 6-11



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Project:

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Figure 6-11

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Scale:

1" = 40' - 0"

Scale:

1" = 40' - 0"



Broad Beach Road Biofiltration Project

Preliminary Landscape & Biofilter Plan

Preliminary Design - Not for Construction

Figure 6-12

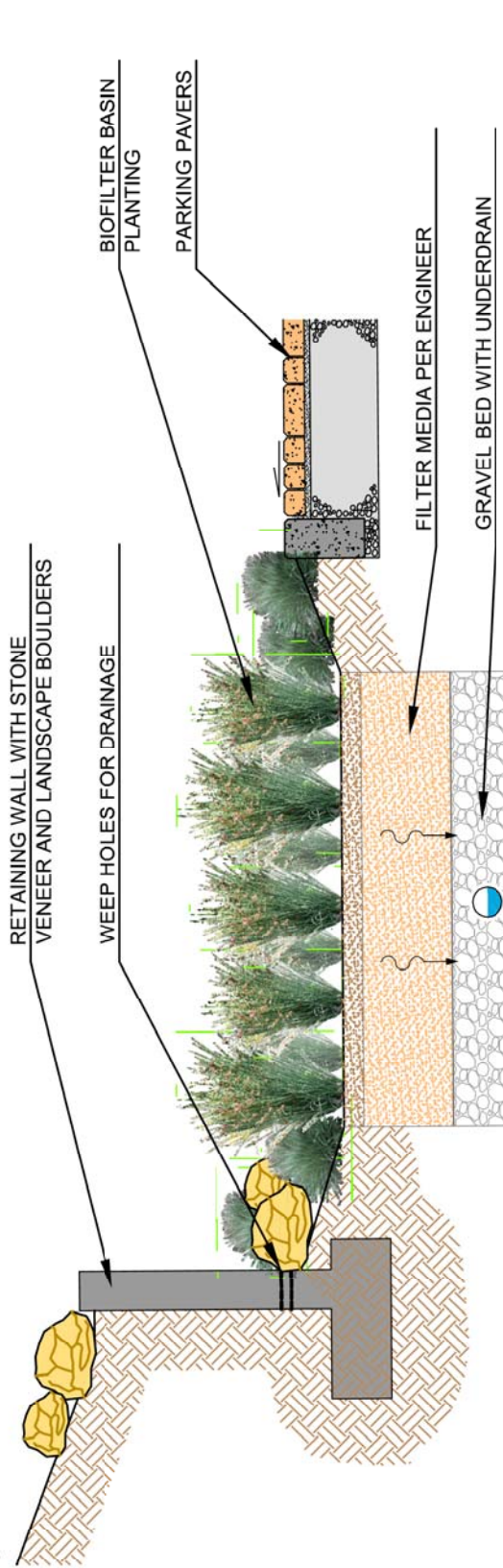
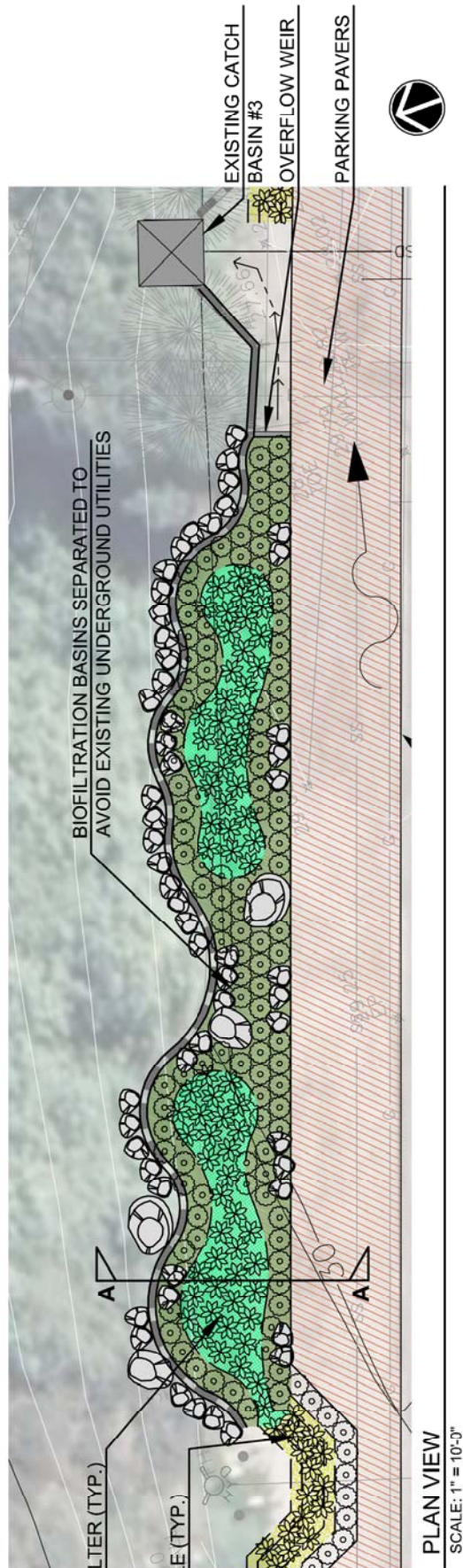
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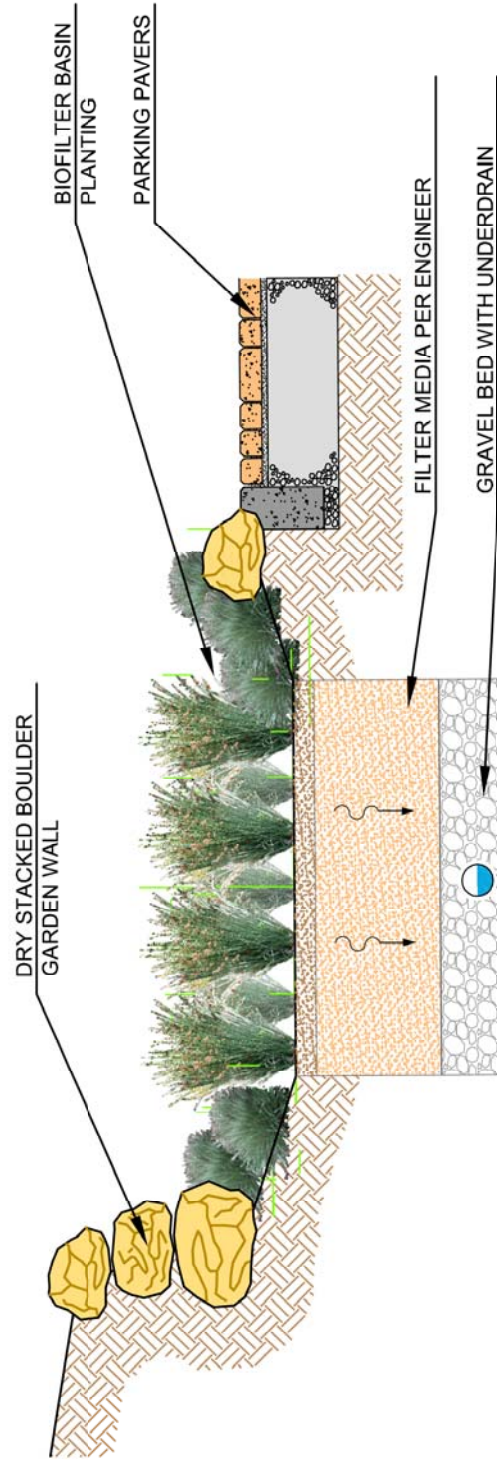
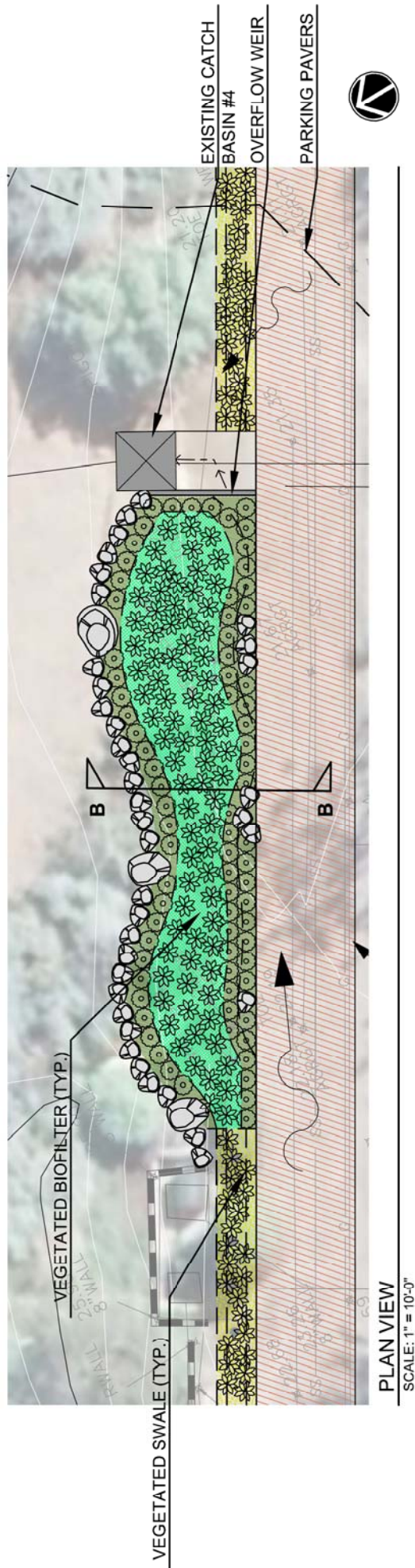
Preliminary Design - Not for Construction Figure 6-13



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Broad Beach Road Biofiltration Project

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Figure 6-14

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Appendix 4: Model Calibration and Parameters

TOPANGA CREEK ABOVE MOUTH
OF CANYON
Station ID: F54C
07/01/2010 - 06/30/2020

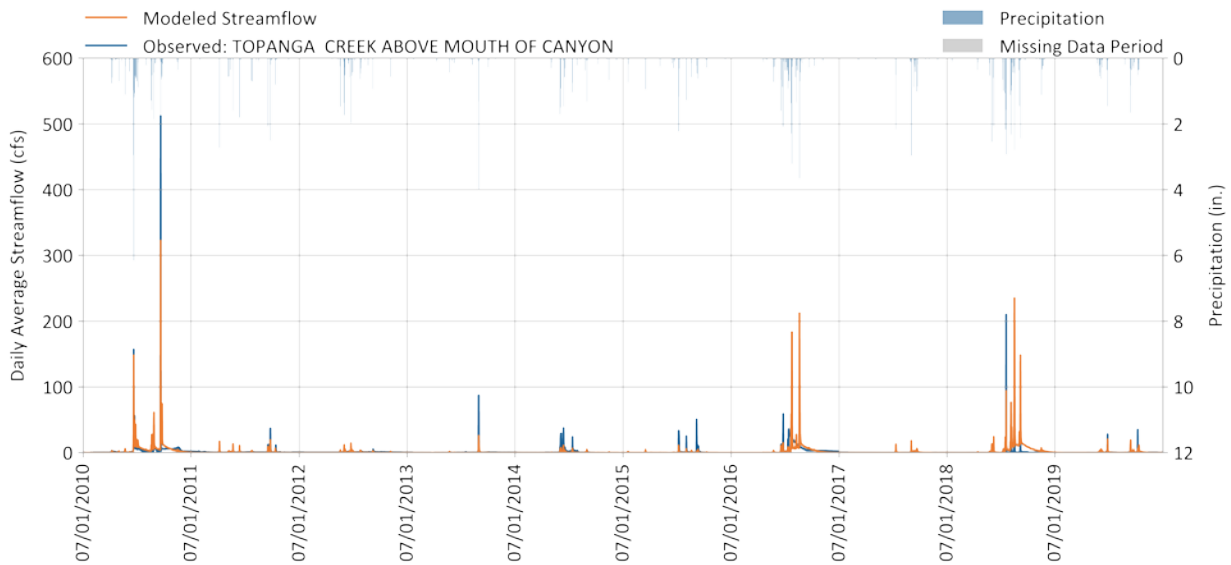


Figure 4-1. Topanga Creek Above Mouth of Canyon (F54C) - Hydrology calibration: Simulated vs. daily observed streamflow

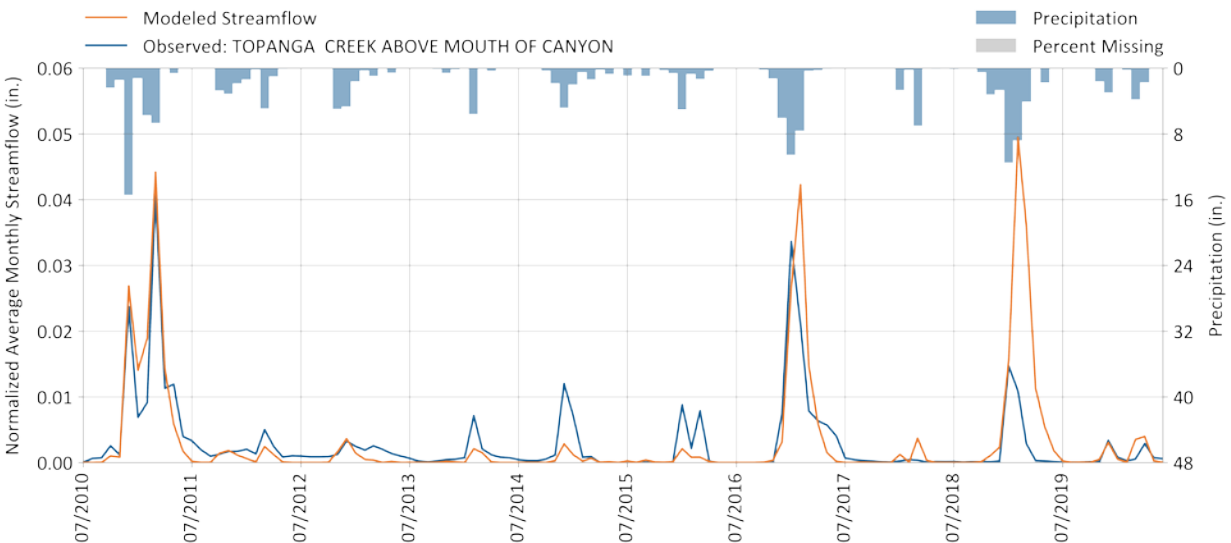


Figure 4-2. Topanga Creek Above Mouth of Canyon (F54C) - Hydrology calibration: Simulated vs. observed normalized monthly streamflow

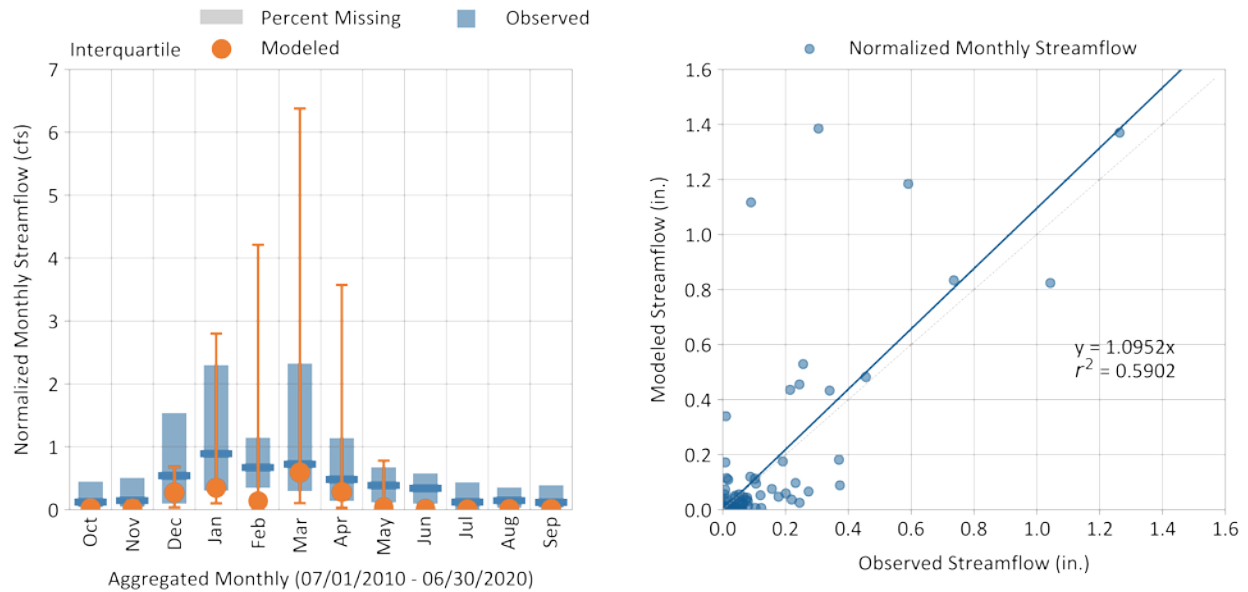


Figure 4-3. Topanga Creek Above Mouth of Canyon (F54C) - Hydrology calibration: Simulated vs. observed normalized monthly streamflow

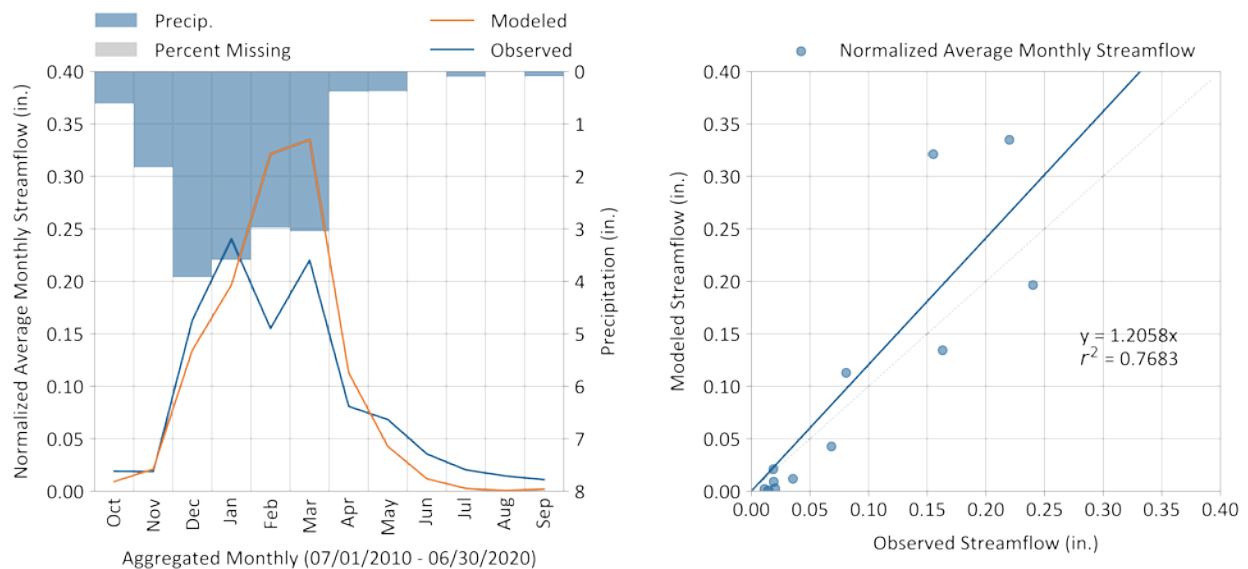


Figure 4-4. Topanga Creek Above Mouth of Canyon (F54C) - Hydrology calibration: Average normalized monthly streamflow

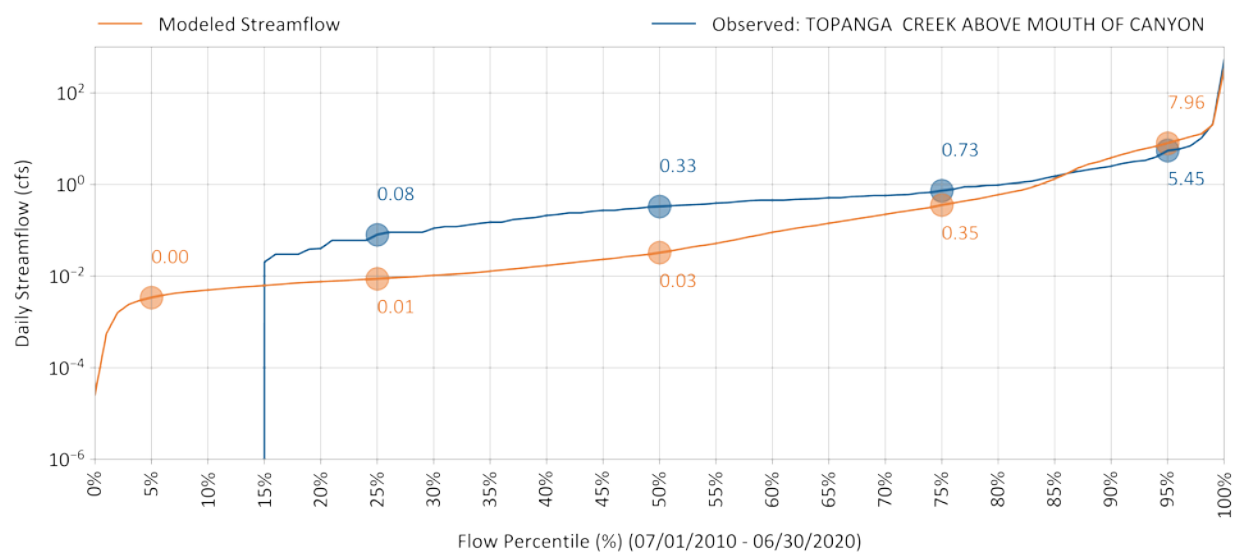


Figure 4-5. Topanga Creek Above Mouth of Canyon (F54C) - Hydrology calibration: Simulated vs. observed streamflow duration curves

Table 4-1. Regional Board guidance and calibrated hydrology model parameter values

	Model Parameters	Units	Recommended Values*	Calibrated Values
Hydrology	Interception storage capacity (in)	Inches	0.01-0.40	0.02 – 0.15
	Manning's n for overland flow	NA	0.01-0.15	0.1 – 0.25
	Upper zone nominal soil moisture storage (in)	Inches	0.050-2.00	0.525 – 1.50
	Temperature below which evapotranspiration (ET) is reduced by half (°F)	°F	32.0-48.0	45
	Temperature below which ET is set to zero (°F)	°F	30.0-40.0	35
	Fraction of groundwater (GW) inflow to deep recharge	NA	0.0-0.50	0.0-0.30
	Fraction of remaining ET from baseflow	NA	0.0-0.20	0.00 – 0.01
	Fraction of remaining ET from active GW	NA	0.0-0.20	0.00 – 0.03
	Lower zone nominal soil moisture storage (in)	Inches	2.0-15.0	7-15
	Interflow inflow parameter	NA	1.0-10.0	0.5-1.0
	Interflow recession parameter	NA	0.3-0.85	0.3
	Lower zone ET parameter	NA	0.1-0.9	0.2 – 0.7

* Source: Regional Board (Los Angeles Regional Water Quality Control Board). 2014. Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program, Including an Enhanced Watershed Management Program. \\LARWQCB, Los Angeles, CA.

Appendix 5A: Graphical Outputs for EWMP Implementation Plan and Scheduling

This appendix has three sections:

- **Part 1.** EWMP Implementation Plan: BMP Capacities and Capital Costs by Jurisdiction and Priority Area Type
- **Part 2.** Final Implementation Plan: BMP Capacities and Capital Costs by Priority Area
- **Part 3.** Scheduling of BMP Capacities and Capital Costs by Jurisdiction and Priority Area Type

Part 1.

EWMP Implementation Plan: BMP Capacities and Capital Costs by Jurisdiction and Priority Area Type

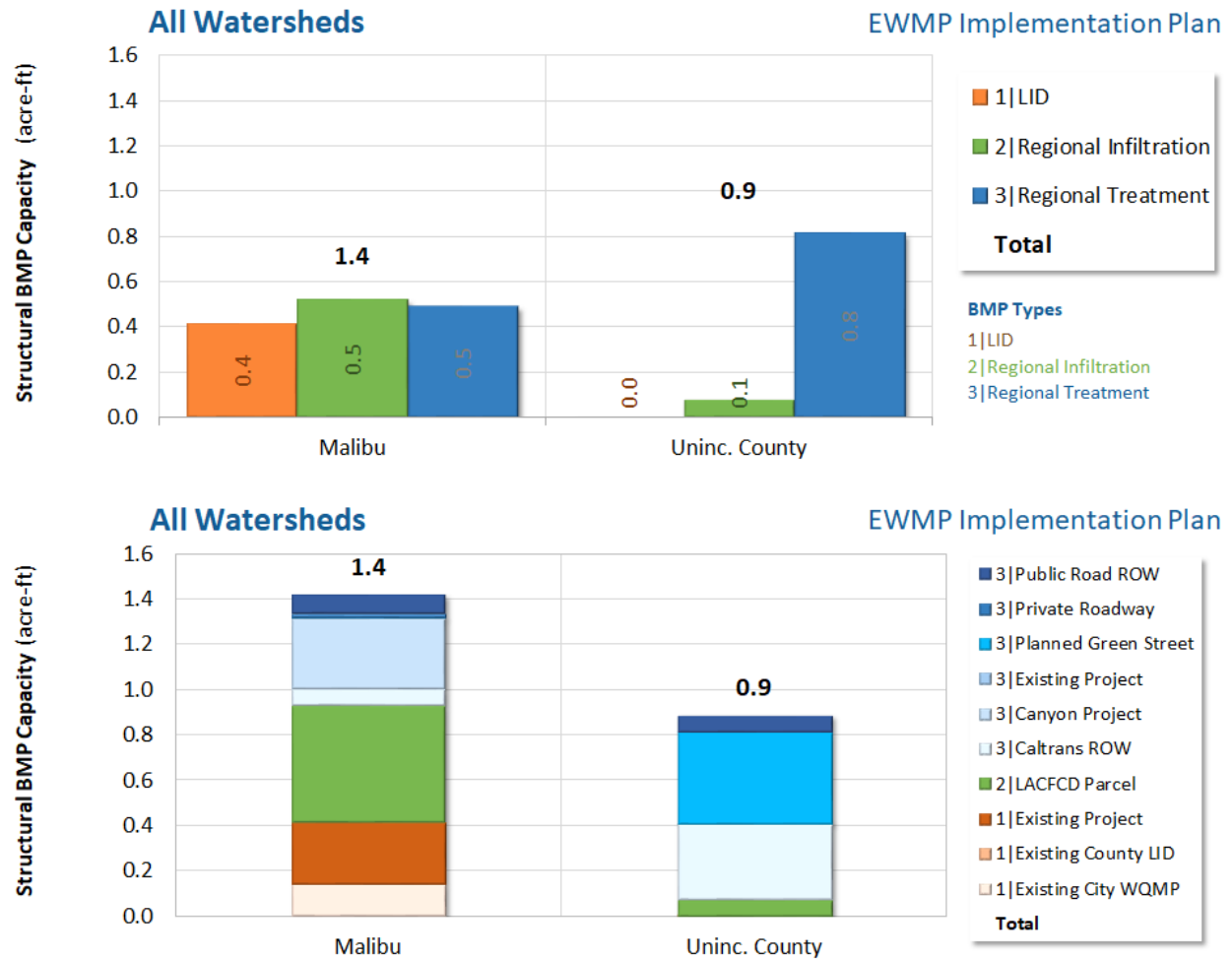


Figure 5A- 1. All Watersheds by Jurisdiction: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

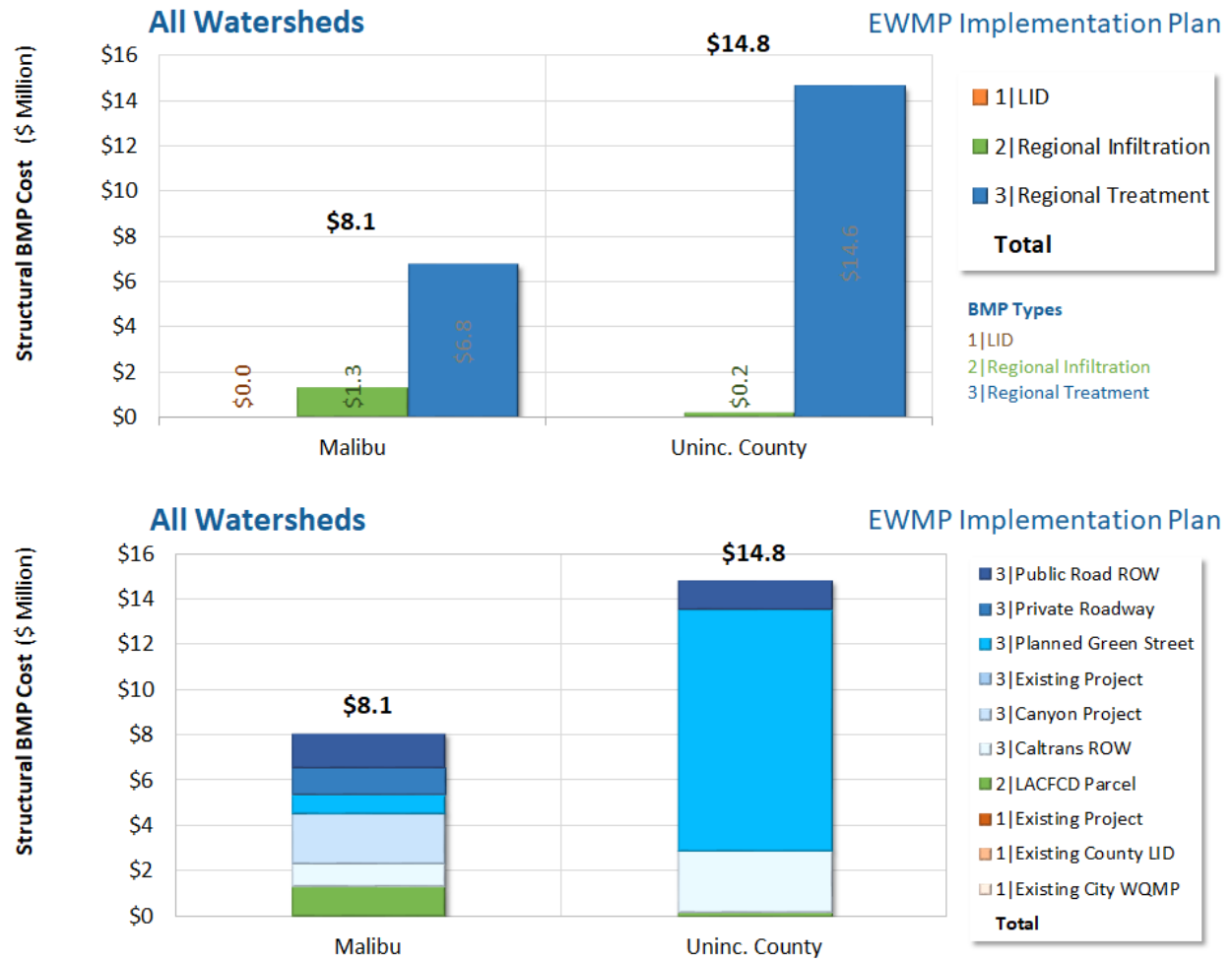


Figure 5A- 2. All Watersheds by Jurisdiction: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

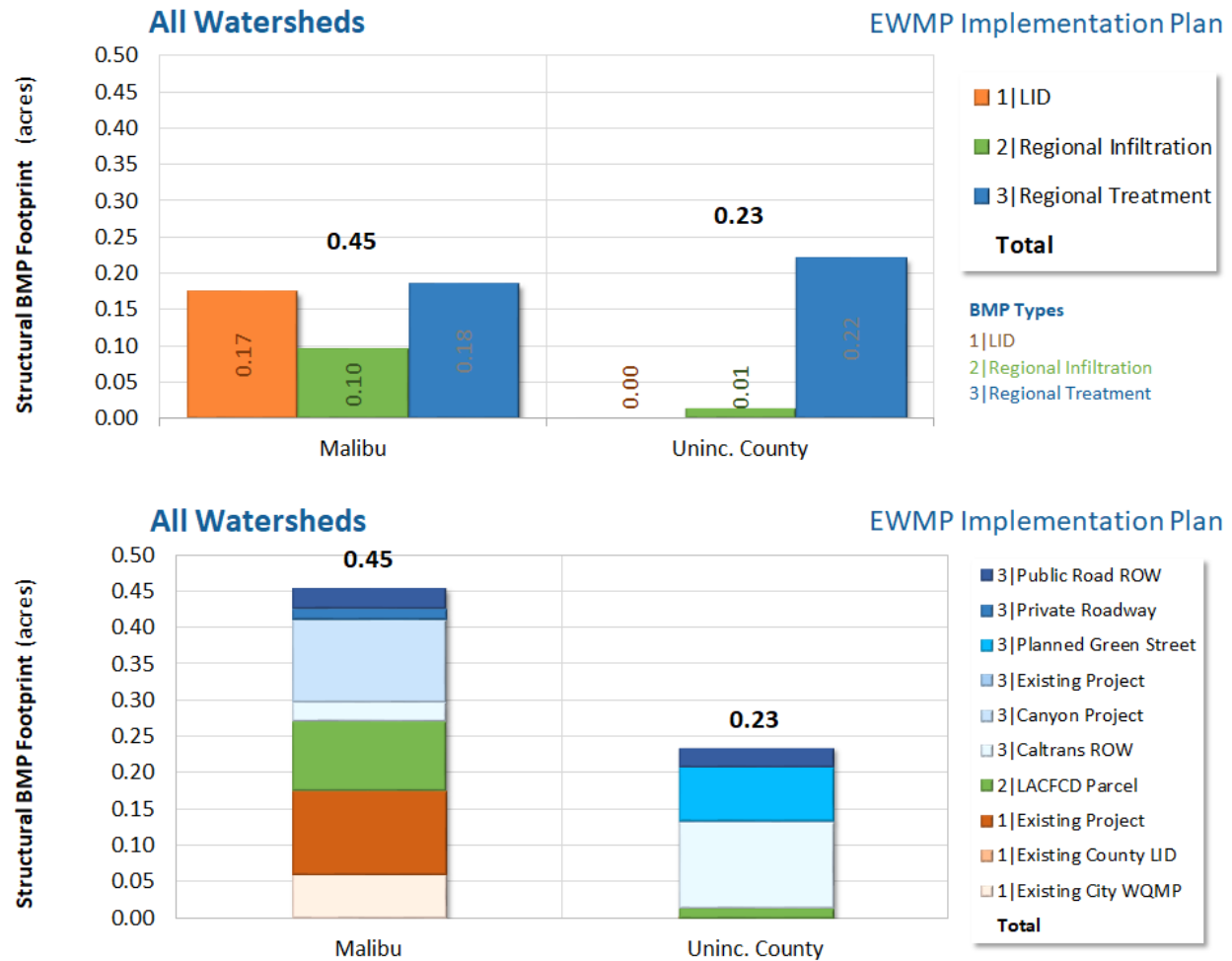


Figure 5A- 3. All Watersheds by Jurisdiction: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

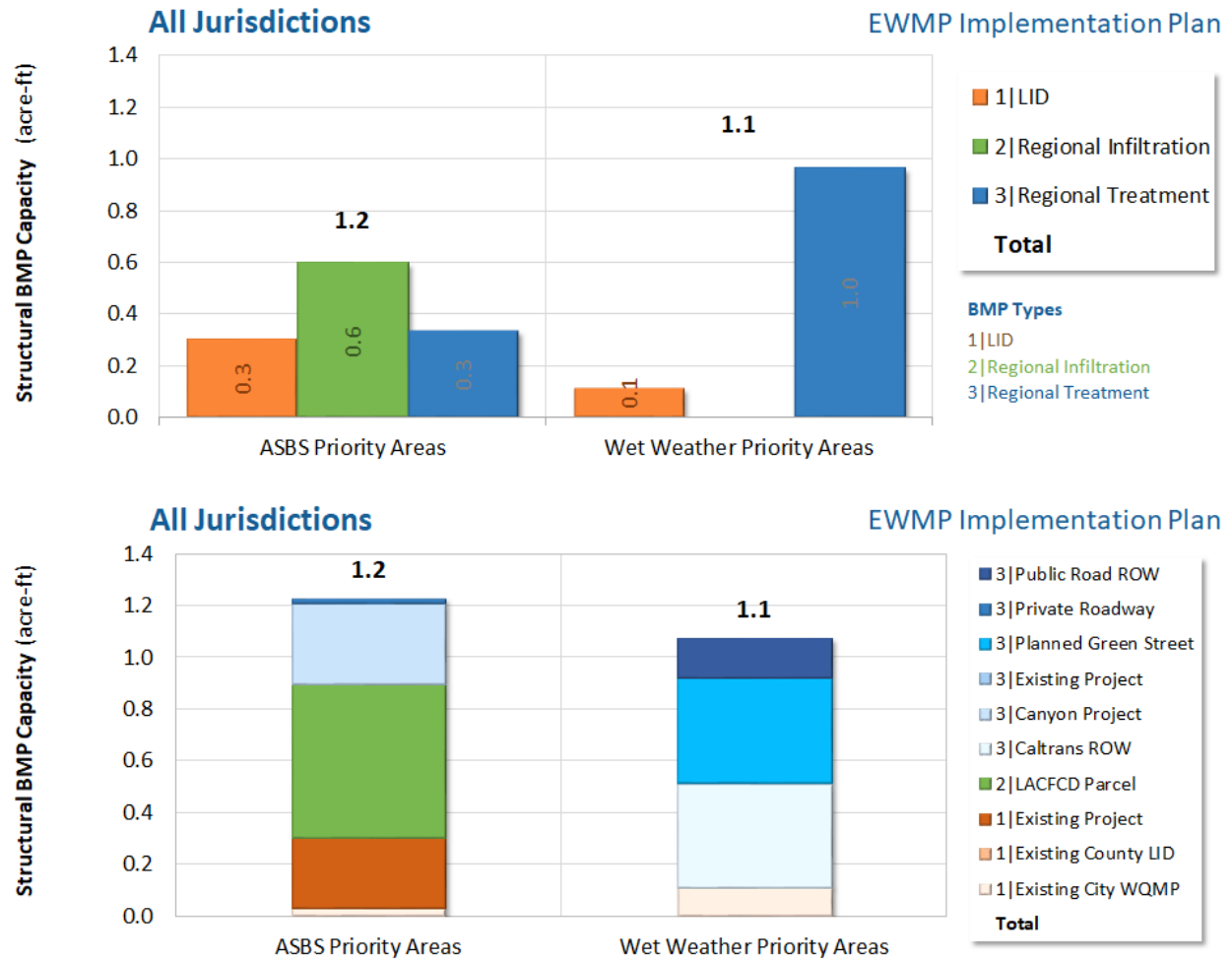


Figure 5A- 4. All Jurisdictions by Watershed: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

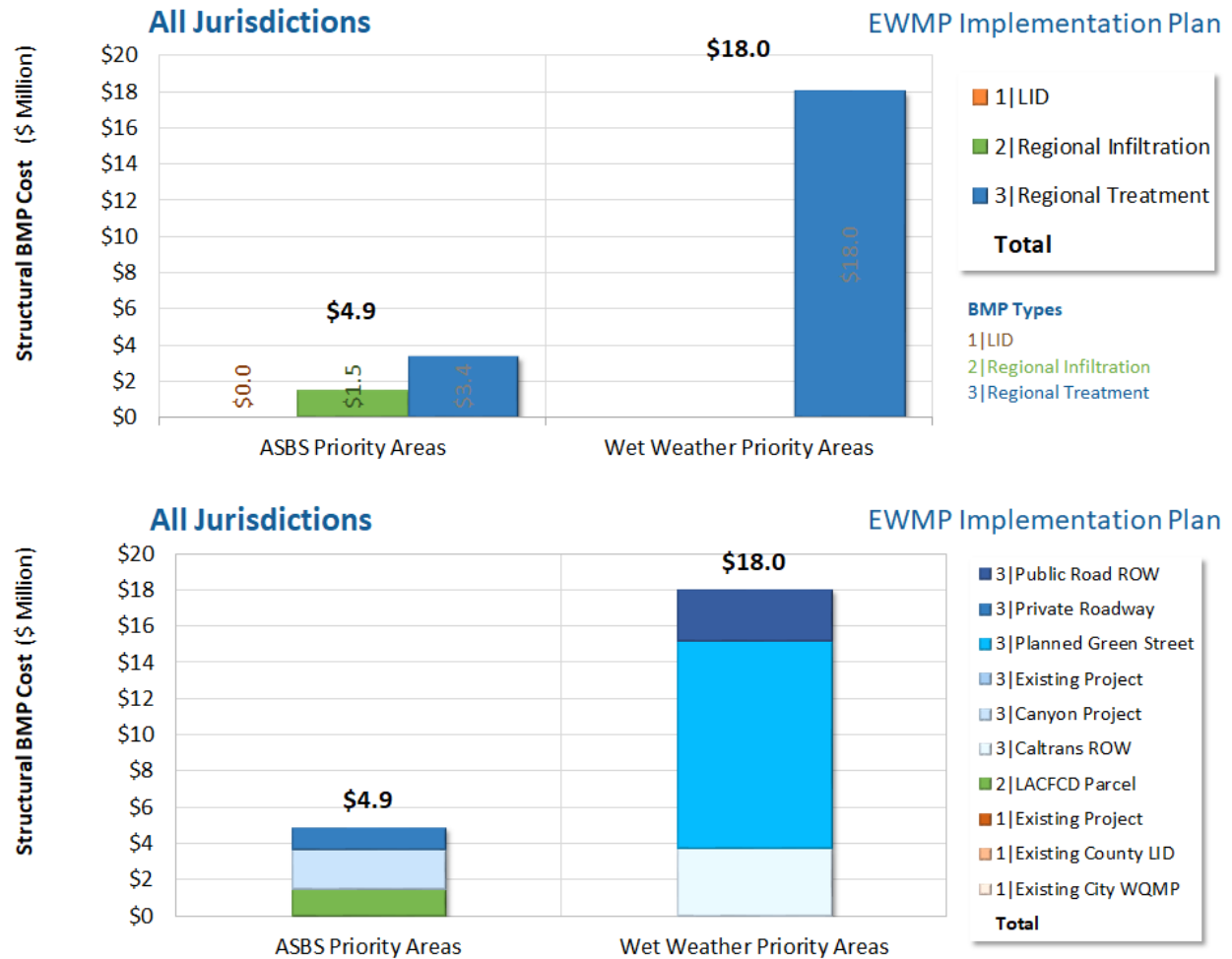


Figure 5A- 5. All Jurisdictions by Watershed: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

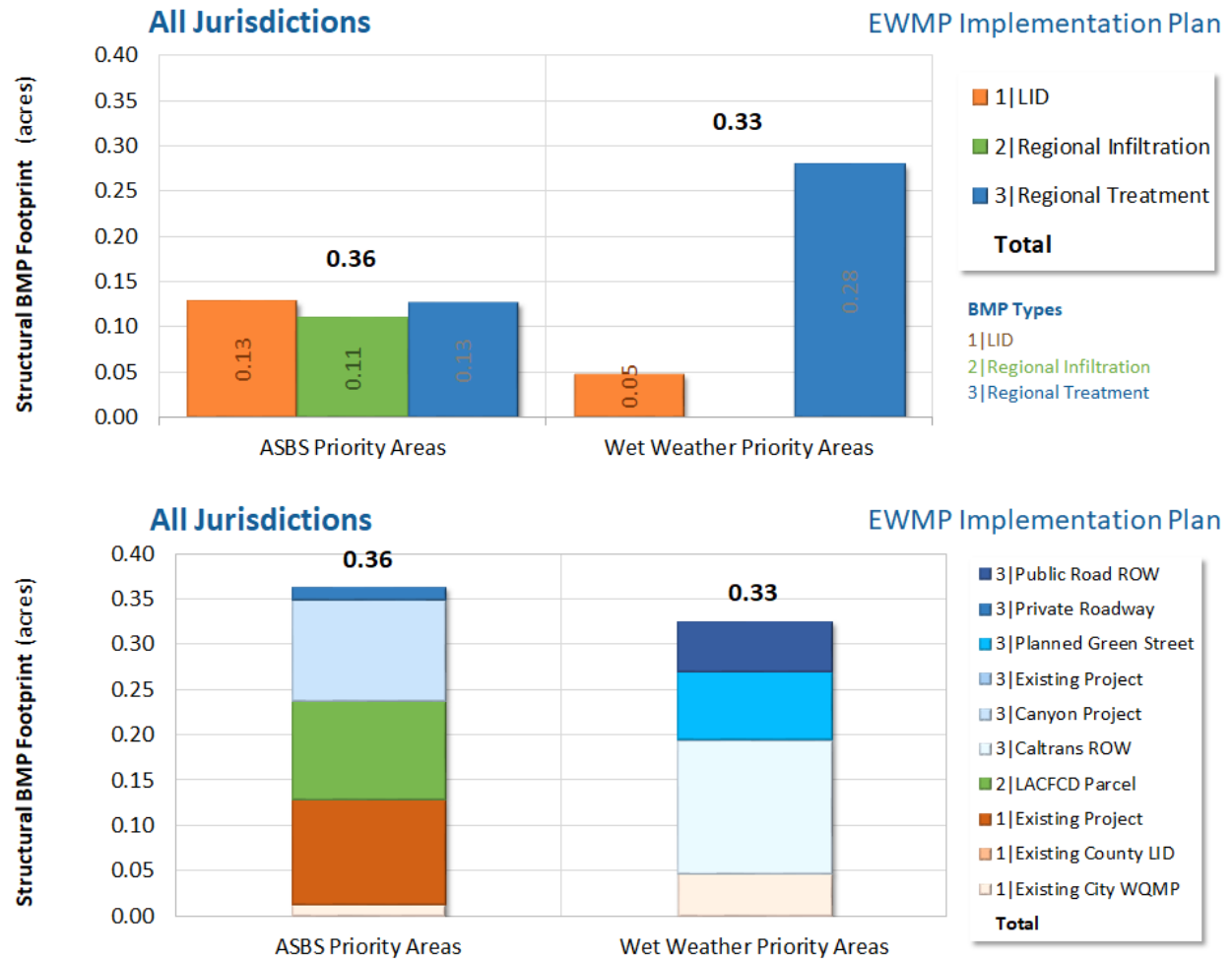


Figure 5A- 6. All Jurisdictions by Watershed: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

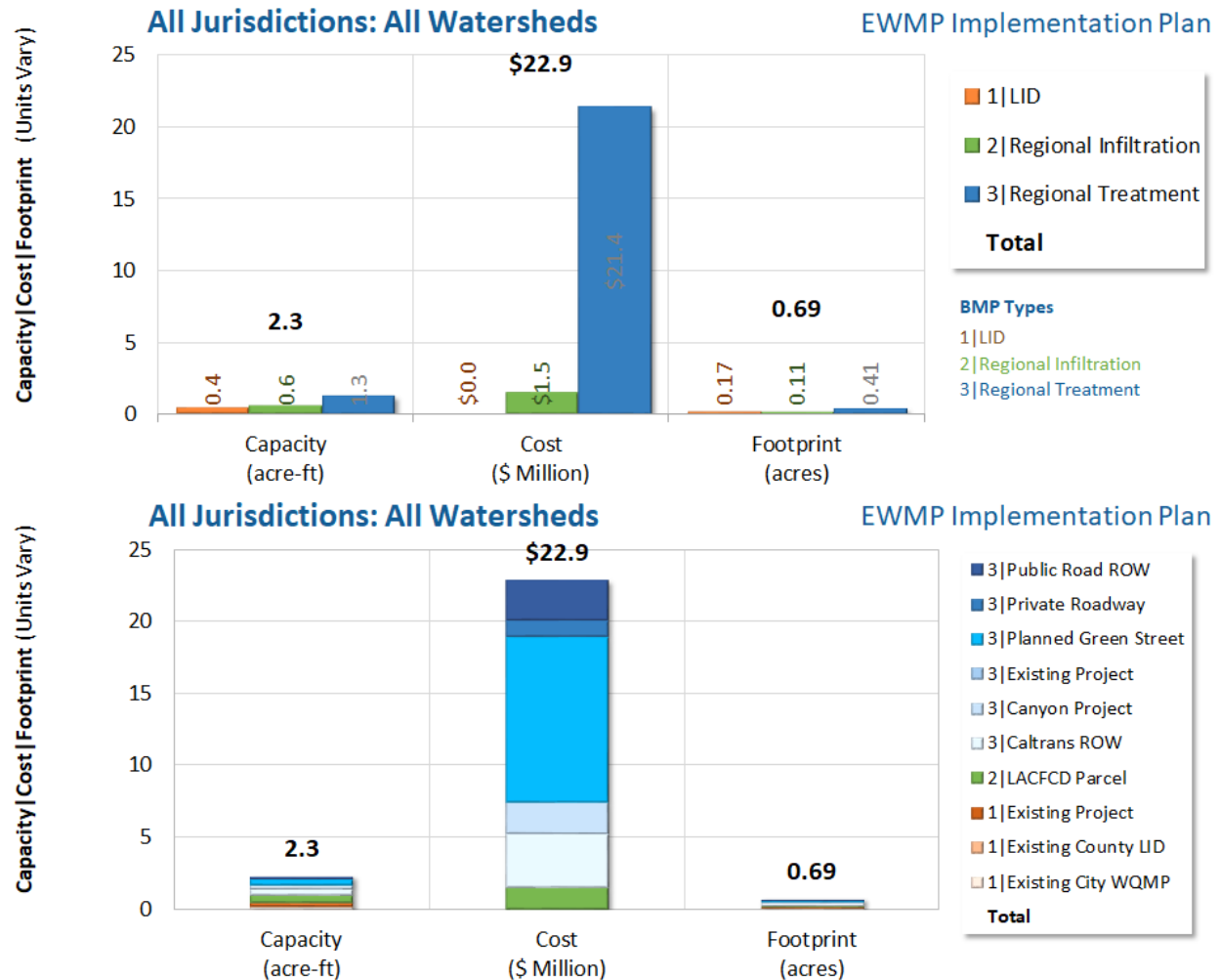


Figure 5A- 7. All Jurisdictions, All Watersheds: EWMP Implementation Strategy to Achieve Final EWMP Compliance.

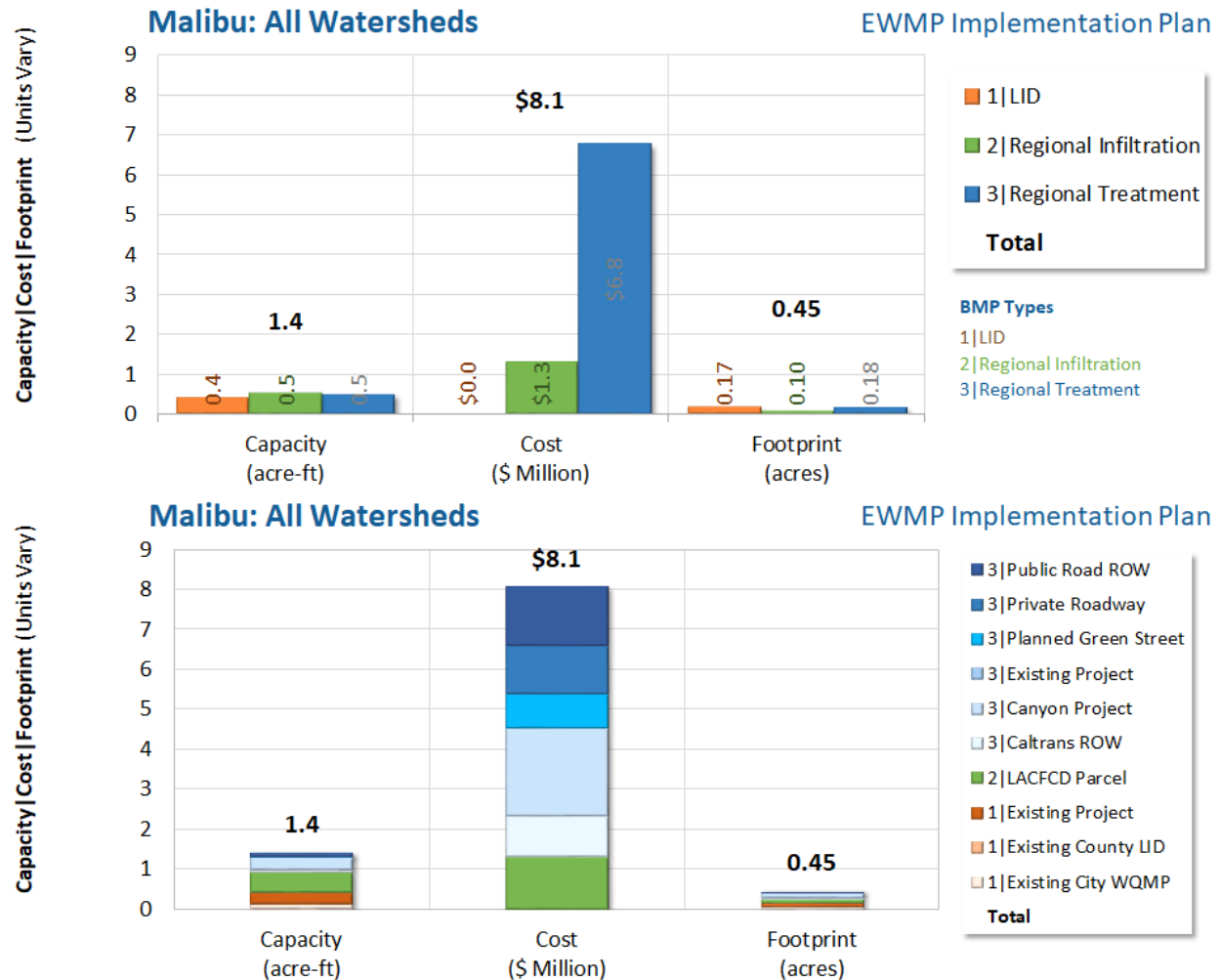


Figure 5A- 8. Malibu, All Watersheds: EWMP Implementation Strategy to Achieve Final EWMP Compliance.

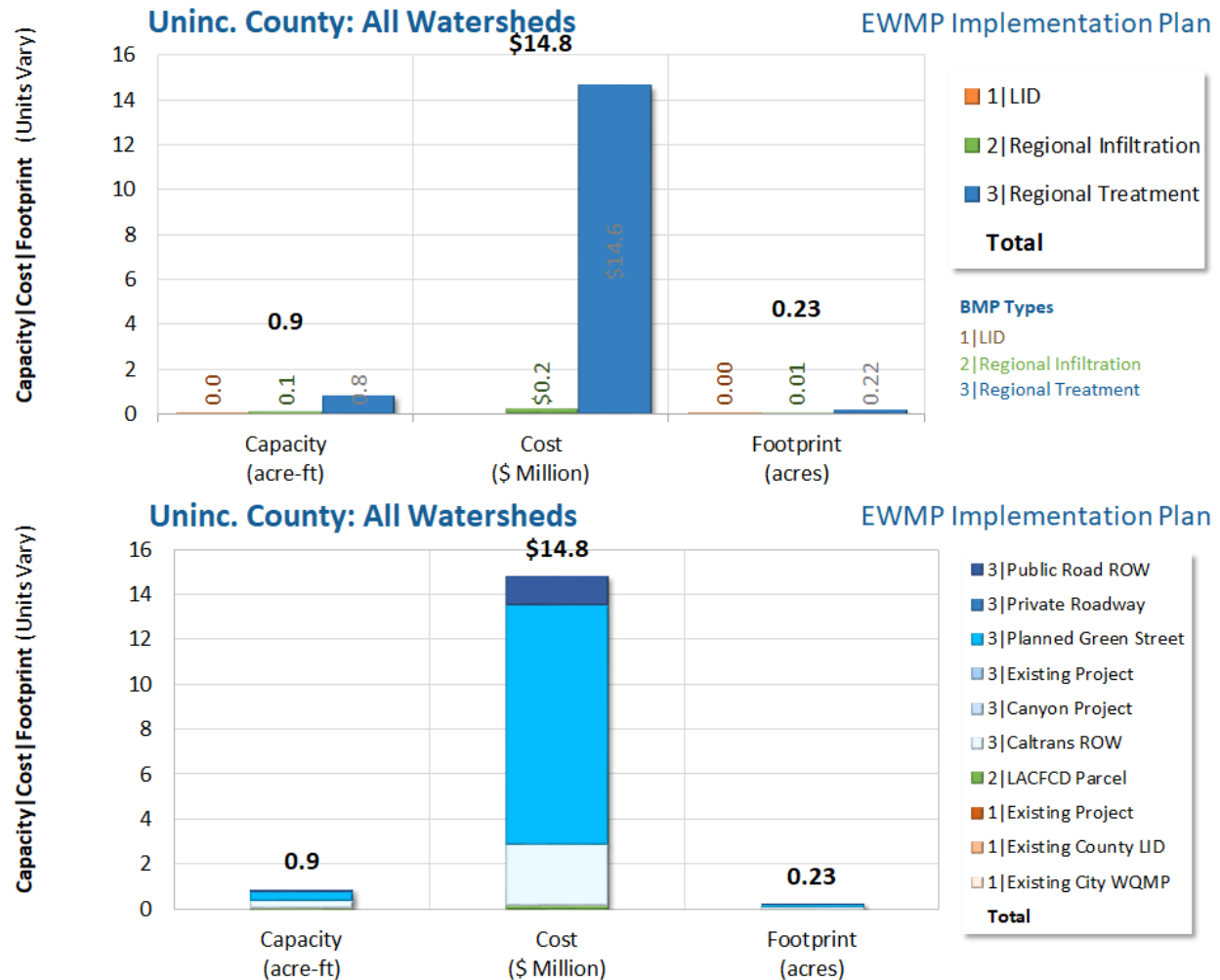


Figure 5A- 9. Uninc. County, All Watersheds: EWMP Implementation Strategy to Achieve Final EWMP Compliance.

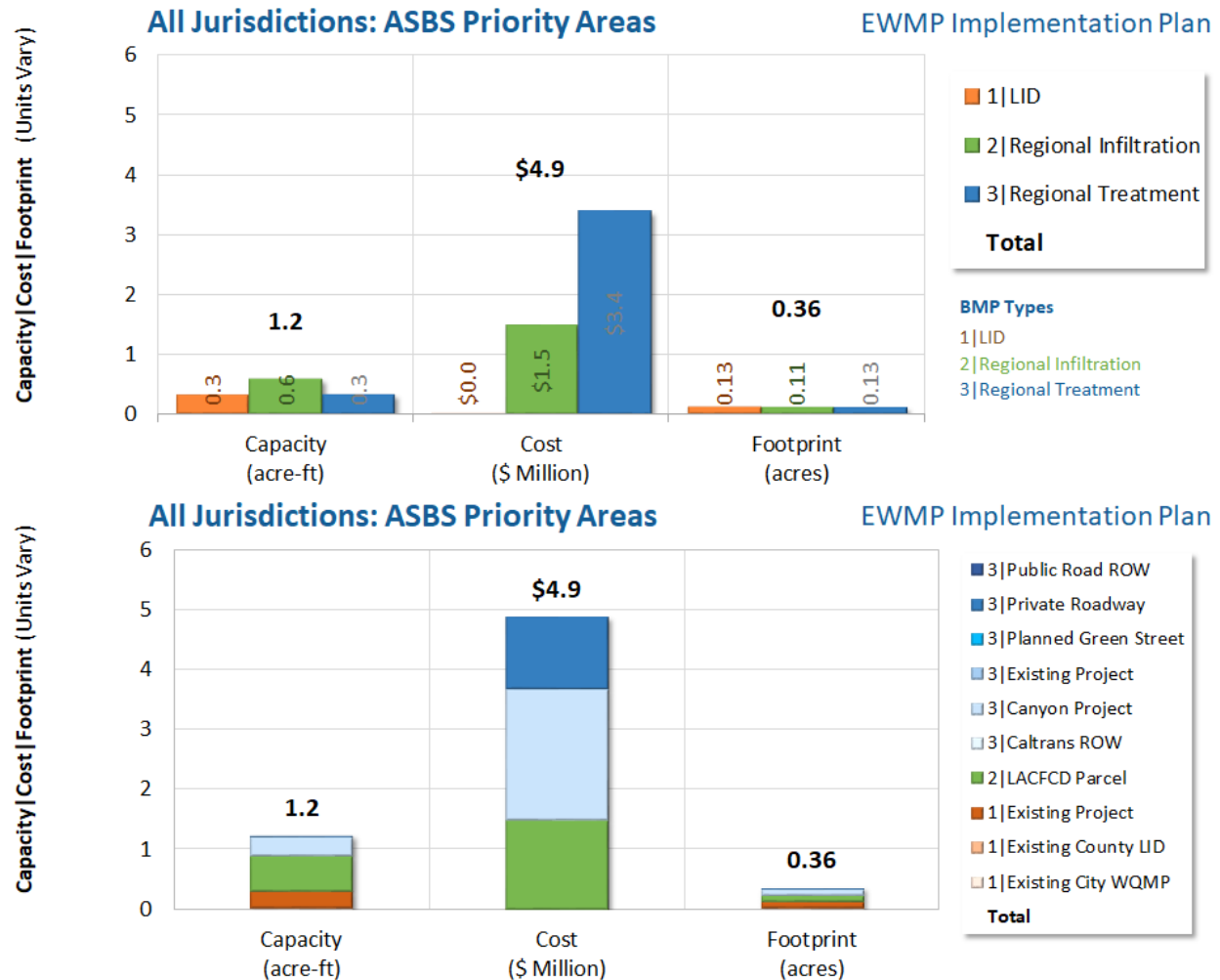


Figure 5A- 10. All Jurisdictions, ASBS Priority Areas: EWMP Implementation Strategy to Achieve Final EWMP Compliance.

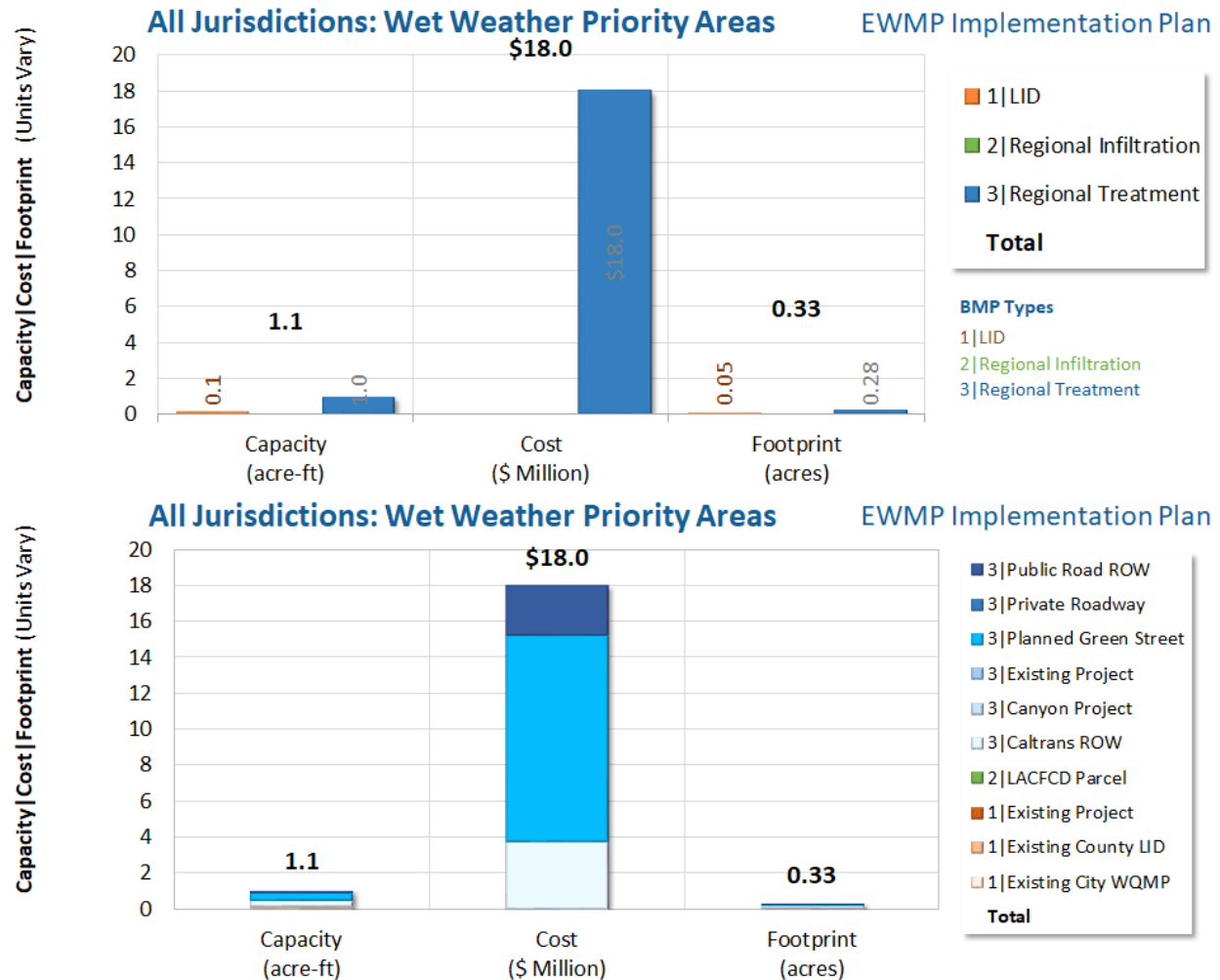


Figure 5A- 11. All Jurisdictions, Wet Weather Priority Areas: EWMP Implementation Strategy to Achieve Final EWMP Compliance.

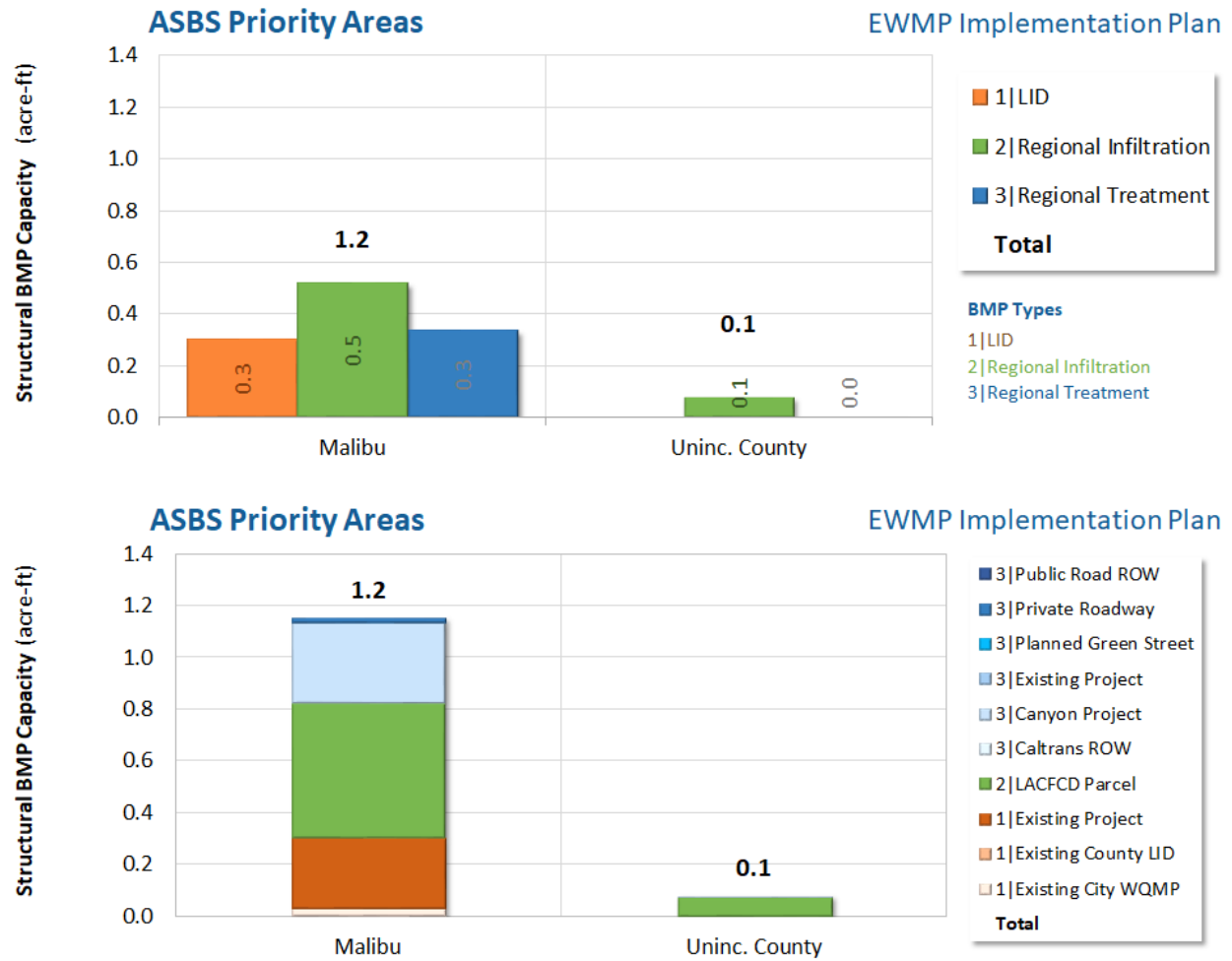


Figure 5A- 12. ASBS Priority Areas by Jurisdiction: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

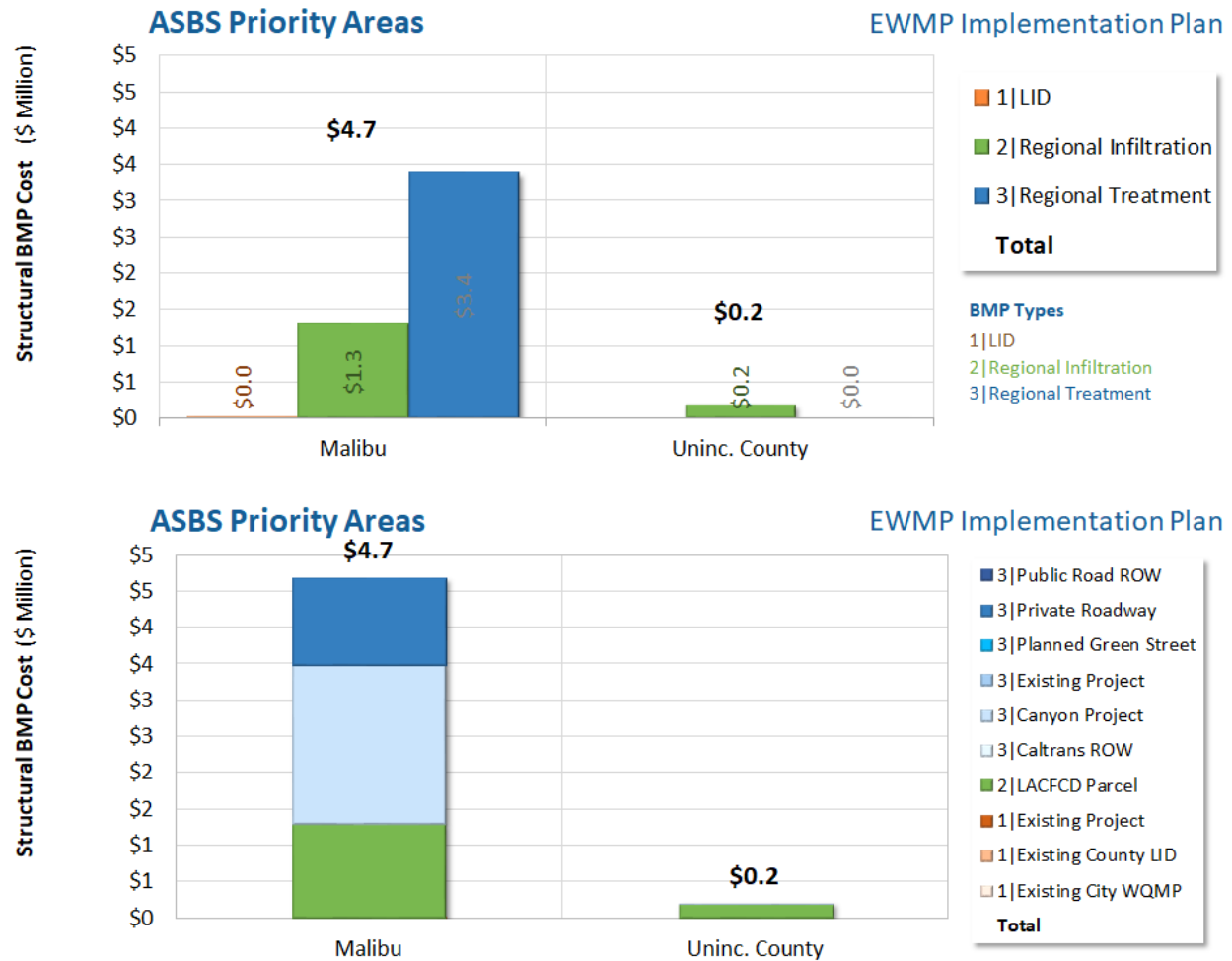


Figure 5A- 13. ASBS Priority Areas by Jurisdiction: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

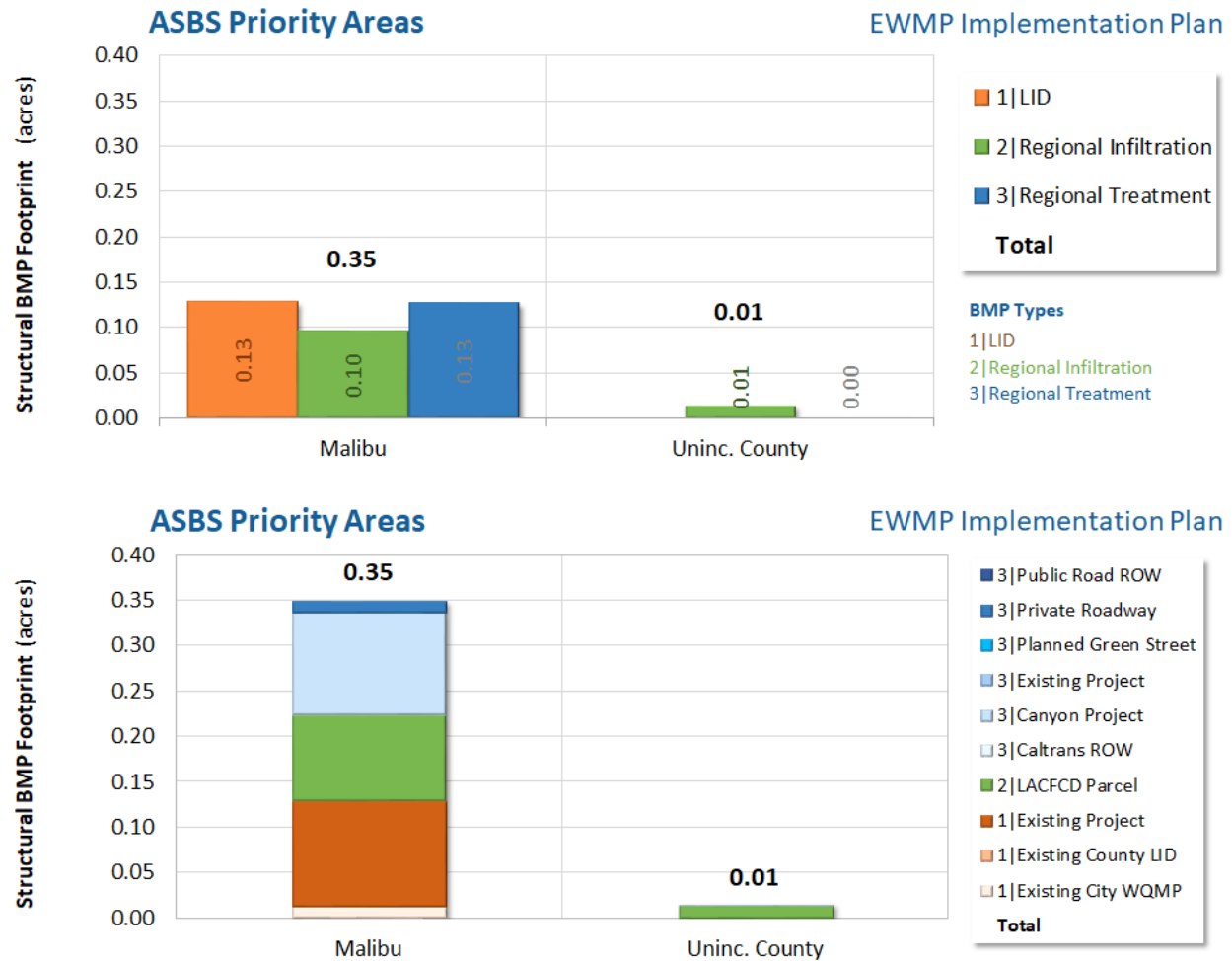


Figure 5A- 14. ASBS Priority Areas by Jurisdiction: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

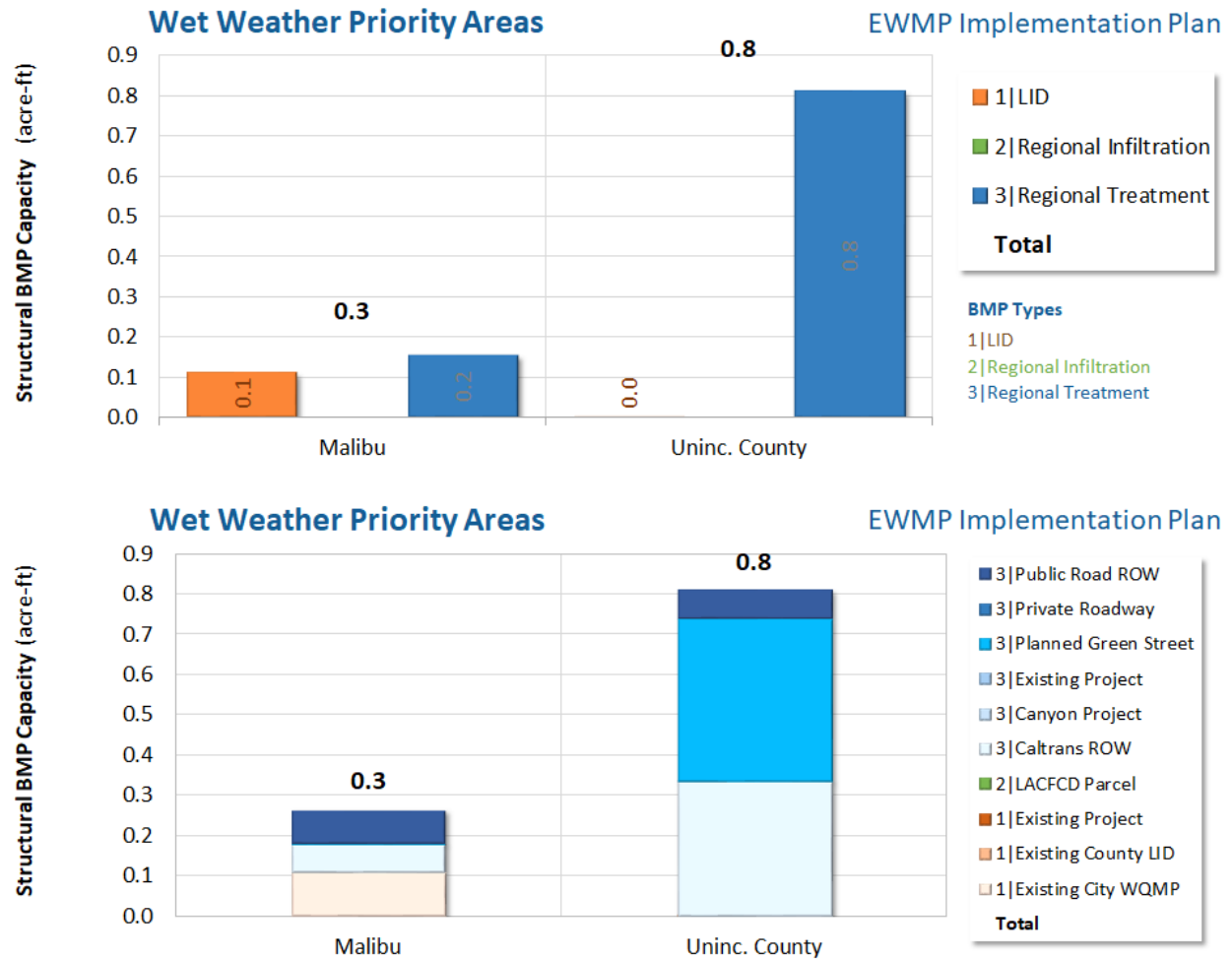


Figure 5A- 15. Wet Weather Priority Areas by Jurisdiction: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

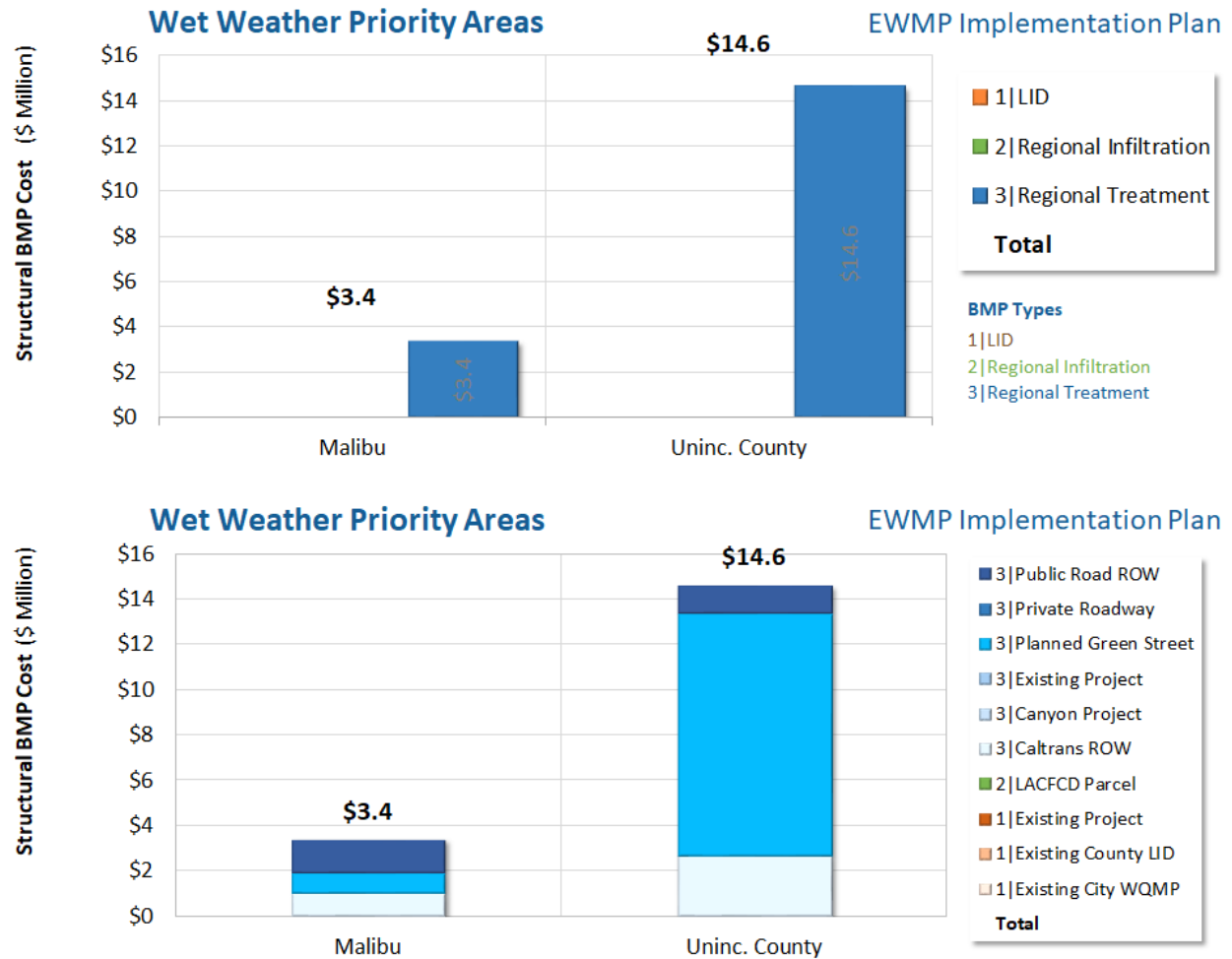


Figure 5A- 16. Wet Weather Priority Areas by Jurisdiction: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

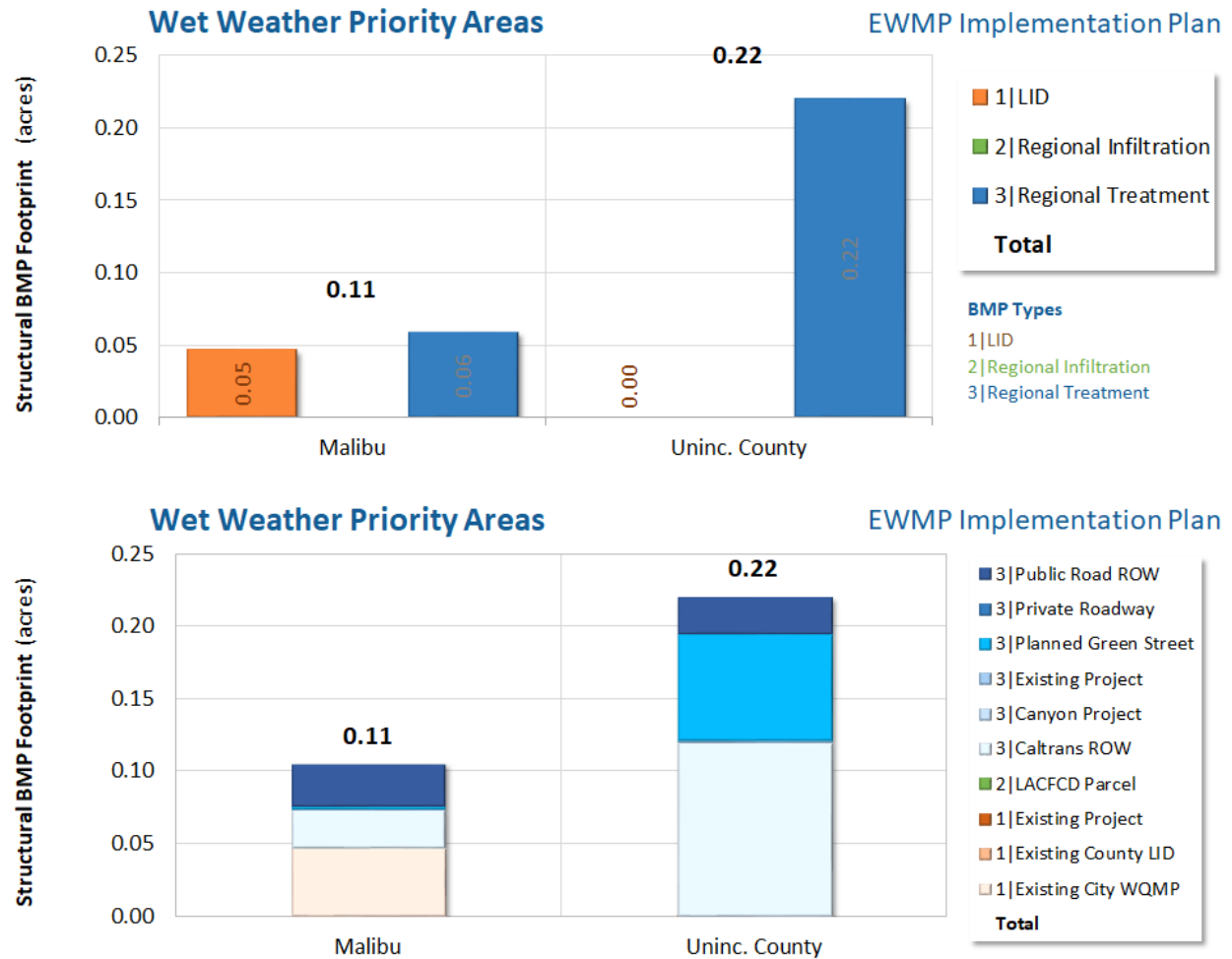


Figure 5A- 17. Wet Weather Priority Areas by Jurisdiction: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

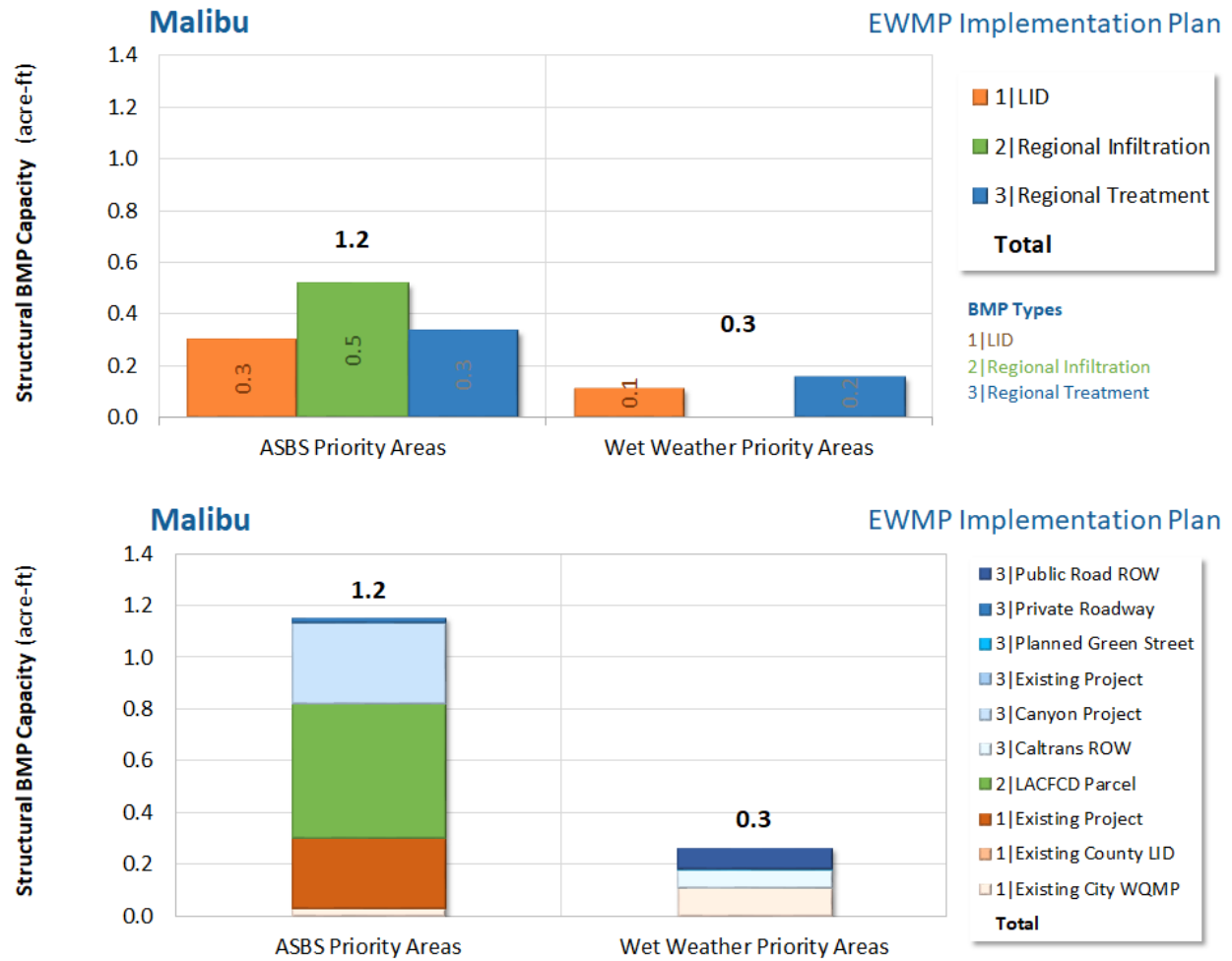


Figure 5A- 18. Malibu by Watershed: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

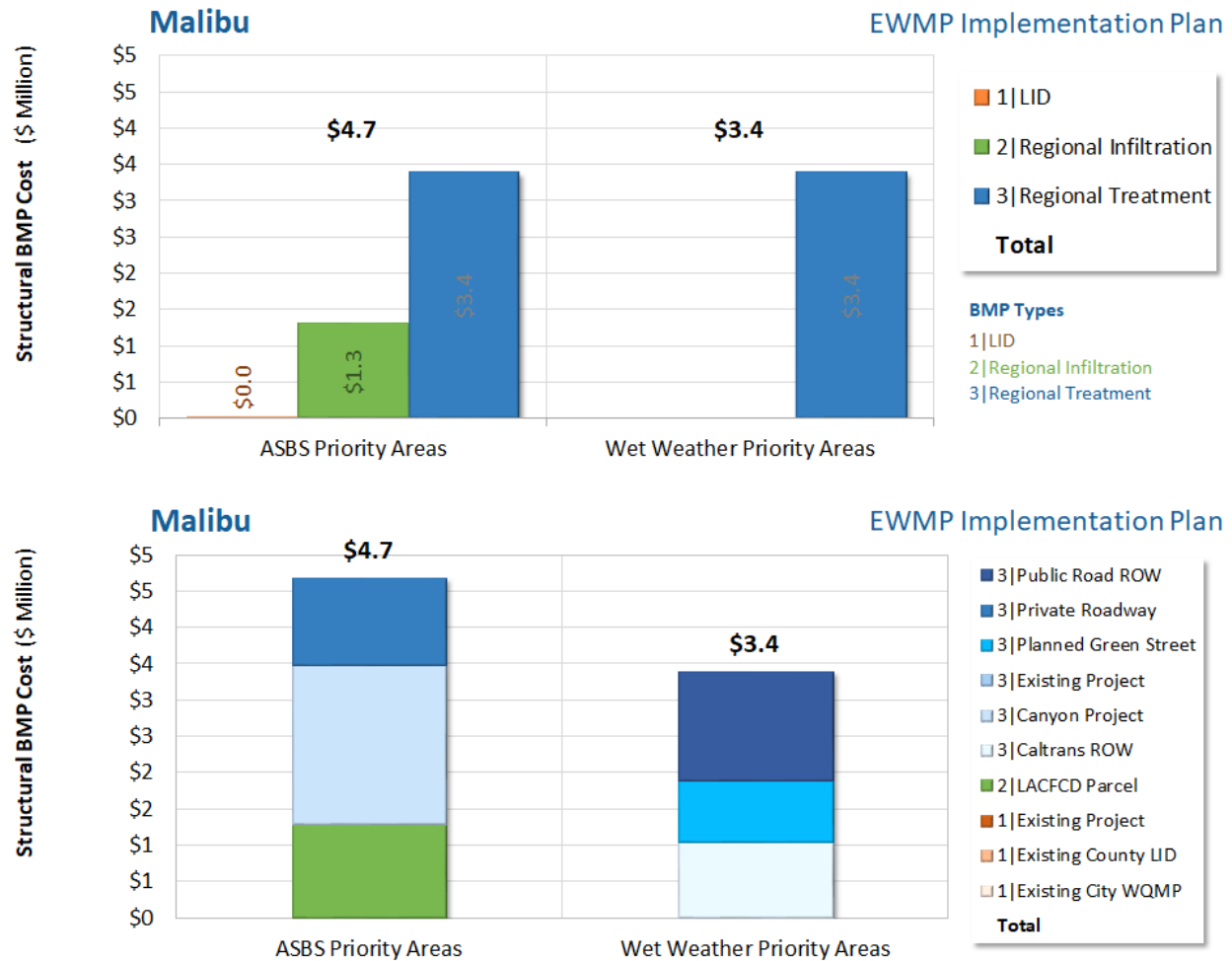


Figure 5A- 19. Malibu by Watershed: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

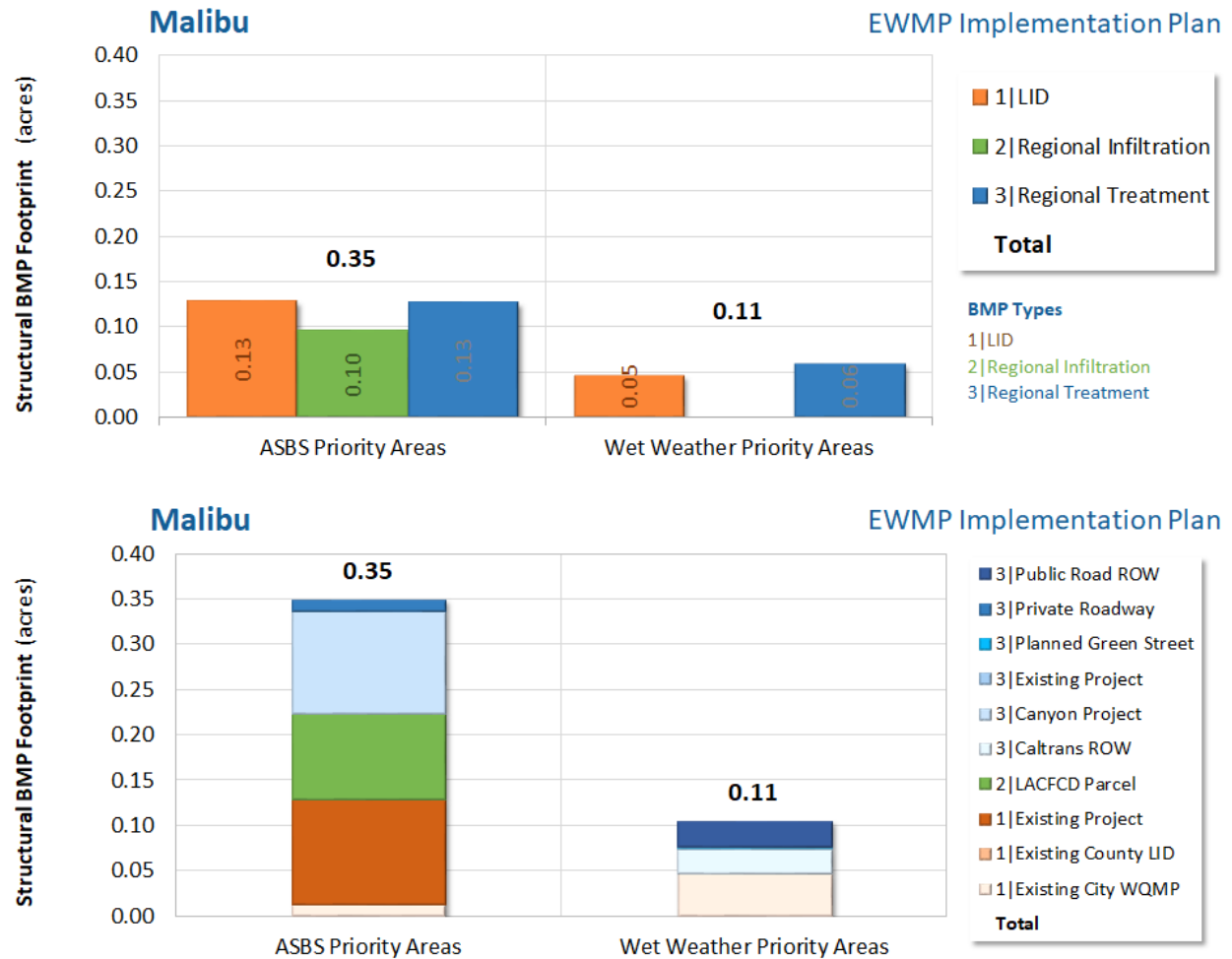


Figure 5A- 20. Malibu by Watershed: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

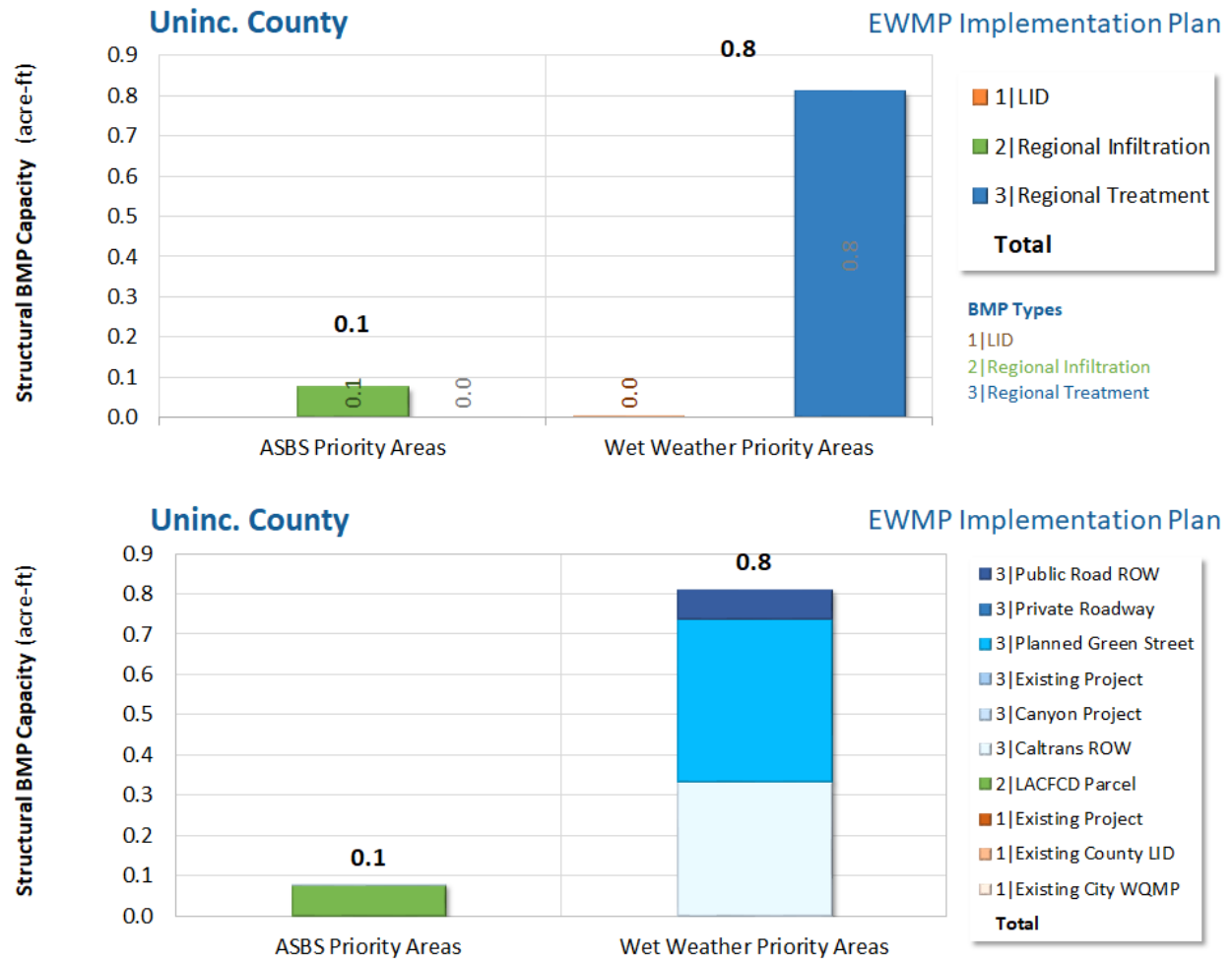


Figure 5A- 21. Uninc. County by Watershed: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

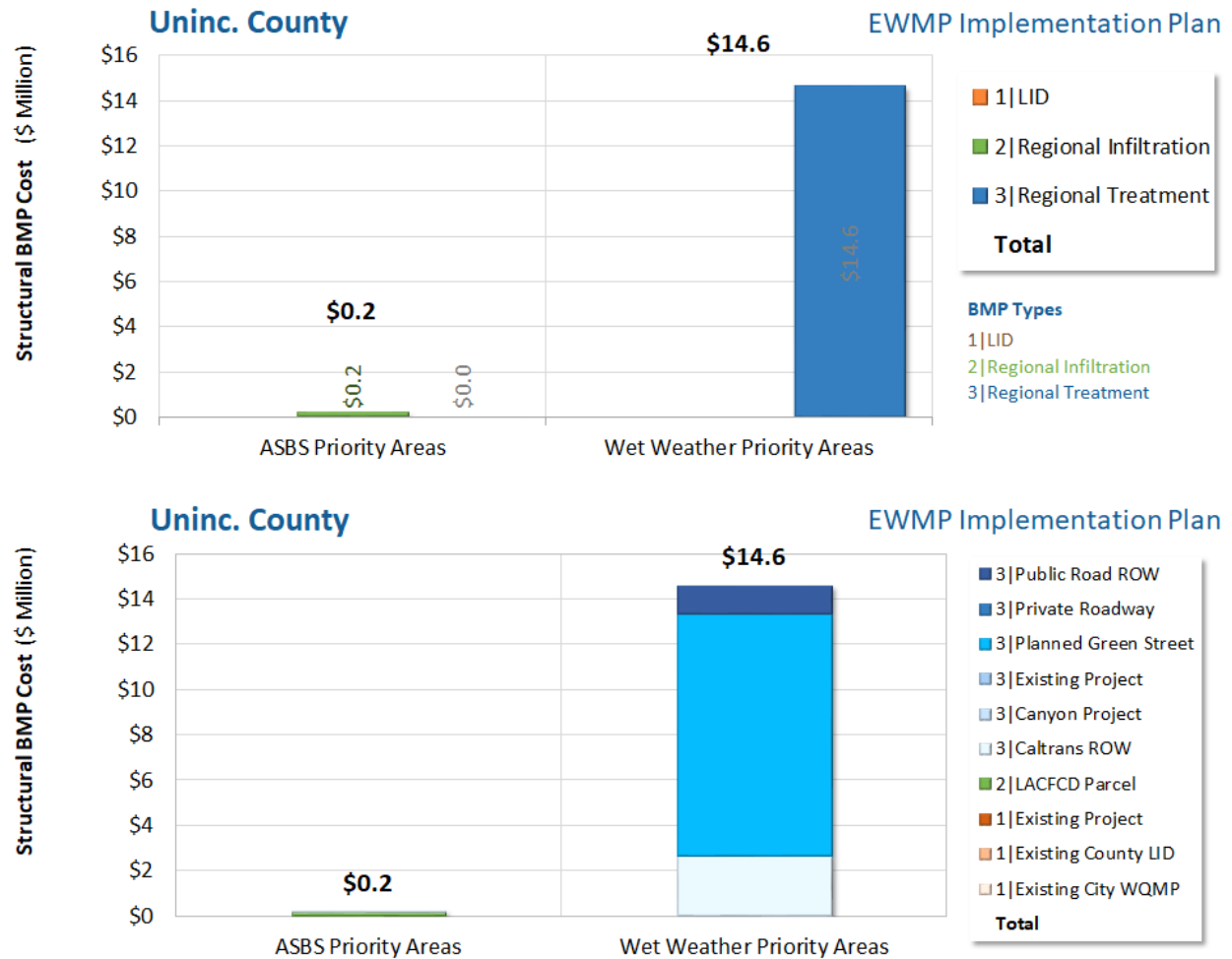


Figure 5A- 22. Uninc. County by Watershed: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

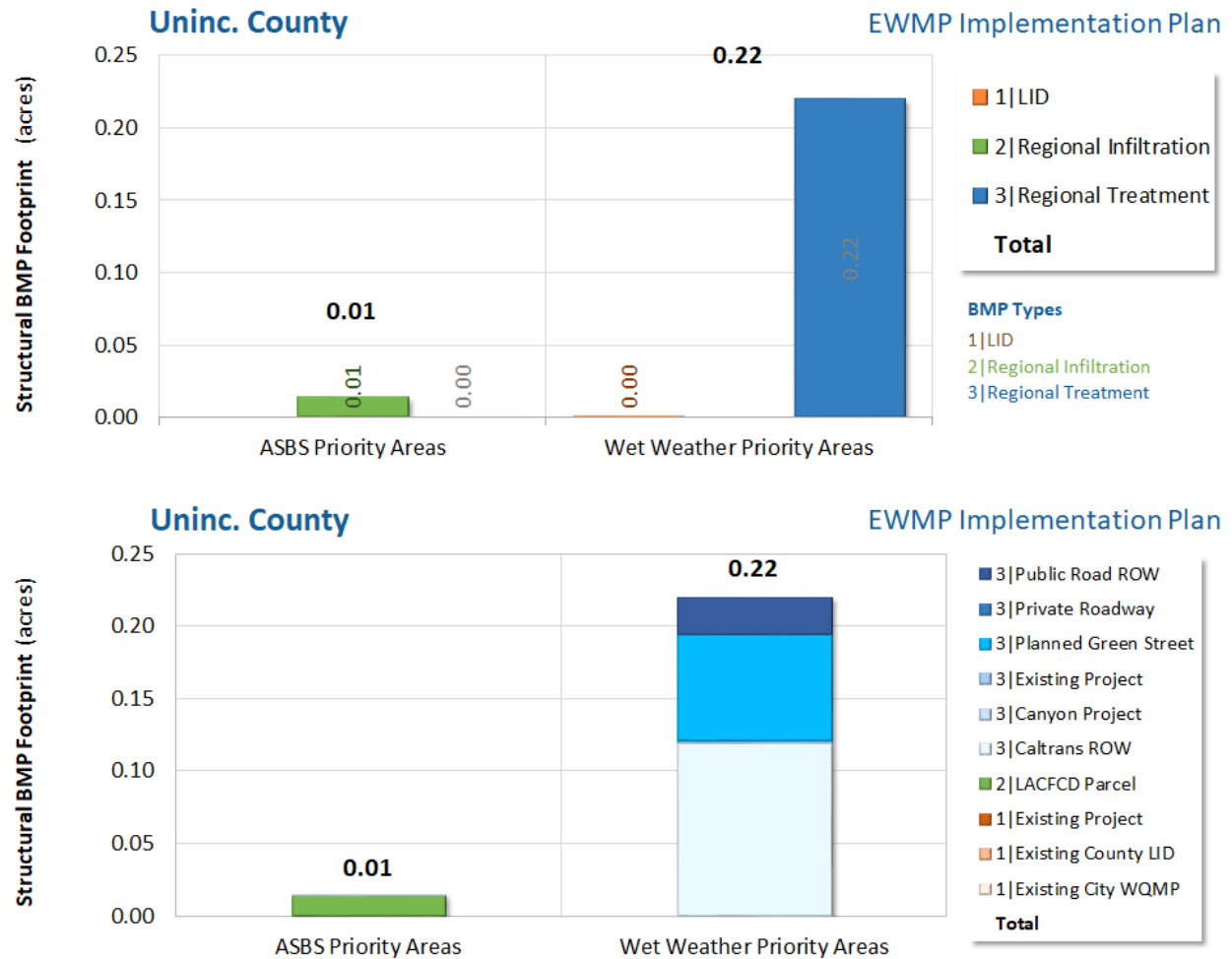


Figure 5A- 23. Uninc. County by Watershed: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

Part 2.

Final Implementation Plan: BMP Capacities and Capital Costs by Priority Area

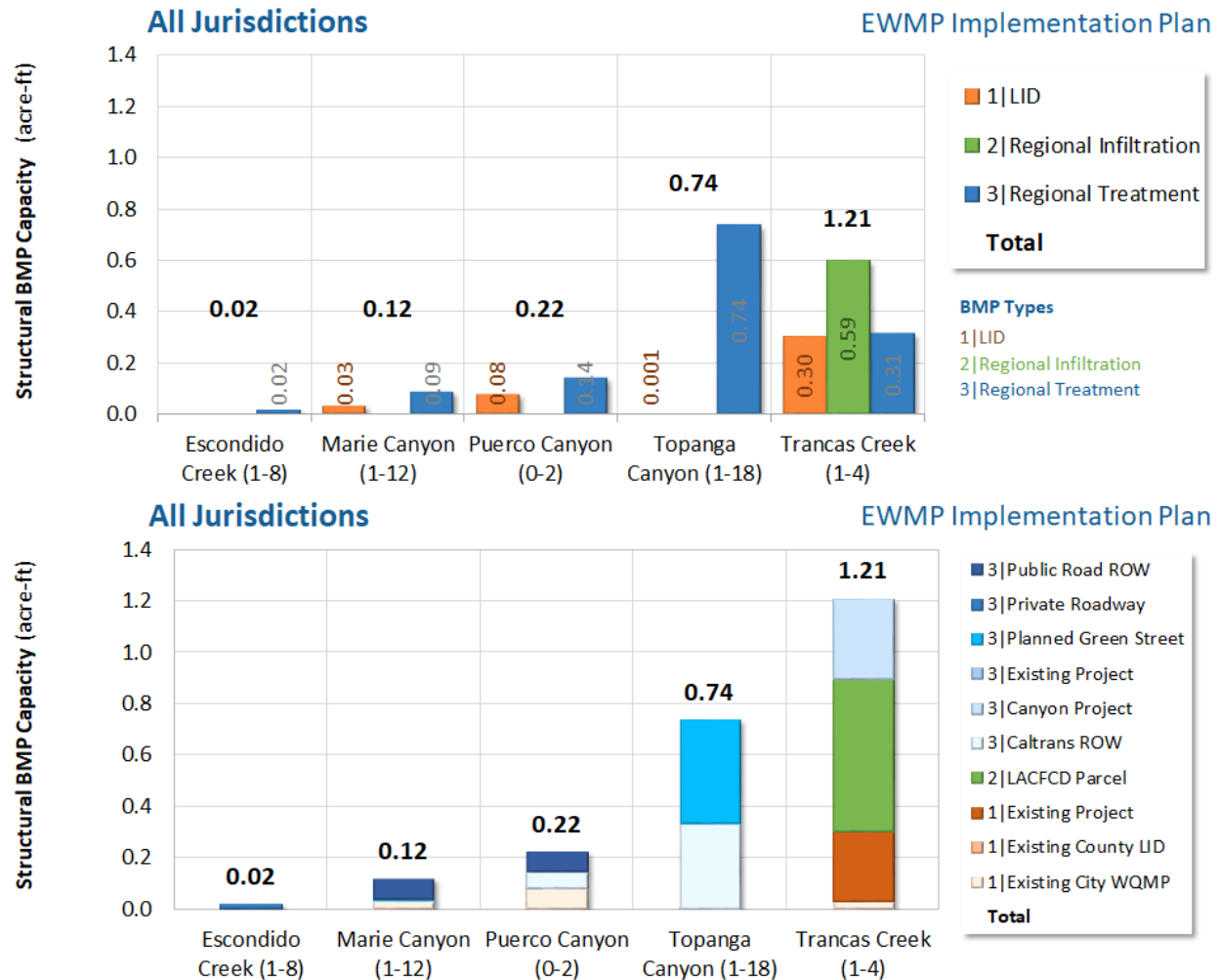


Figure 5A- 24. All Jurisdictions by Watershed: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

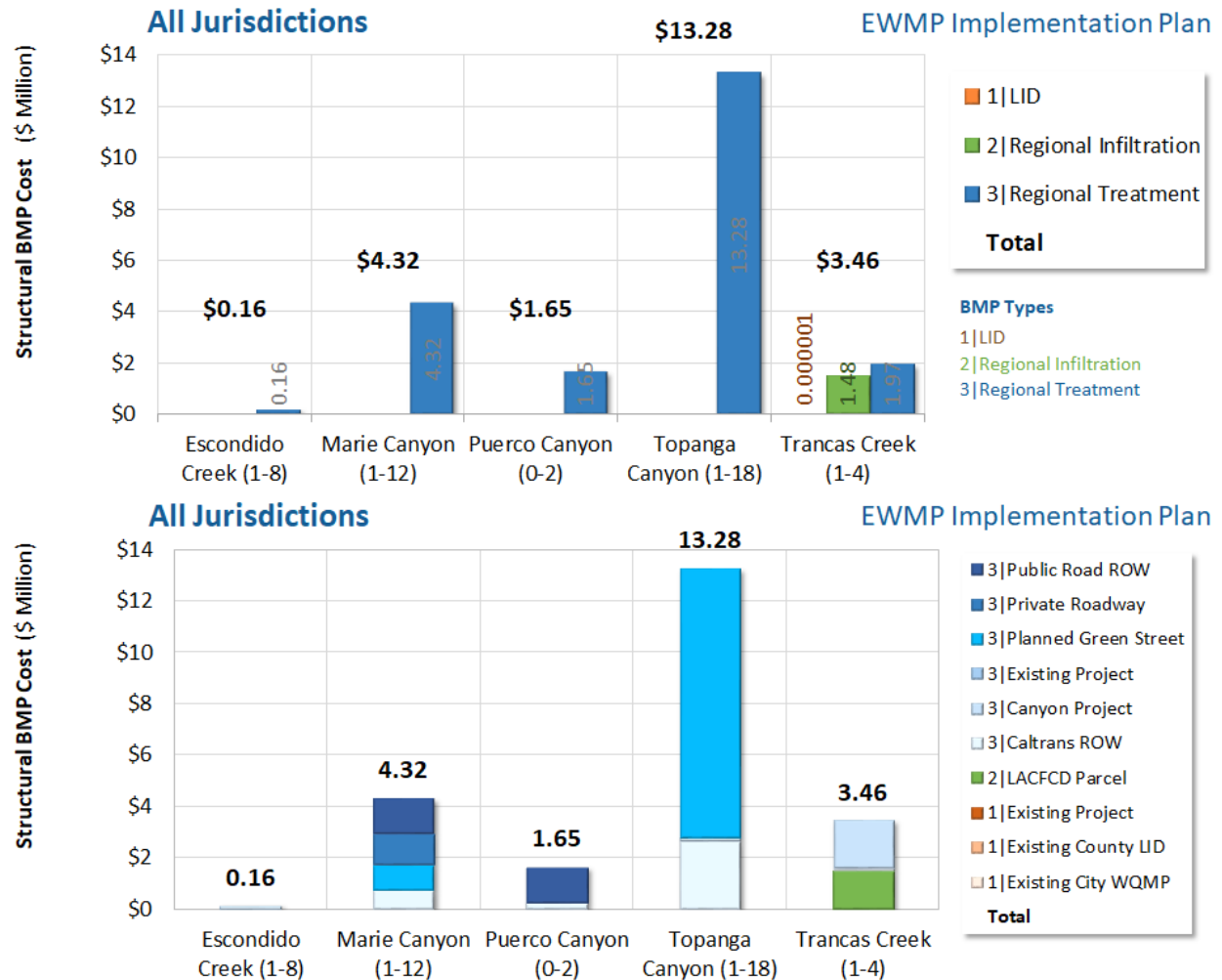


Figure 5A- 25. All Jurisdictions by Watershed: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

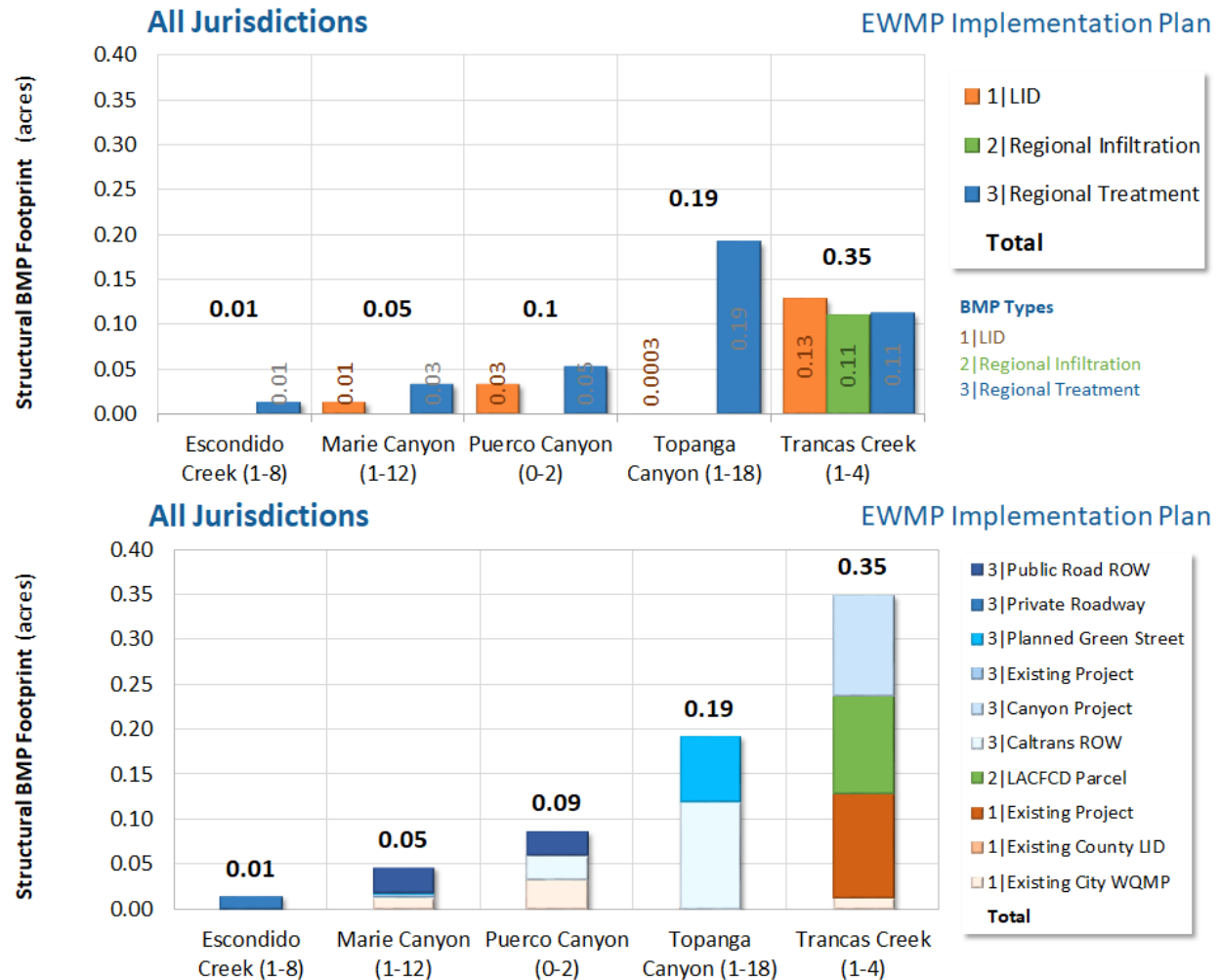


Figure 5A- 26. All Jurisdictions by Watershed: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

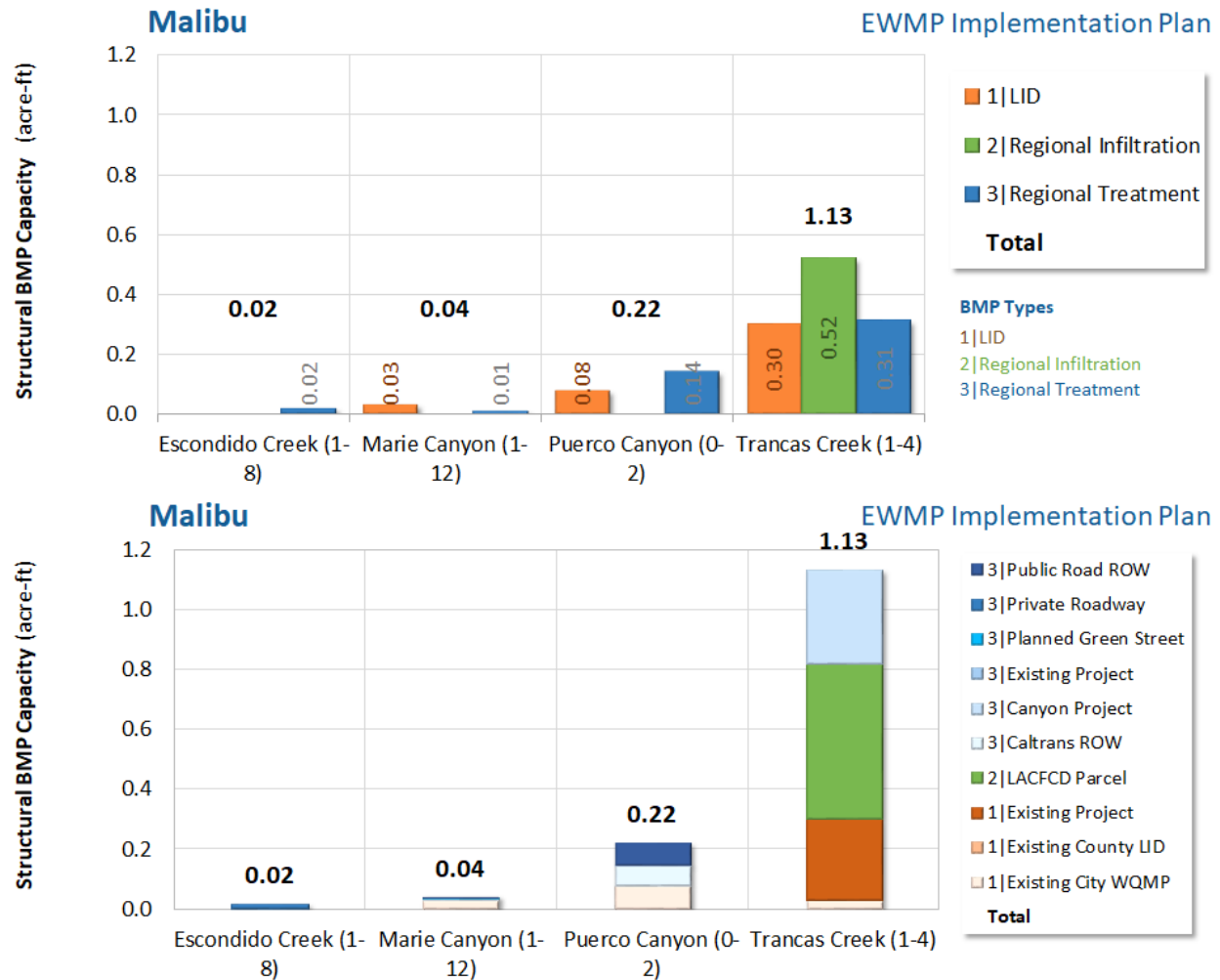


Figure 5A- 27. Malibu by Watershed: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

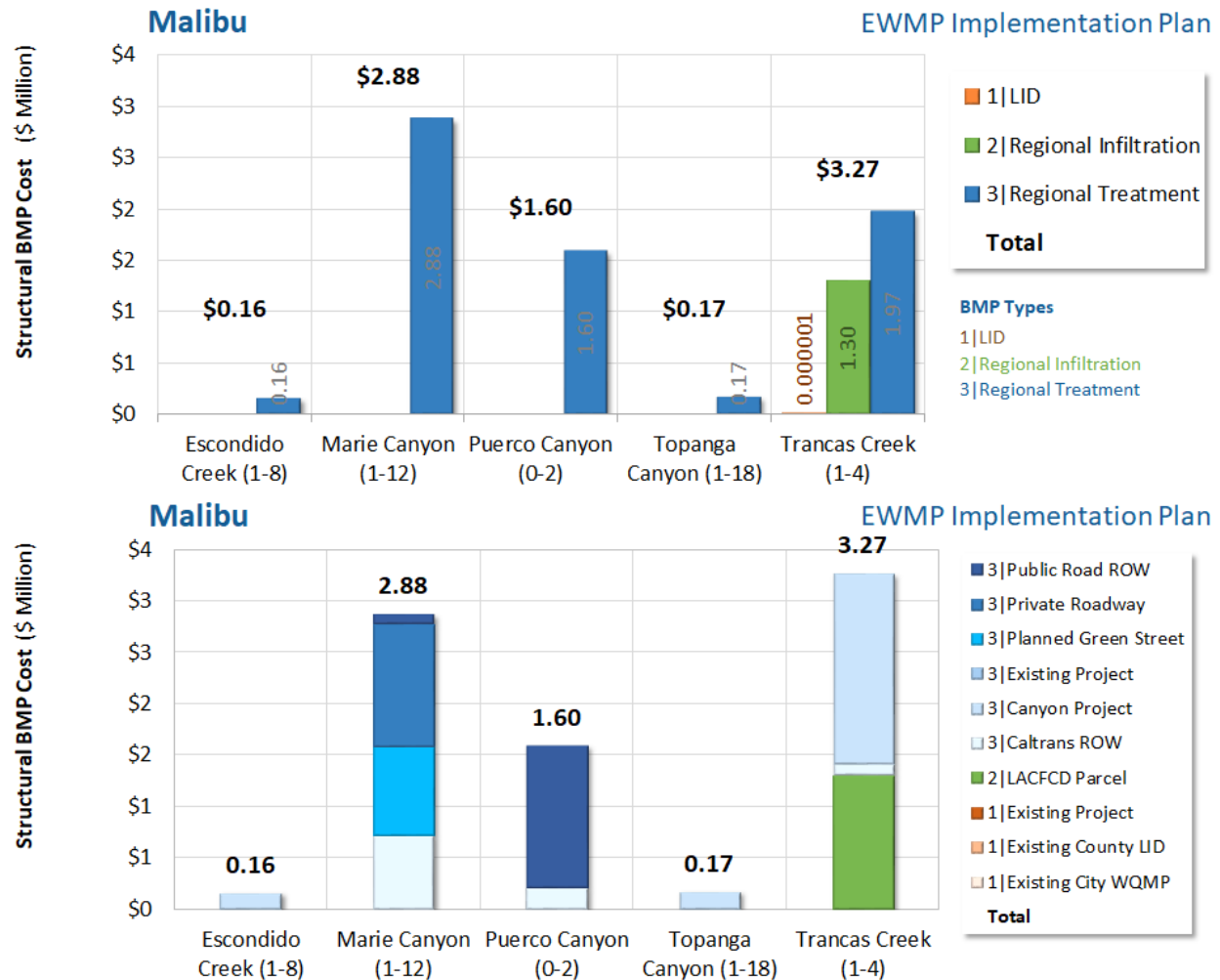


Figure 5A- 28. Malibu by Watershed: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

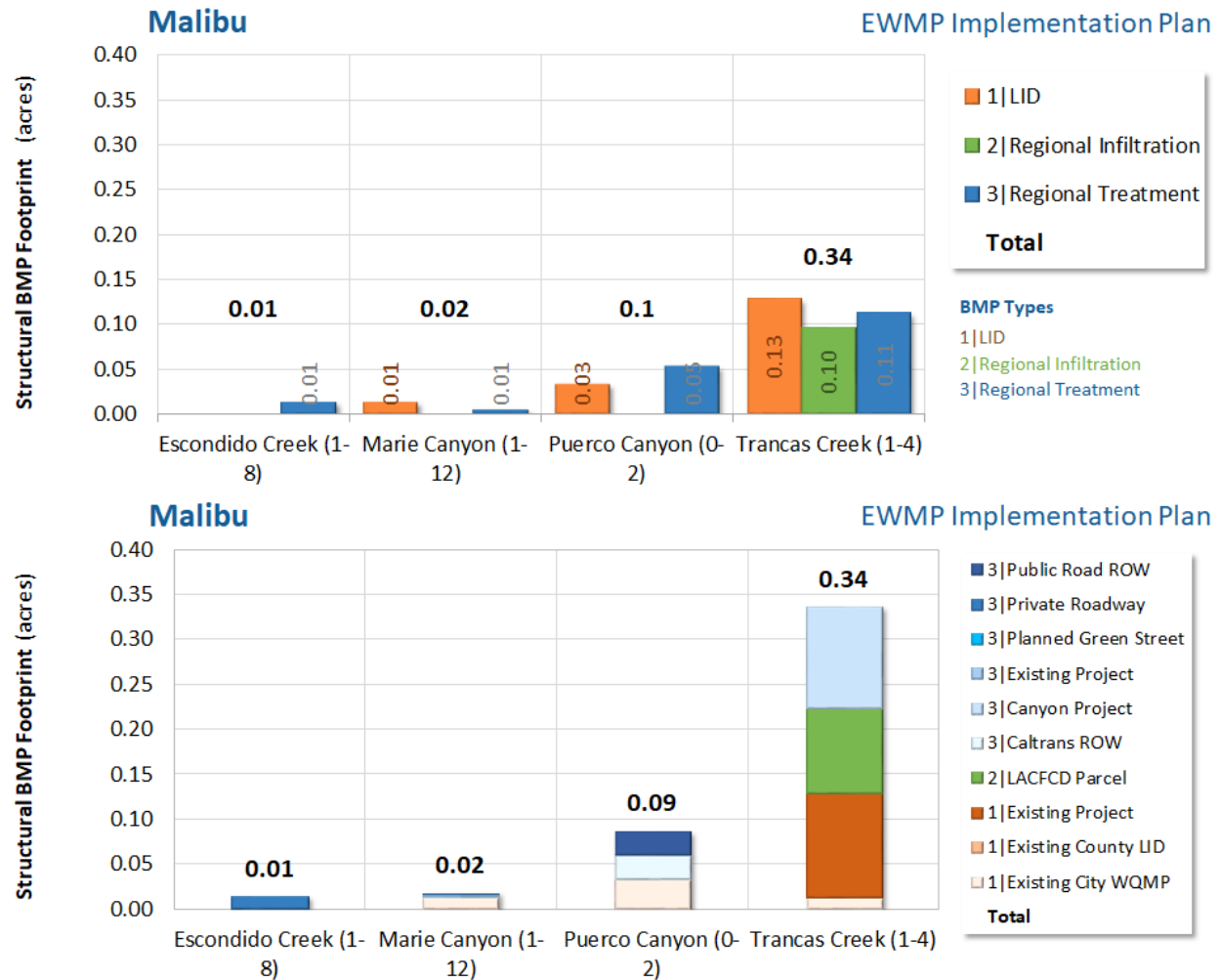


Figure 5A- 29. Malibu by Watershed: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

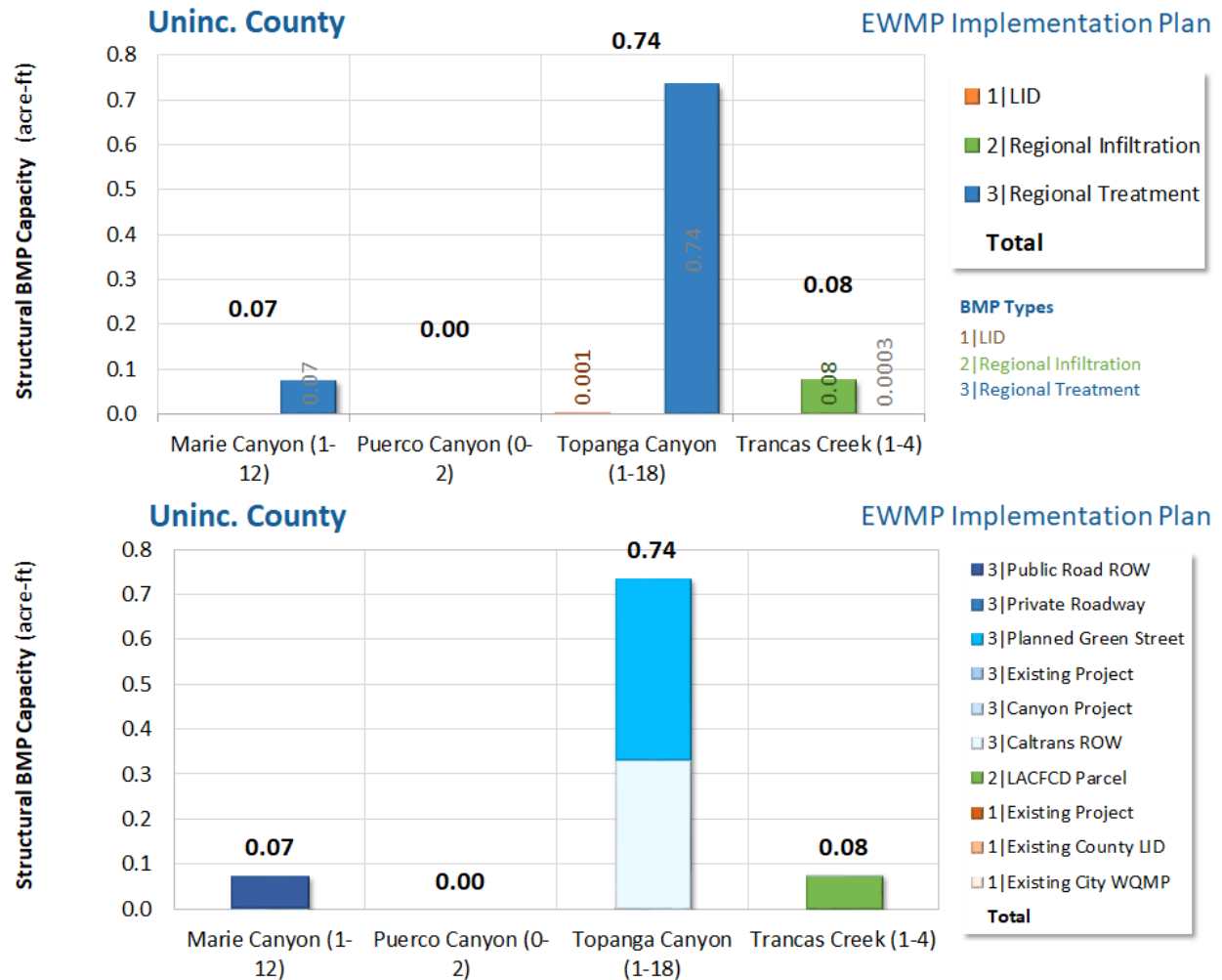


Figure 5A- 30. Uninc. County by Watershed: EWMP Implementation Strategy Capacity to Achieve Final EWMP Compliance.

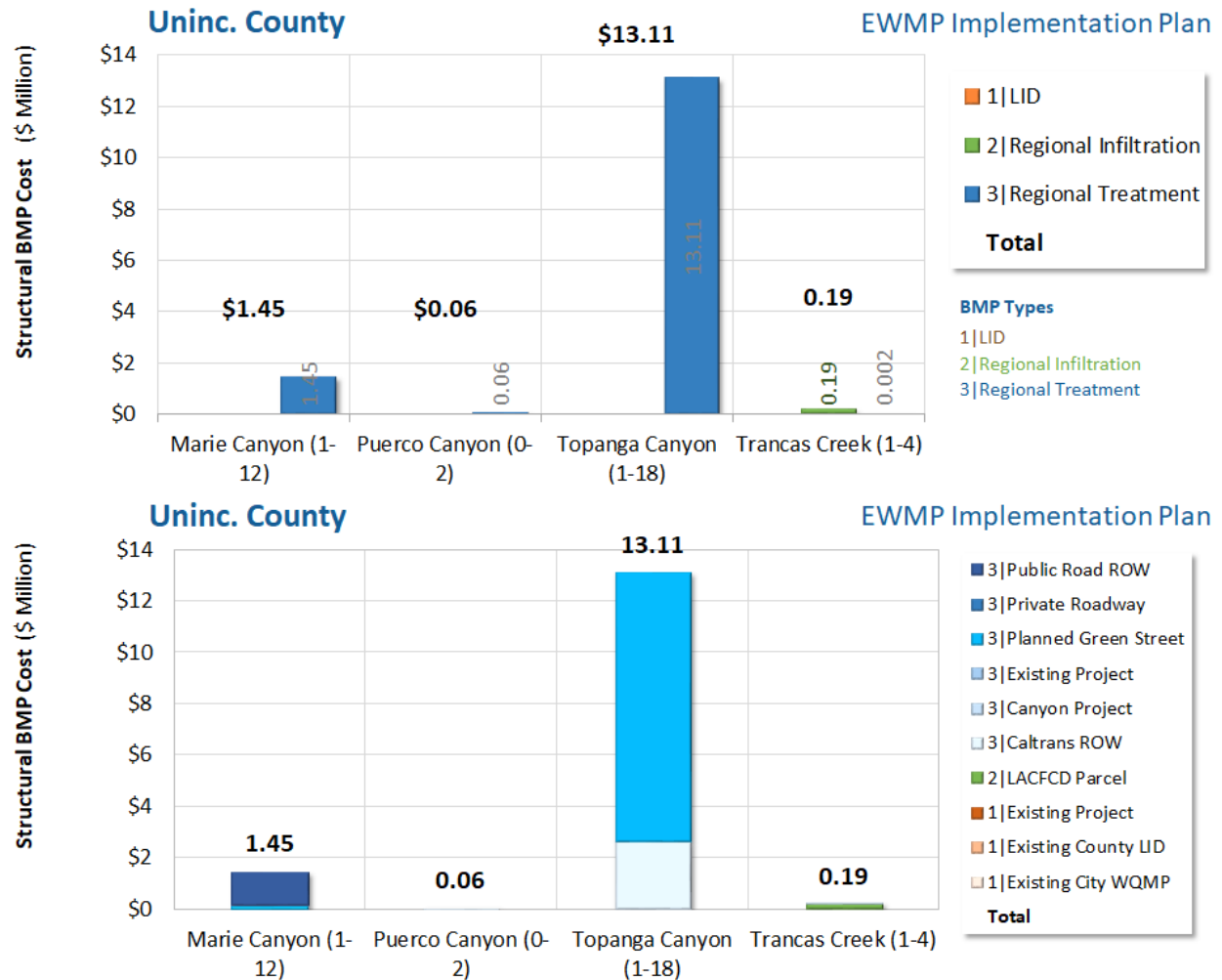


Figure 5A- 31. Uninc. County by Watershed: EWMP Implementation Strategy Cost to Achieve Final EWMP Compliance.

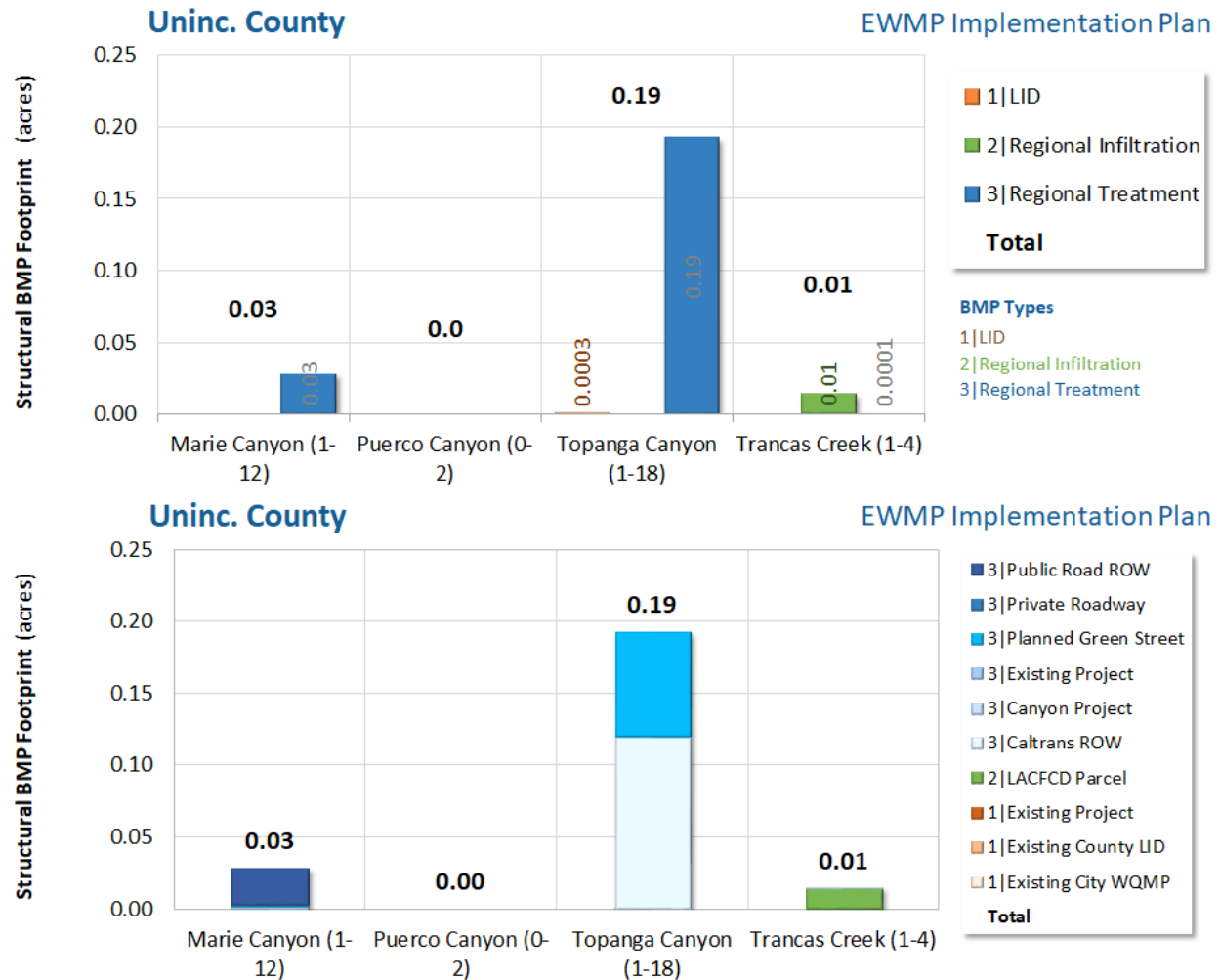


Figure 5A- 32. Uninc. County by Watershed: EWMP Implementation Strategy Footprint to Achieve Final EWMP Compliance.

Part 3.

Scheduling of BMP Capacities and Capital Costs by Jurisdiction and Priority Area Type

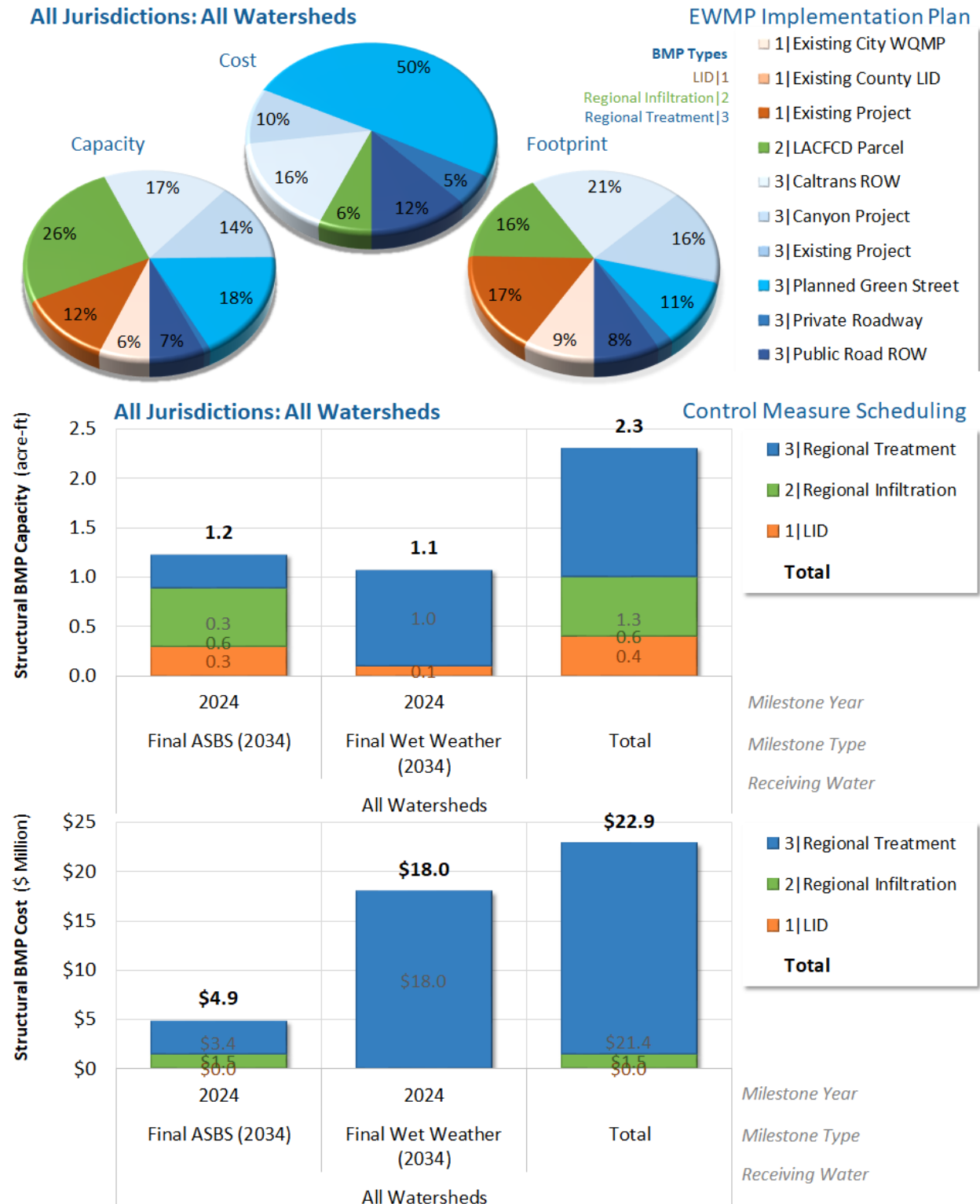


Figure 5A- 33. All Jurisdictions, All Watersheds: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

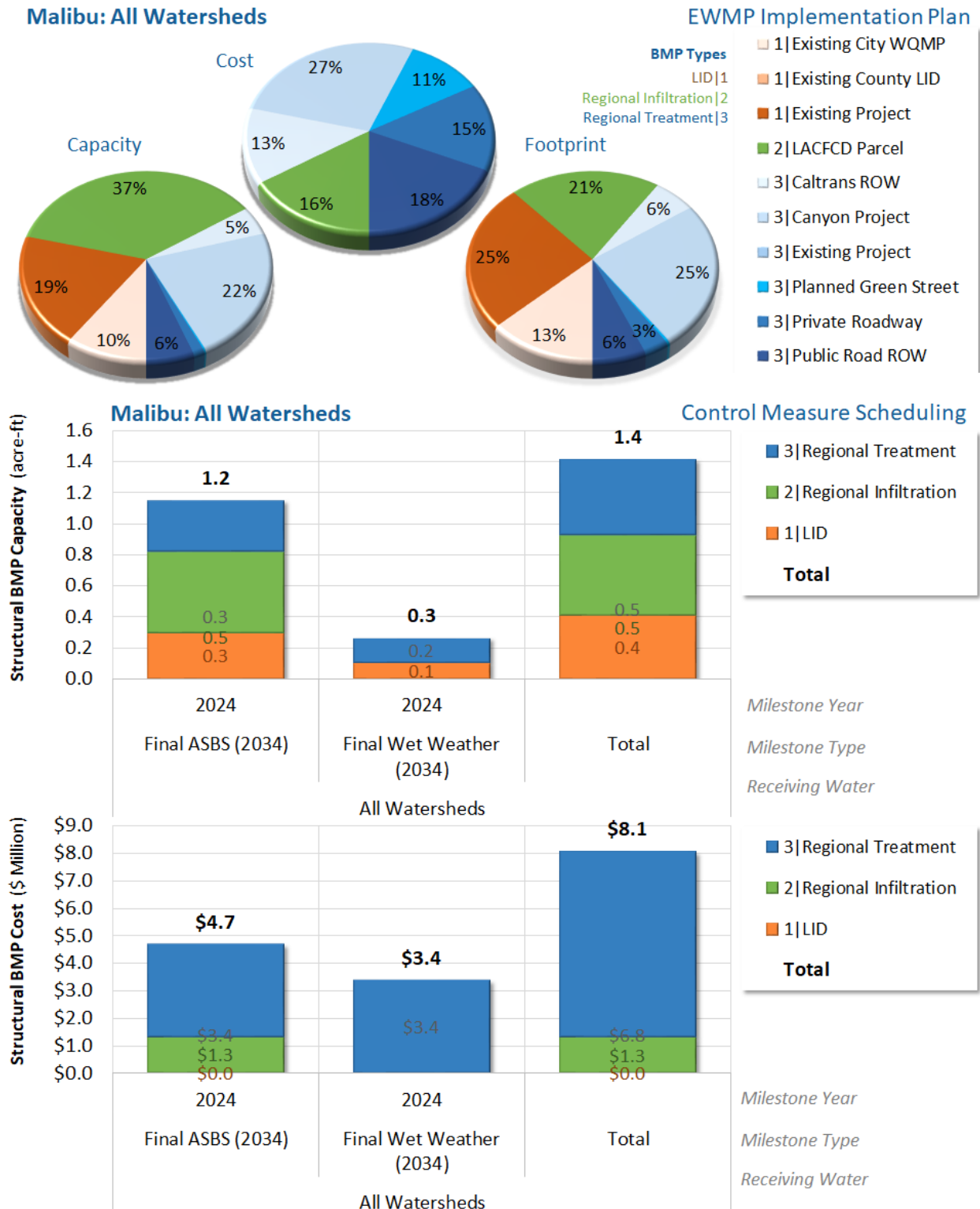


Figure 5A- 34. Malibu, All Watersheds: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

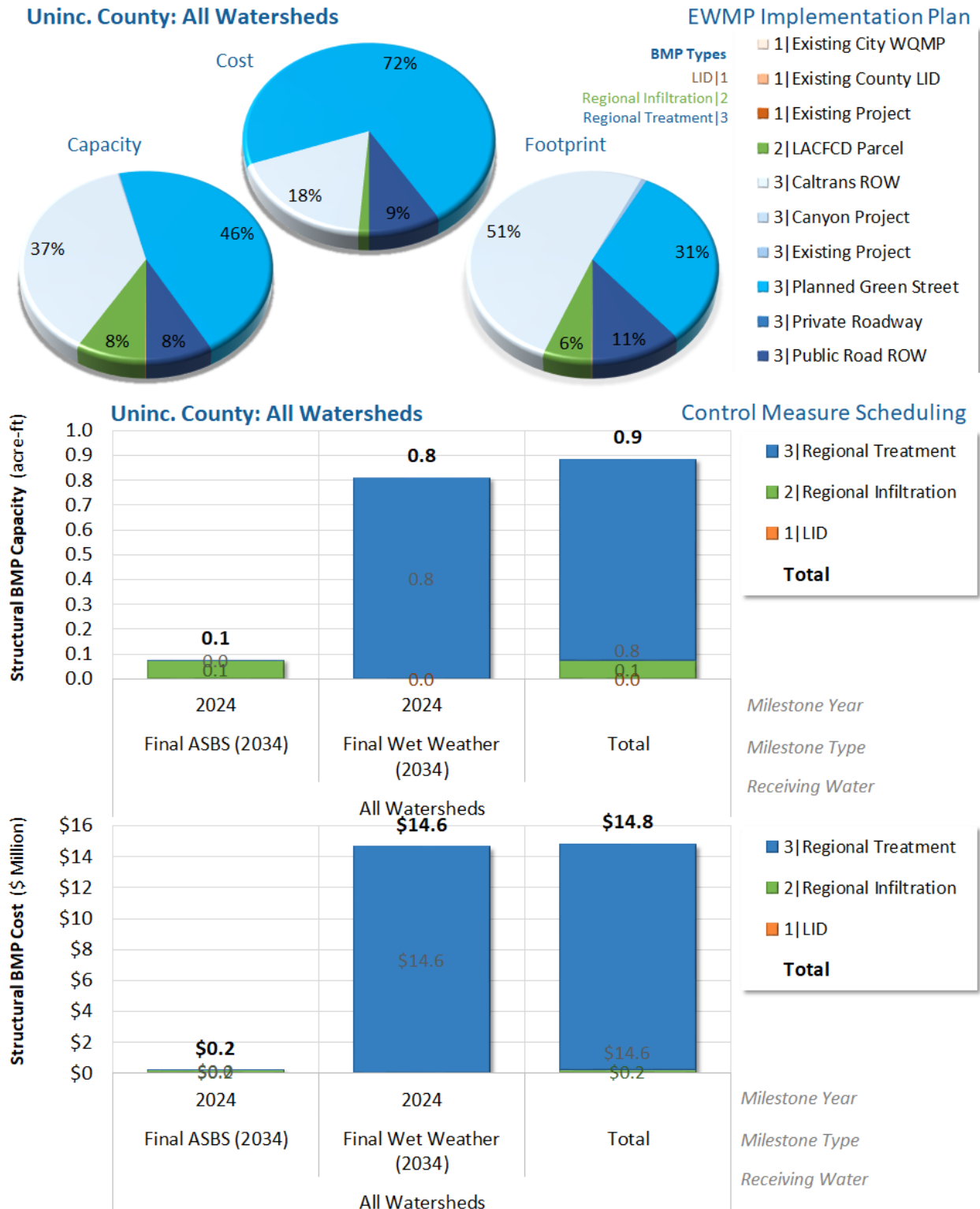


Figure 5A- 35. Uninc. County, All Watersheds: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

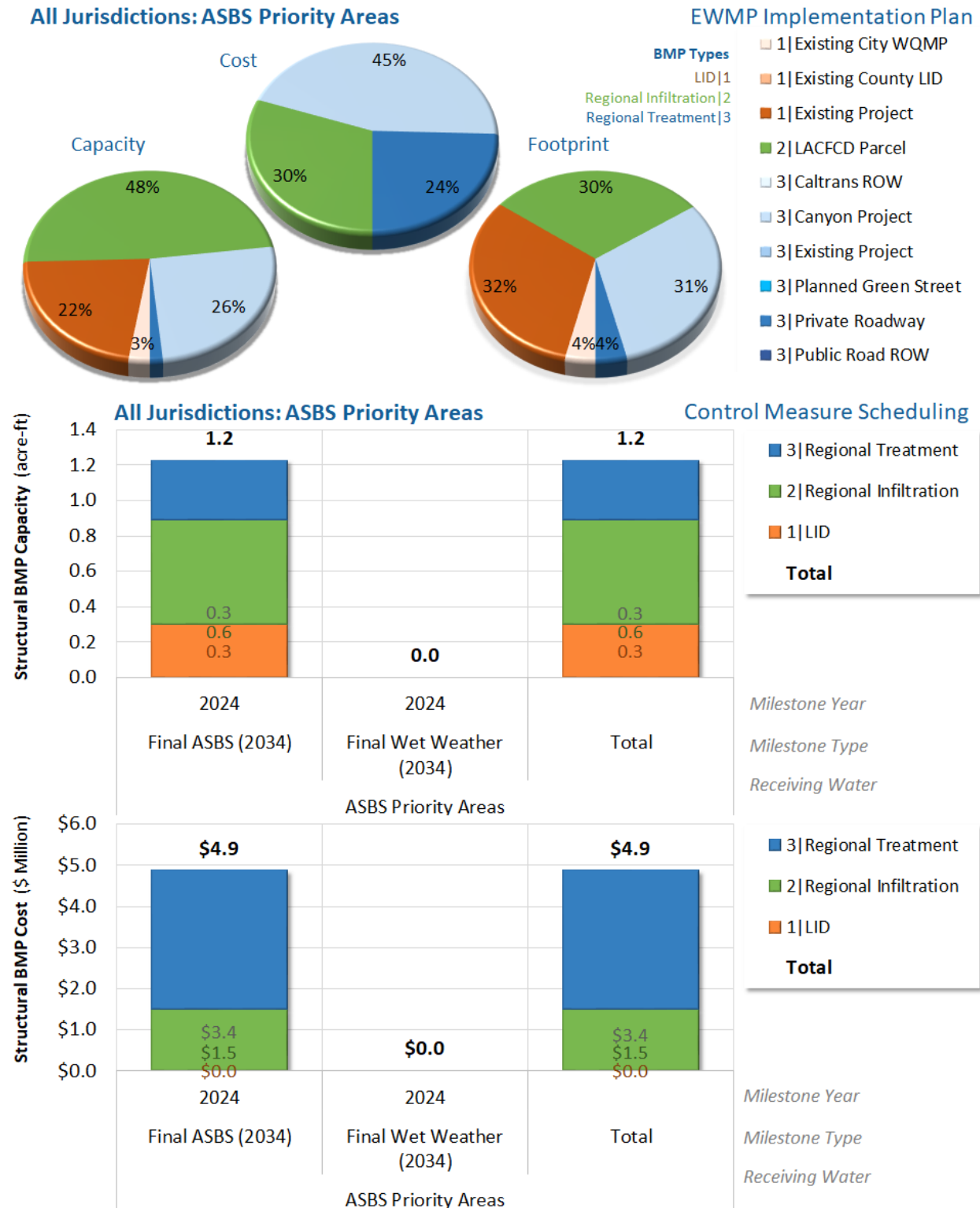


Figure 5A- 36. All Jurisdictions, ASBS Priority Areas: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

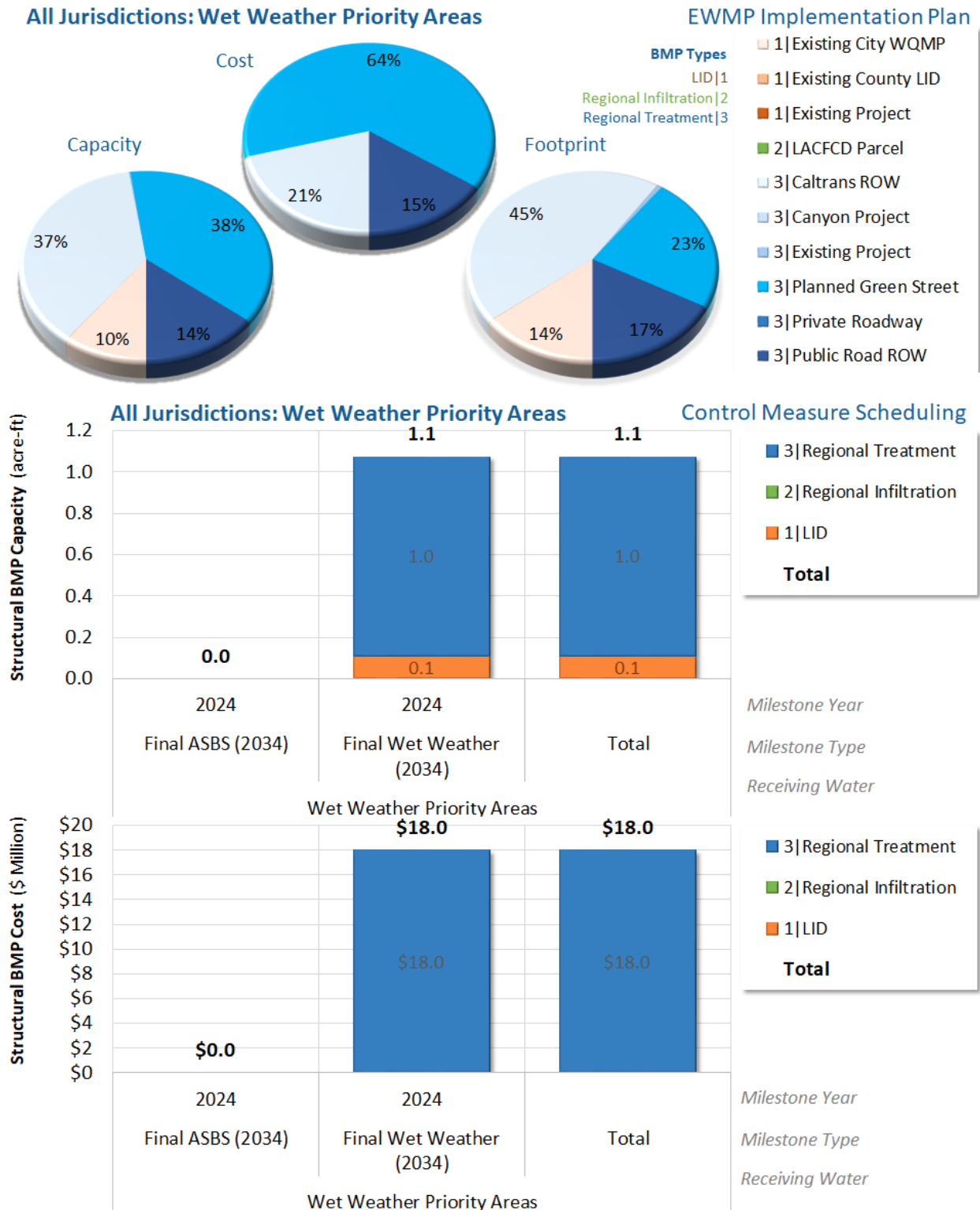
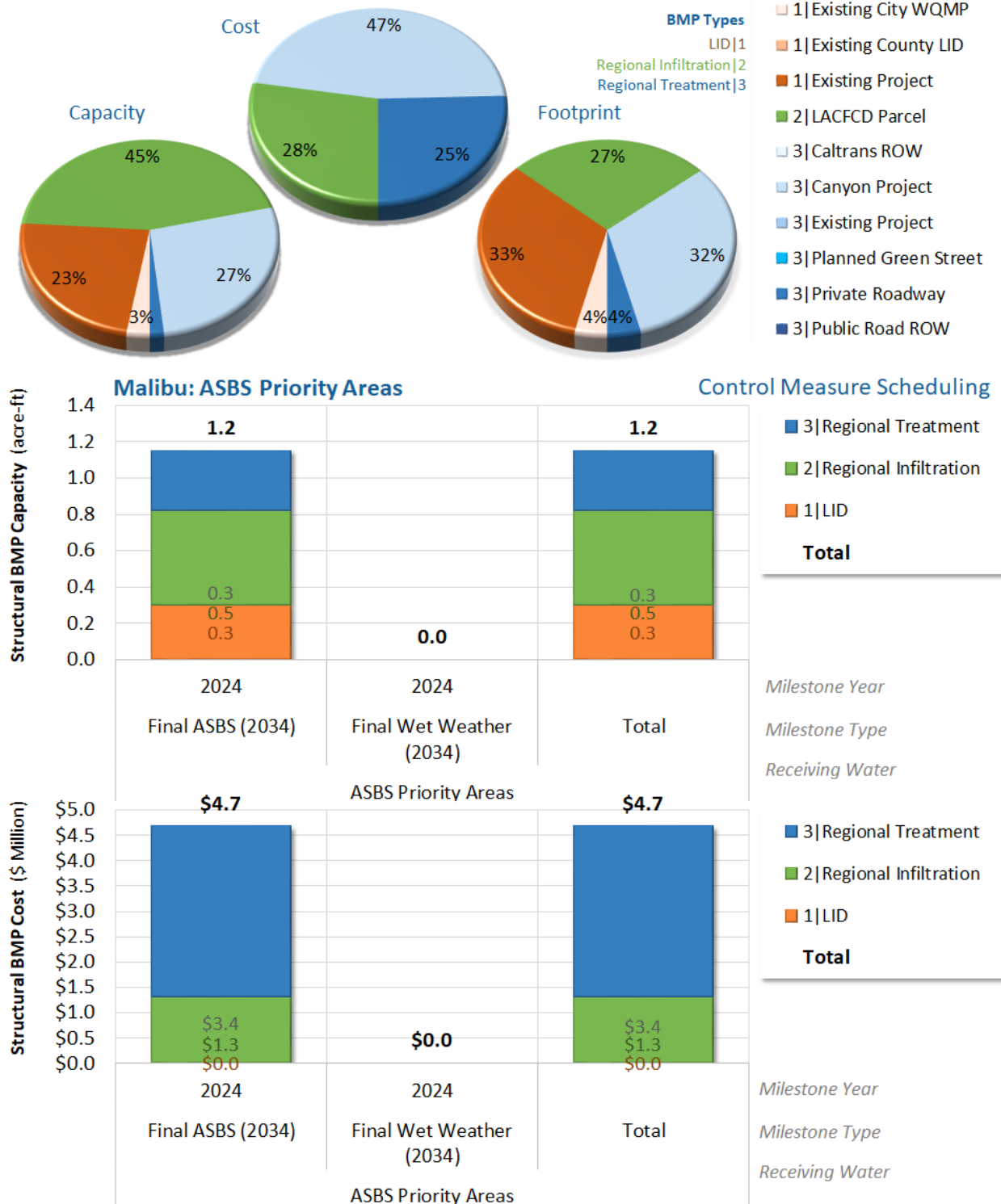


Figure 5A- 37. All Jurisdictions, Wet Weather Priority Areas: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

EWMP Implementation Plan



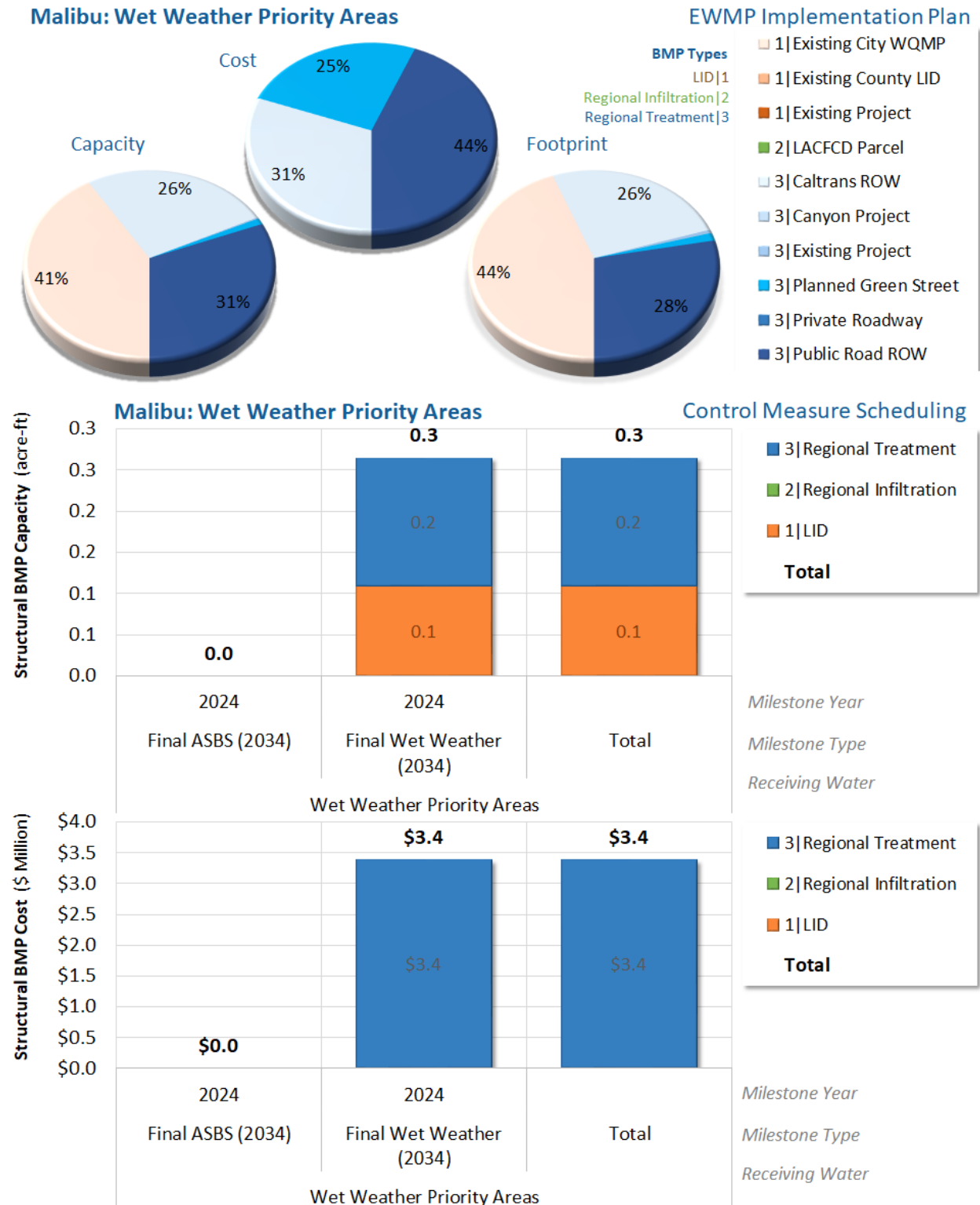
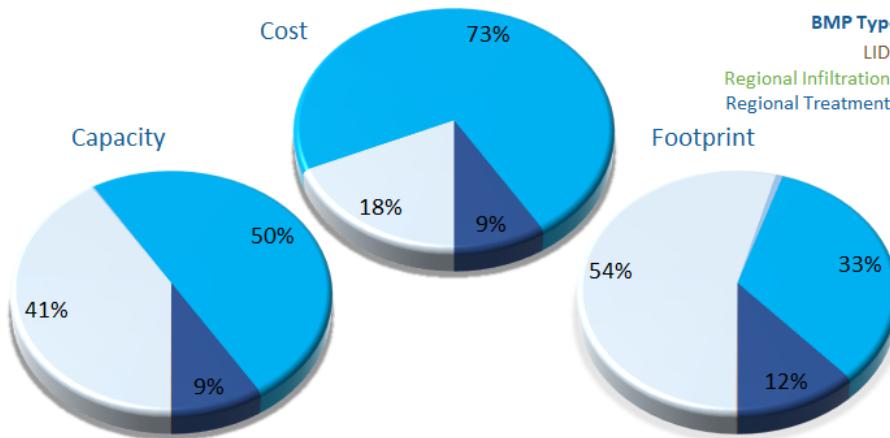


Figure 5A- 39. Malibu, Wet Weather Priority Areas: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

Uninc. County: Wet Weather Priority Areas



EWMP Implementation Plan

BMP Types

- LID|1
- Regional Infiltration|2
- Regional Treatment|3

- 1|Existing City WQMP
- 1|Existing County LID
- 1|Existing Project
- 2|LACFCD Parcel
- 3|Caltrans ROW
- 3|Canyon Project
- 3|Existing Project
- 3|Planned Green Street
- 3|Private Roadway
- 3|Public Road ROW

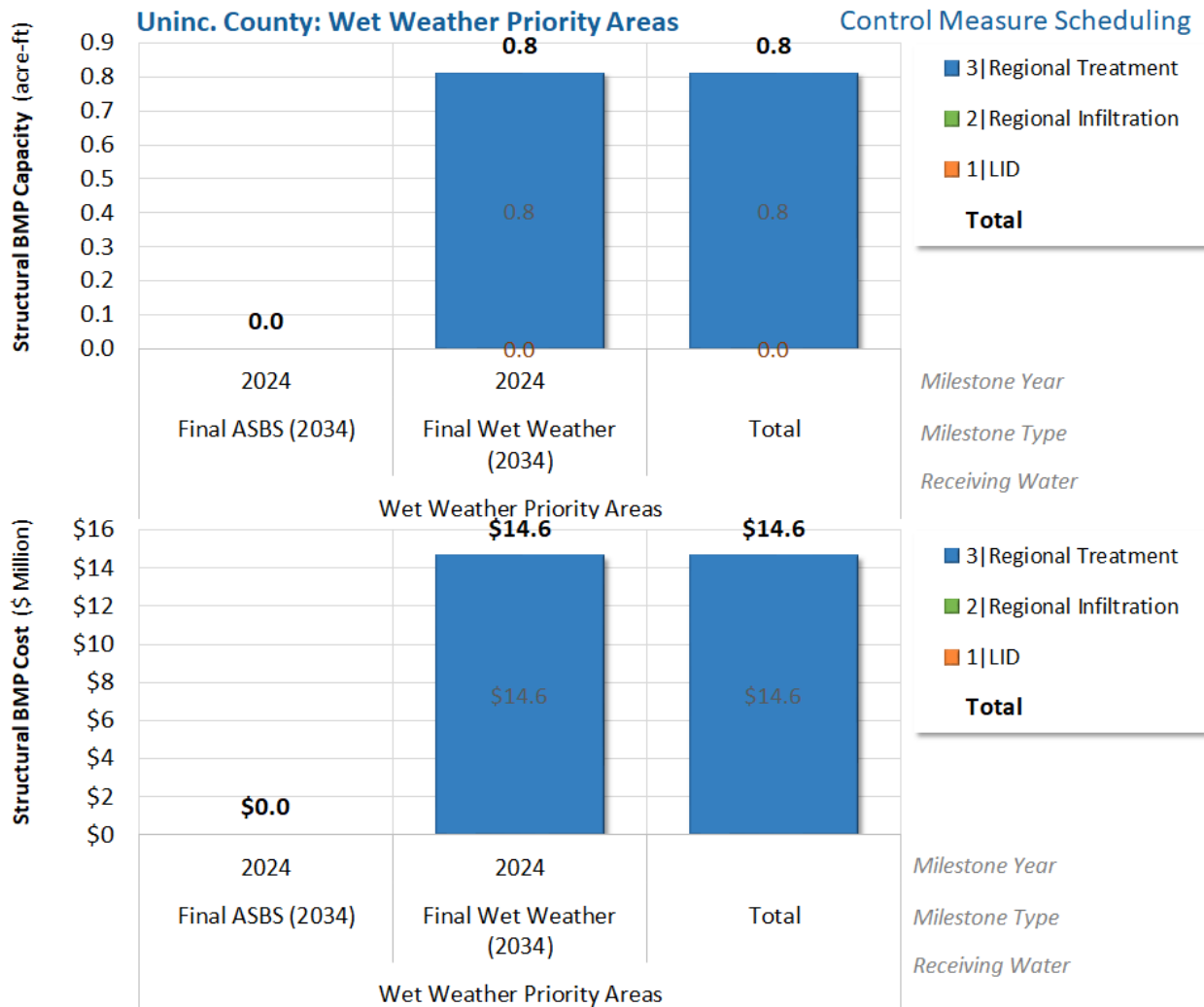


Figure 5A- 41. Uninc. County, Wet Weather Priority Areas: Scheduling of EWMP Implementation Strategy to Achieve TMDL Milestones.

Appendix 5B: Maps of Screening Opportunities and Selected Regional BMPs in EWMP Implementation Plan

OVERVIEW:

In this appendix, each Priority Area in the NSMBCW EWMP has a set of maps to present the results of the screening analysis and details on selected regional BMPs, as follows:

- Map 1: delineation of all evaluated opportunities including LID on residential and ICI parcels
- Map 2: maximum available footprints considered for regional infiltration and treatment BMPs, organized by footprint type (public ROW, Caltrans ROW, etc.)
- Map 3: identification of selected regional BMPs and corresponding IDs and sizing. Details on these regional BMPs can be found in Appendix 5C.
- Map 4: illustration of areas managed by regional BMPs and approximately treatment depths.

All areas are mapped separately for City and County areas.

Note: many of the regional BMPs are high-flow treatment devices and thus the reported storage volumes are relatively small compared to regional infiltration – the capacities do not incorporate the 24-hour flow thru rate, only the void space in the BMP. The 24-hour capacity of the treatment BMPs is much higher than the storage capacity.

City of Malibu, Escondido Creek (1-8)

City of Malibu, Escondido Creek (1-8)

BMP Opportunities and Drainage Areas Identified during Screening Process



Figure 5B-1. City of Malibu, Escondido Creek (1-8) EWMP implementation strategy screened BMP opportunity maximum footprint.

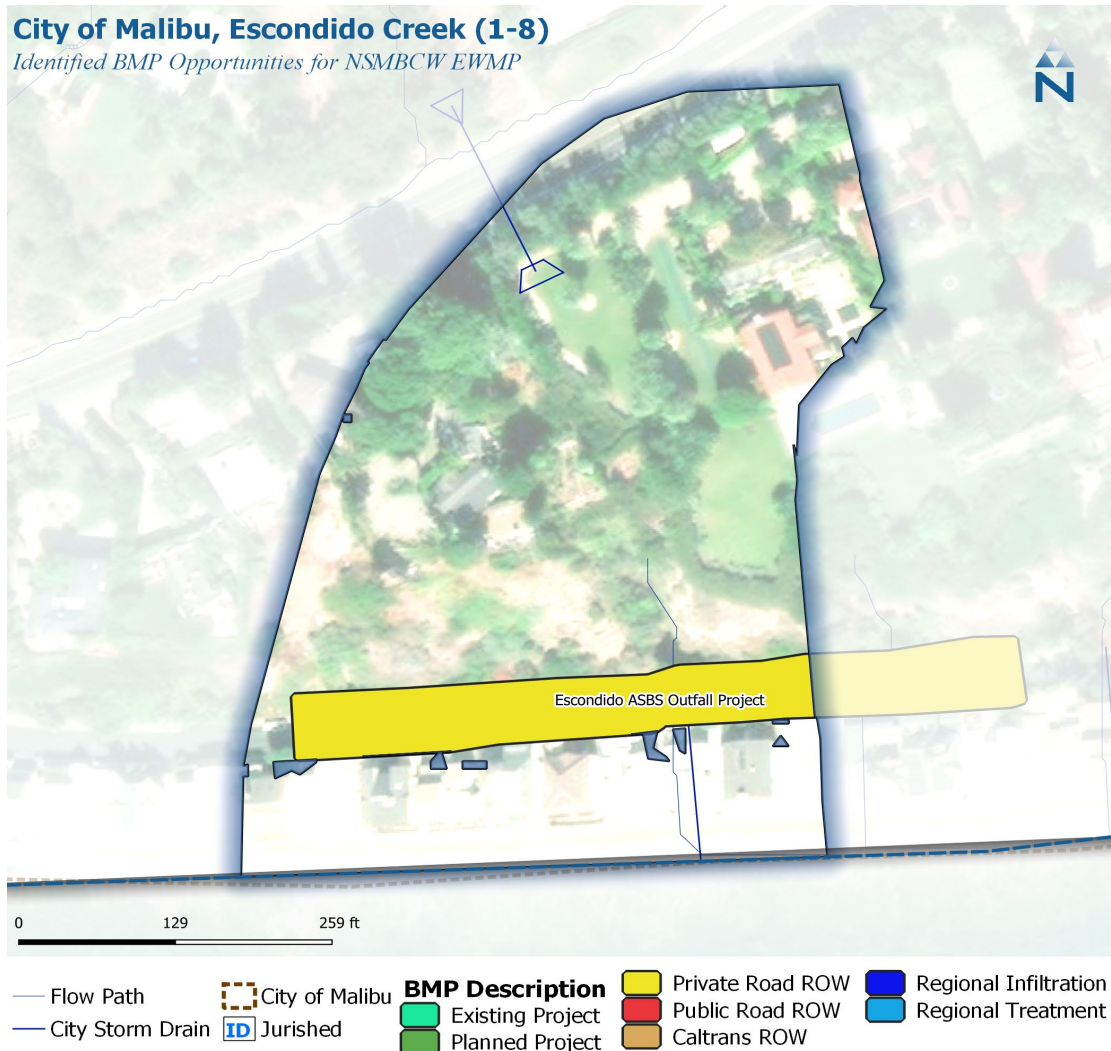


Figure 5B-2. City of Malibu, Escondido Creek (1-8) EWMP implementation strategy screened BMP opportunity type and location.

City of Malibu, Escondido Creek (1-8)

Regional Control Measures in EWMP Implementation Plan

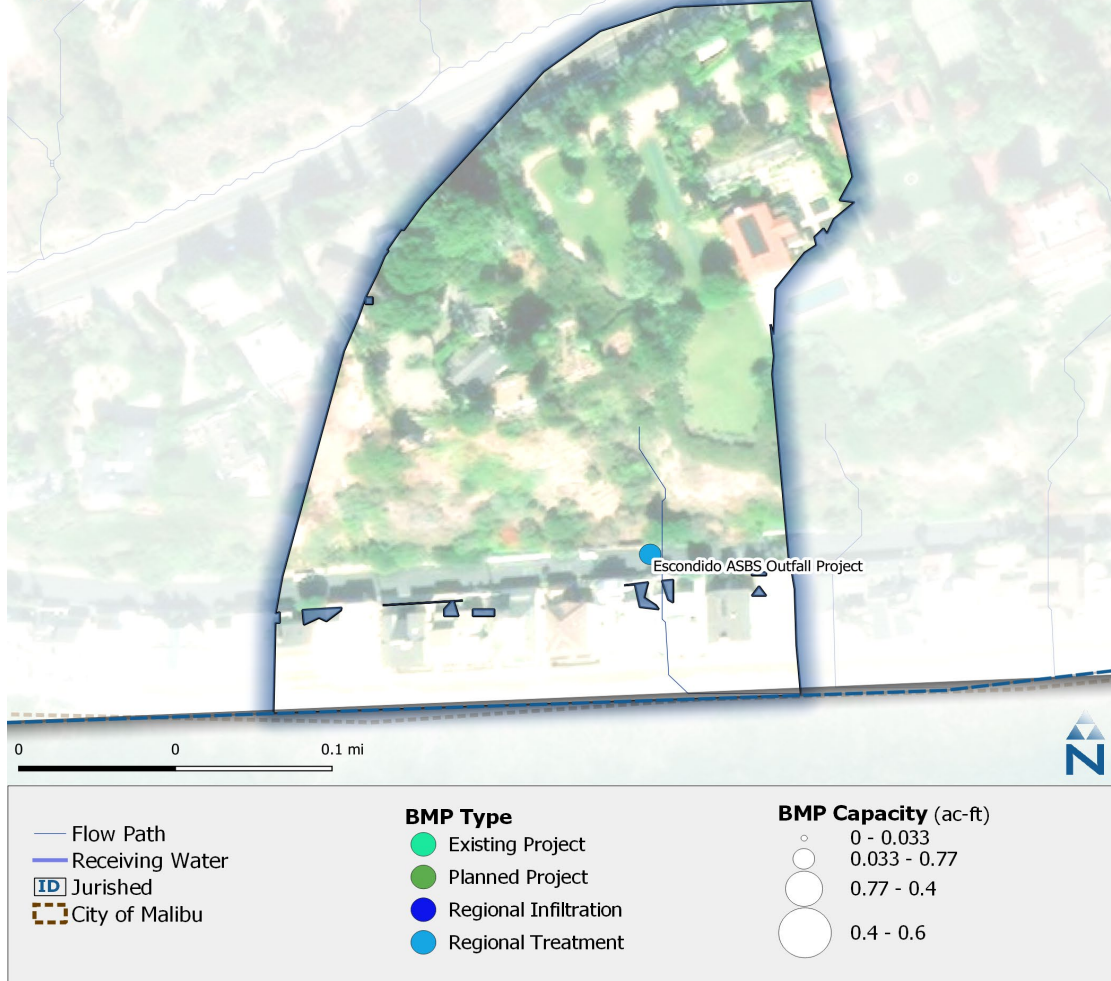


Figure 5B-3. City of Malibu, Escondido Creek (1-8) EWMP implementation strategy selected project BMP type and footprint.

City of Malibu, Escondido Creek (1-8)

Selected BMP Opportunities for NSMBCW EWMP

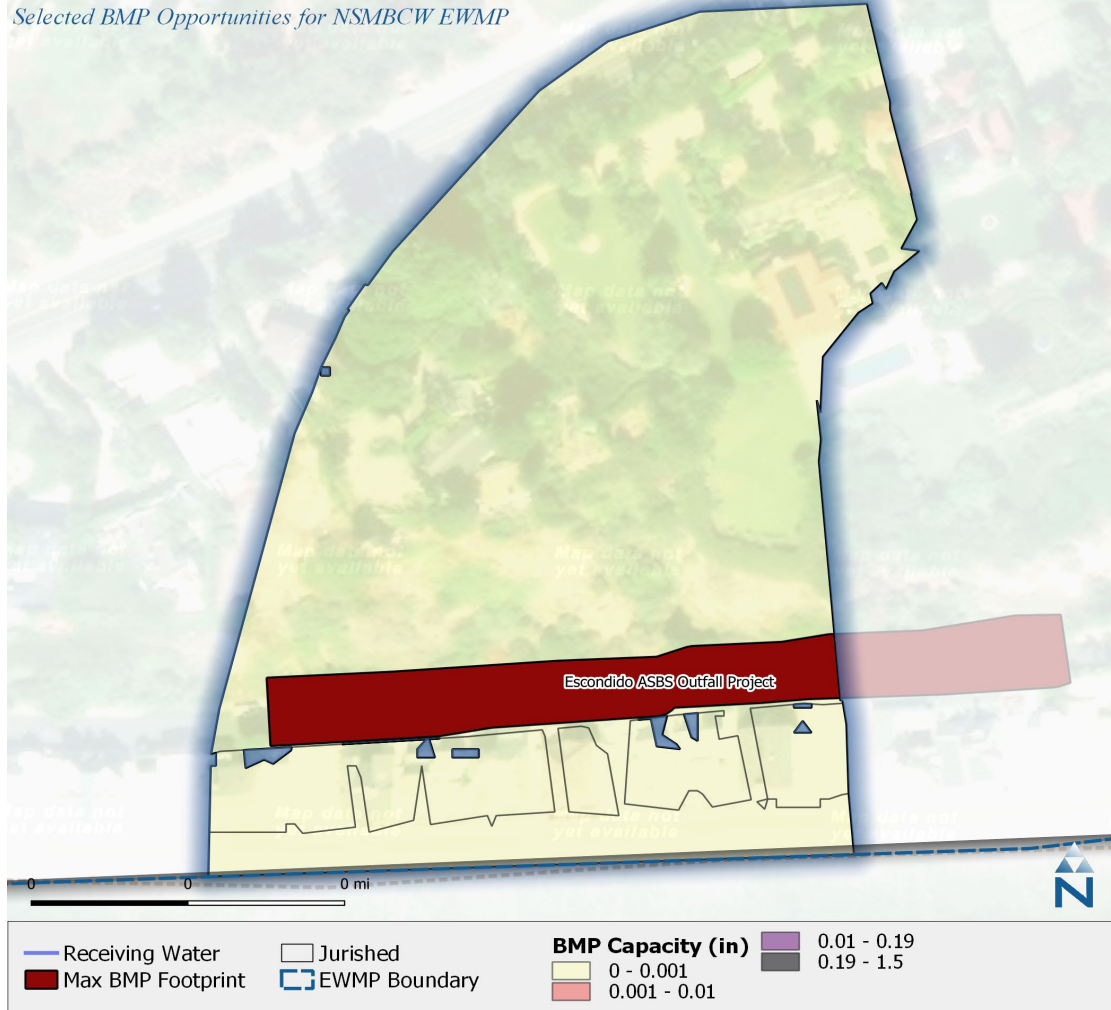


Figure 5B-4. City of Malibu, Escondido Creek (1-8) EWMP implementation strategy selected project treatment depth (inches).

City of Malibu, Marie Canyon (1-12)

City of Malibu, Marie Canyon (1-12)

BMP Opportunities and Drainage Areas Identified during Screening Process

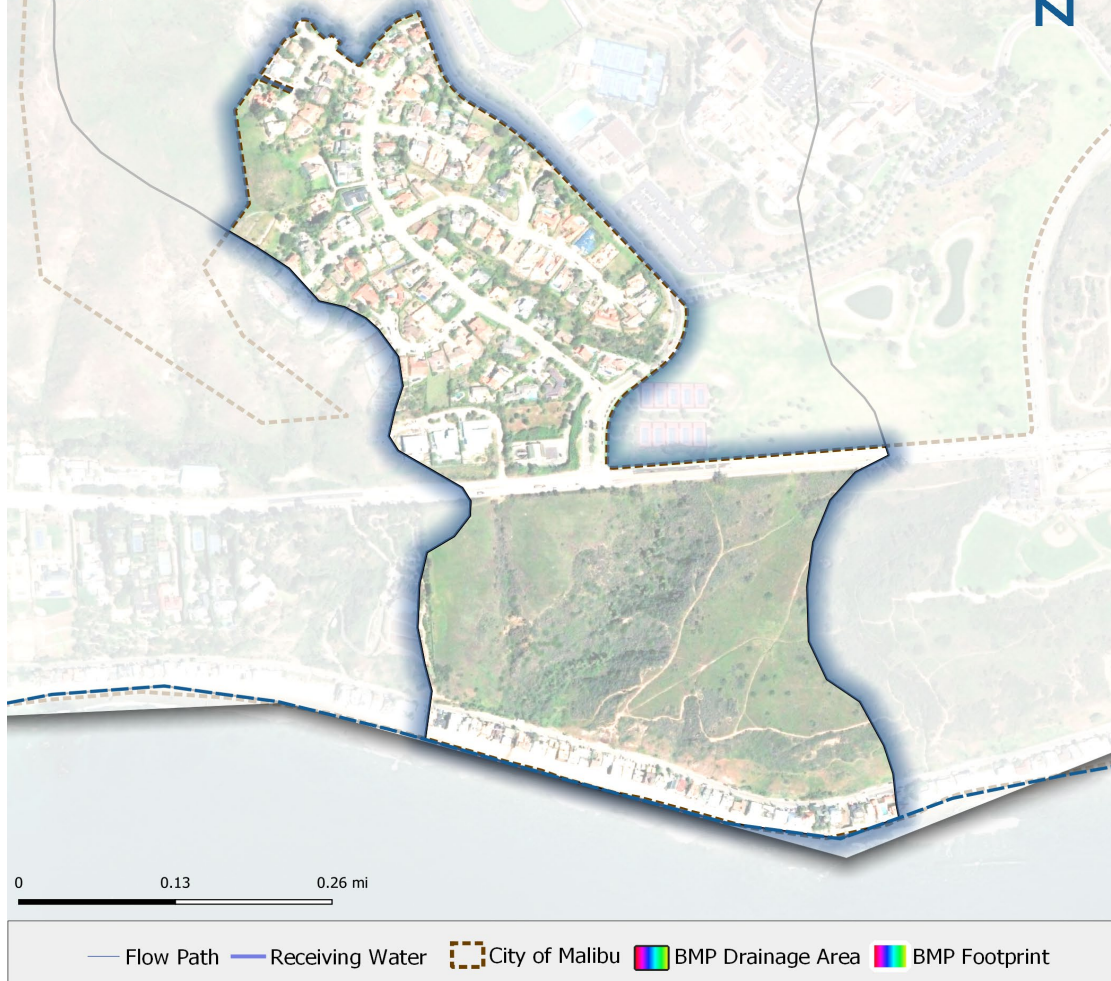


Figure 5B-5. City of Malibu, Marie Canyon (1-12) EWMP implementation strategy screened BMP opportunity maximum footprint.

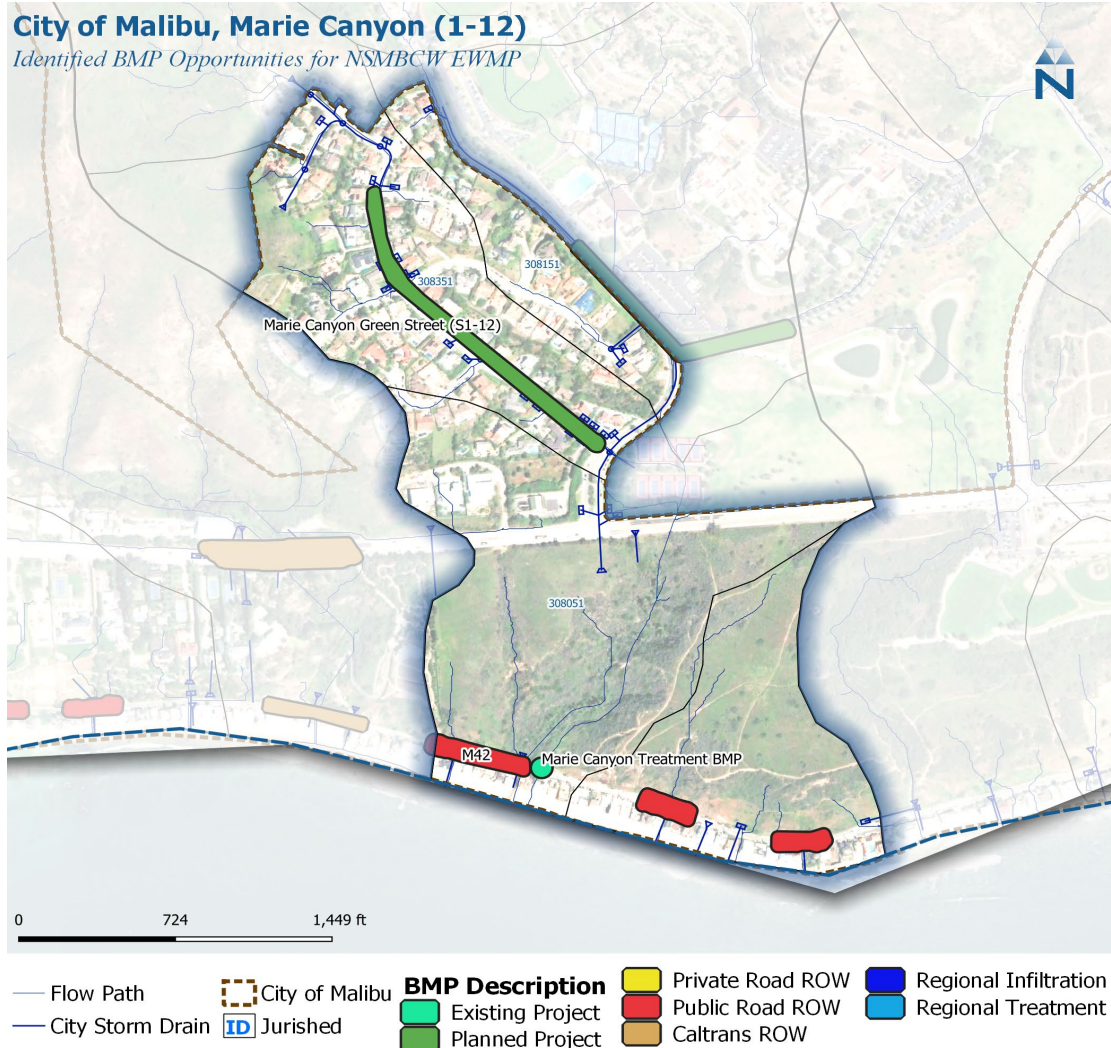


Figure 5B-6. City of Malibu, Marie Canyon (1-12) EWMP implementation strategy screened BMP opportunity type and location.

City of Malibu, Marie Canyon (1-12)

Regional Control Measures in EWMP Implementation Plan

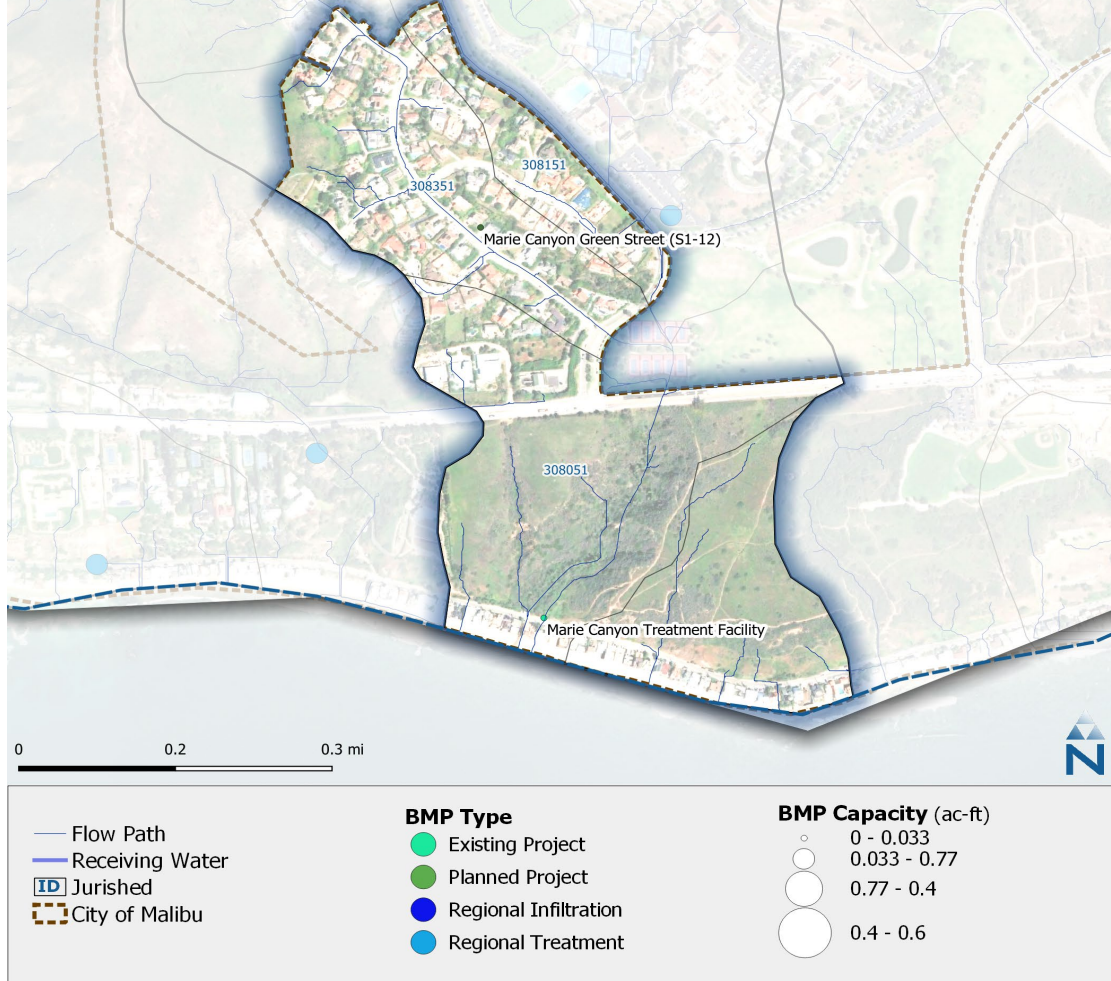


Figure 5B-7. City of Malibu, Marie Canyon (1-12) EWMP implementation strategy selected project BMP type and footprint.

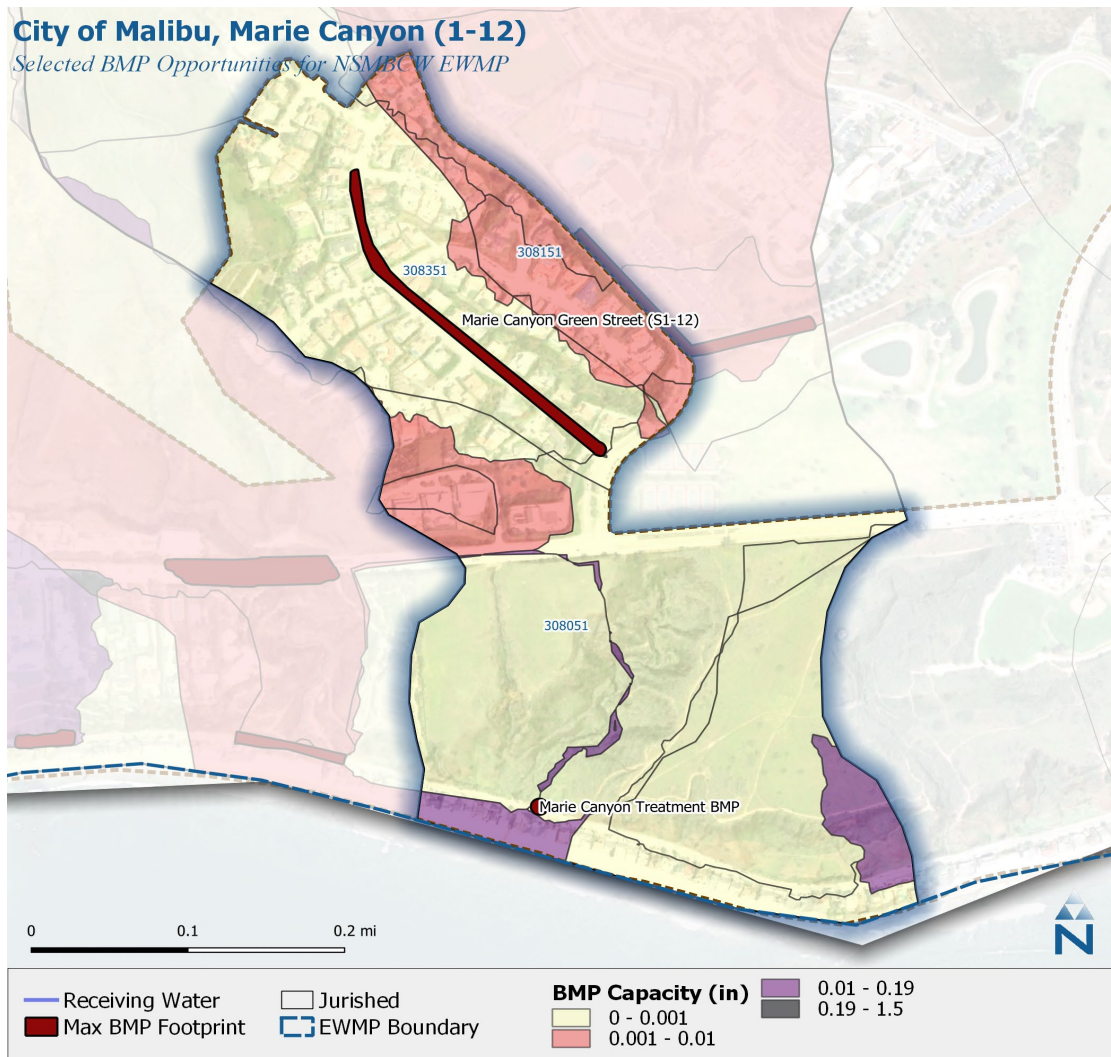


Figure 5B-8. City of Malibu, Marie Canyon (1-12) EWMP implementation strategy selected project treatment depth (inches).

City of Malibu, Puerco Canyon (0-2)

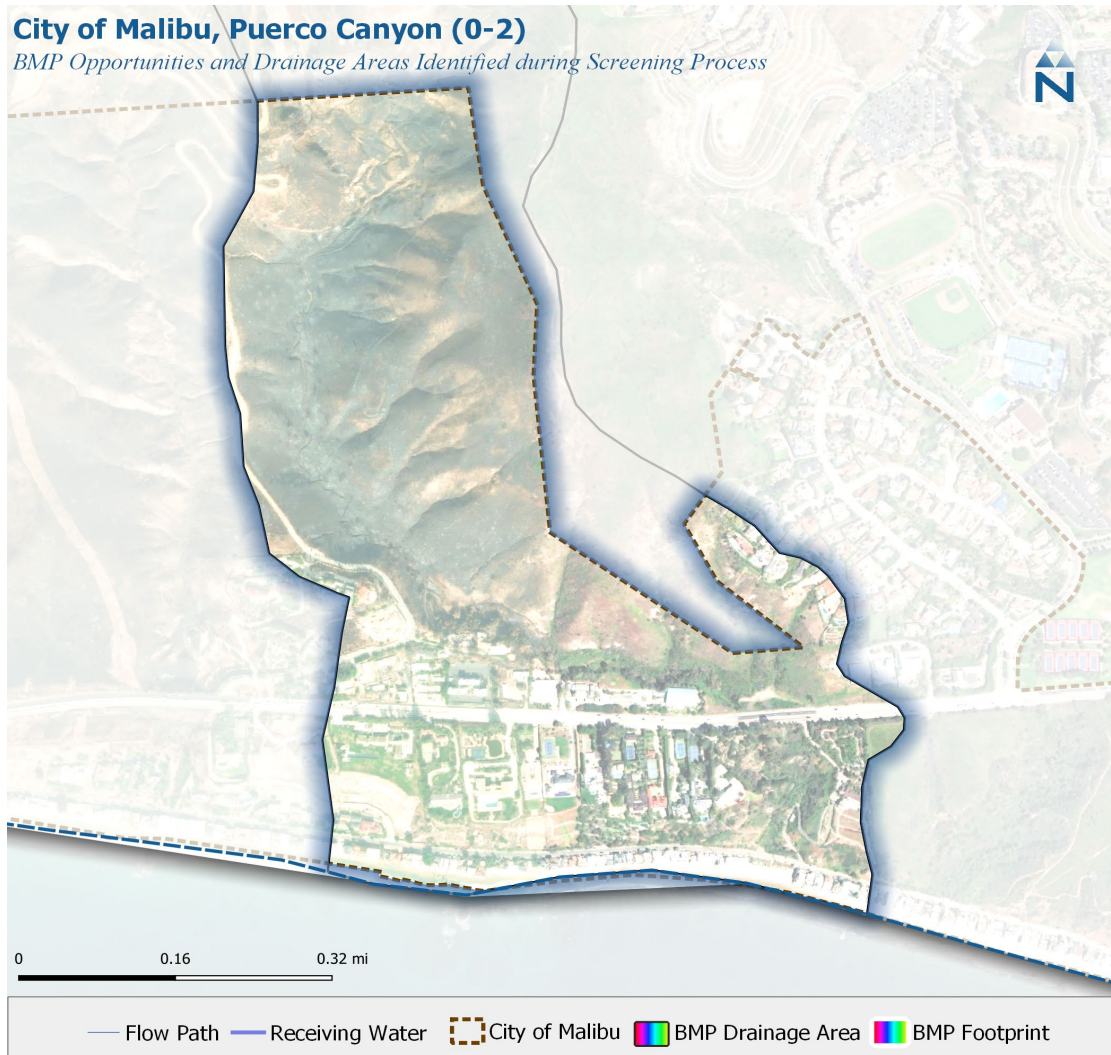


Figure 5B-9. City of Malibu, Puerco Canyon (0-2) EWMP implementation strategy screened BMP opportunity maximum footprint.

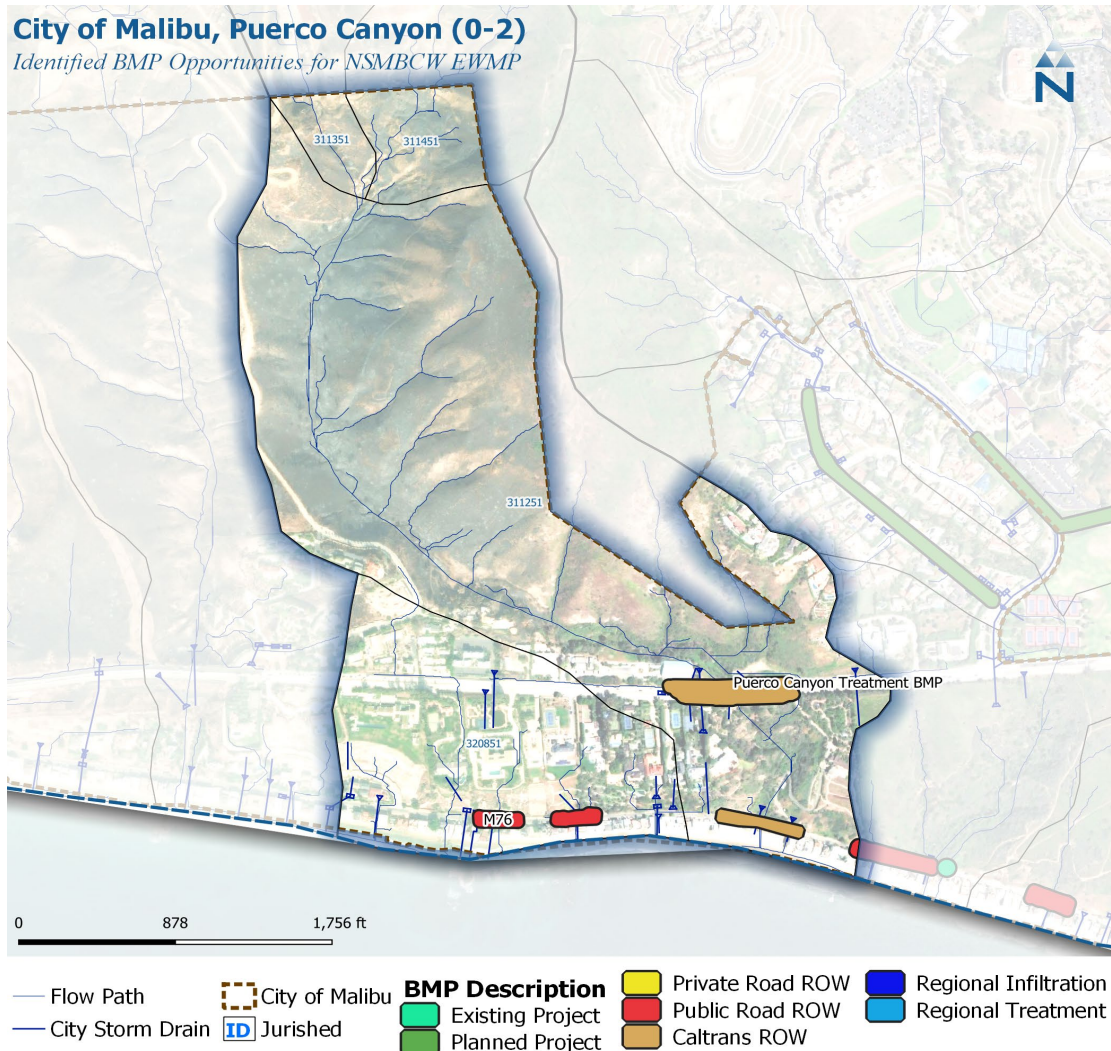


Figure 5B-10. City of Malibu, Puerco Canyon (0-2) EWMP implementation strategy screened BMP opportunity type and location.

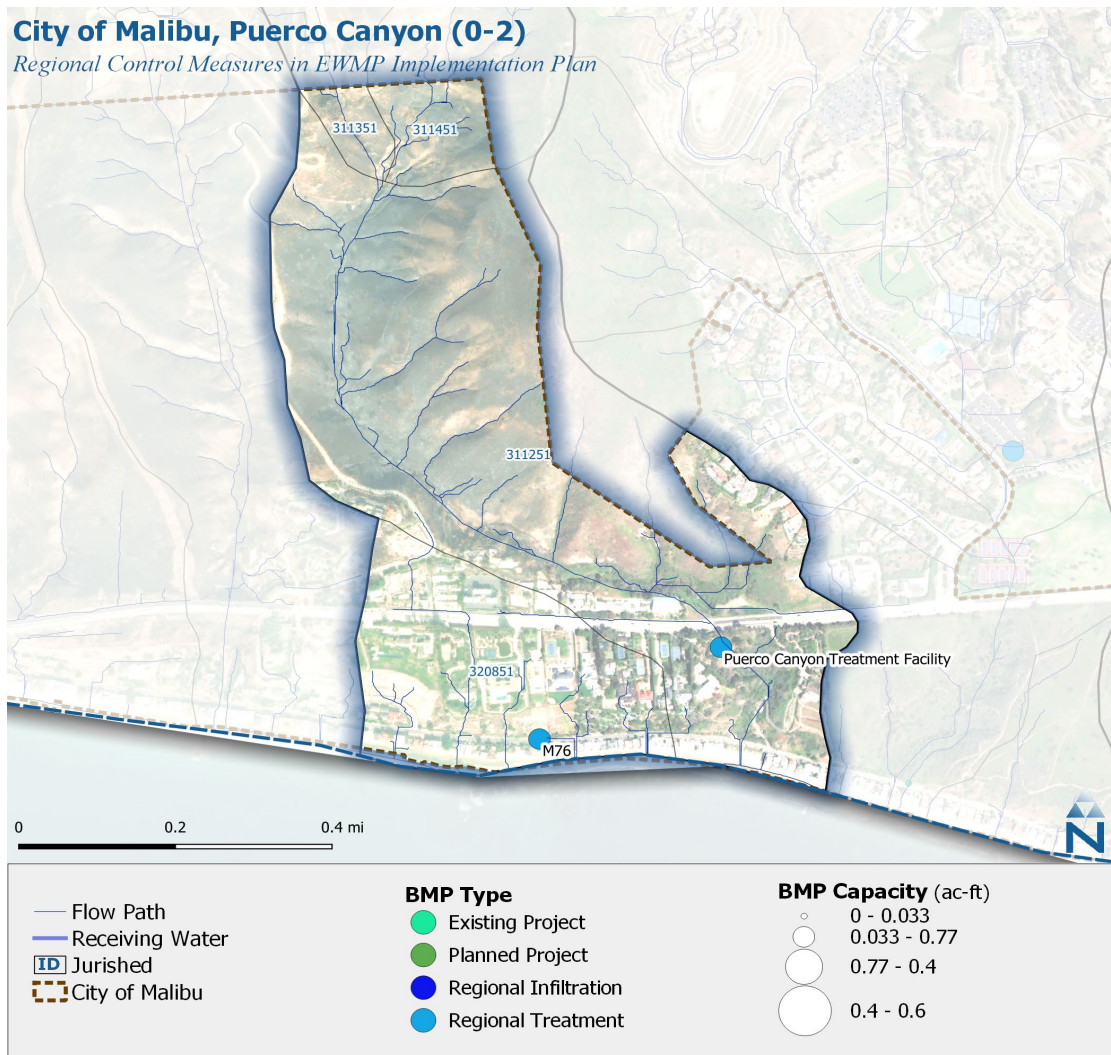


Figure 5B-11. City of Malibu, Puerco Canyon (0-2) EWMP implementation strategy selected project BMP type and footprint.

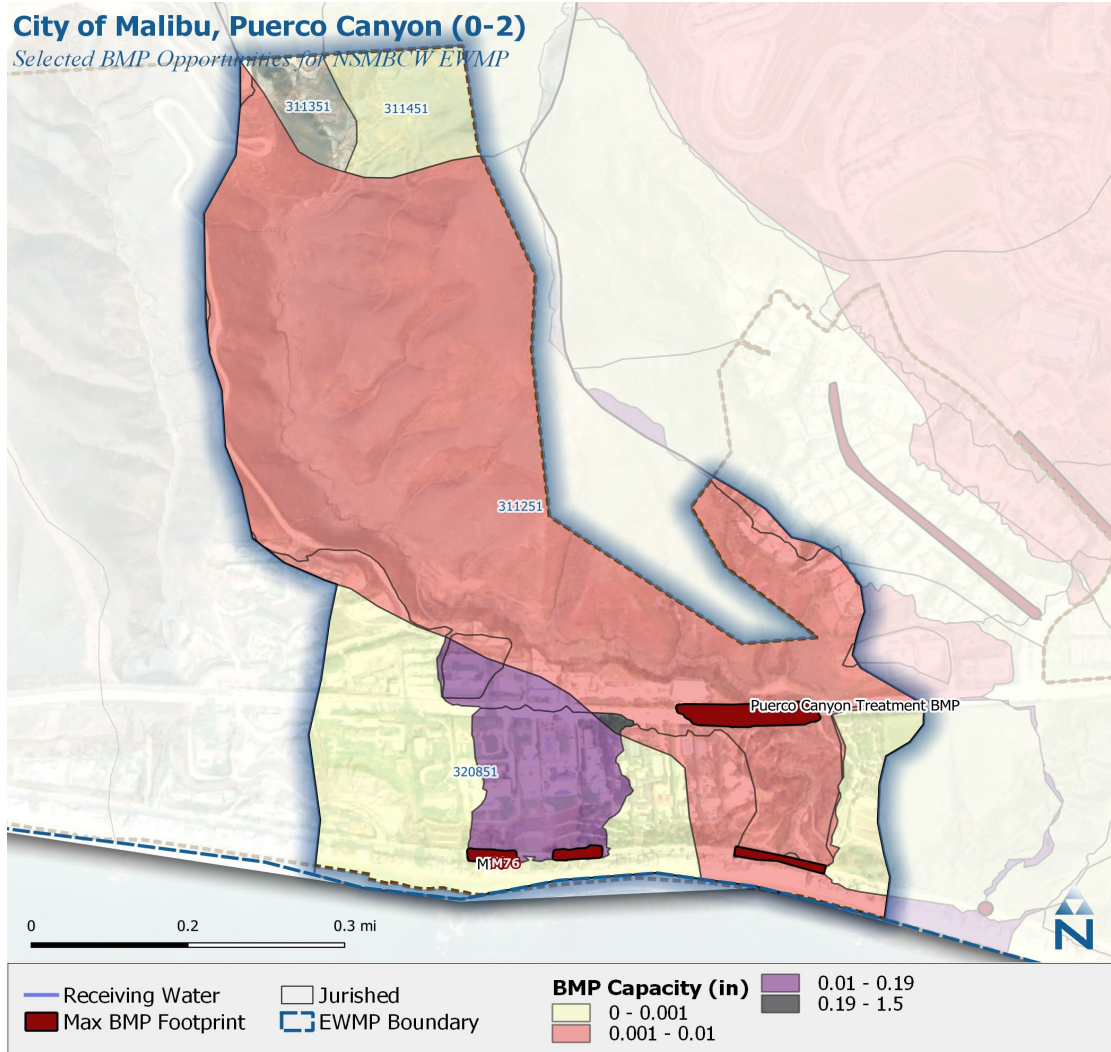


Figure 5B-12. City of Malibu, Puerto Canyon (0-2) EWMP implementation strategy selected project treatment depth (inches).

City of Malibu, Trancas Creek (1-4)

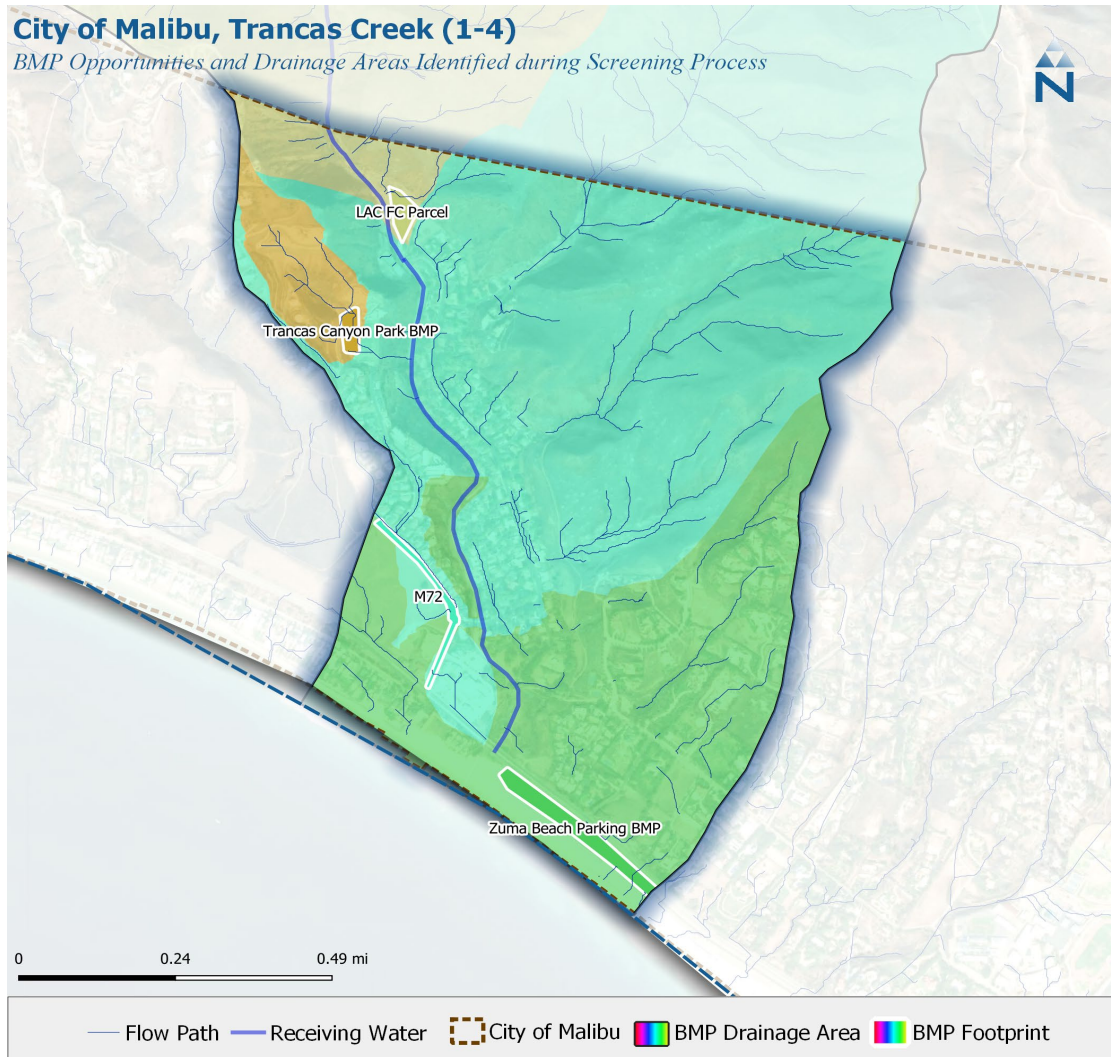


Figure 5B-13. City of Malibu, Trancas Creek (1-4) EWMP implementation strategy screened BMP opportunity maximum footprint.

City of Malibu, Trancas Creek (1-4) *Identified BMP Opportunities for NSMBCW EWMP*

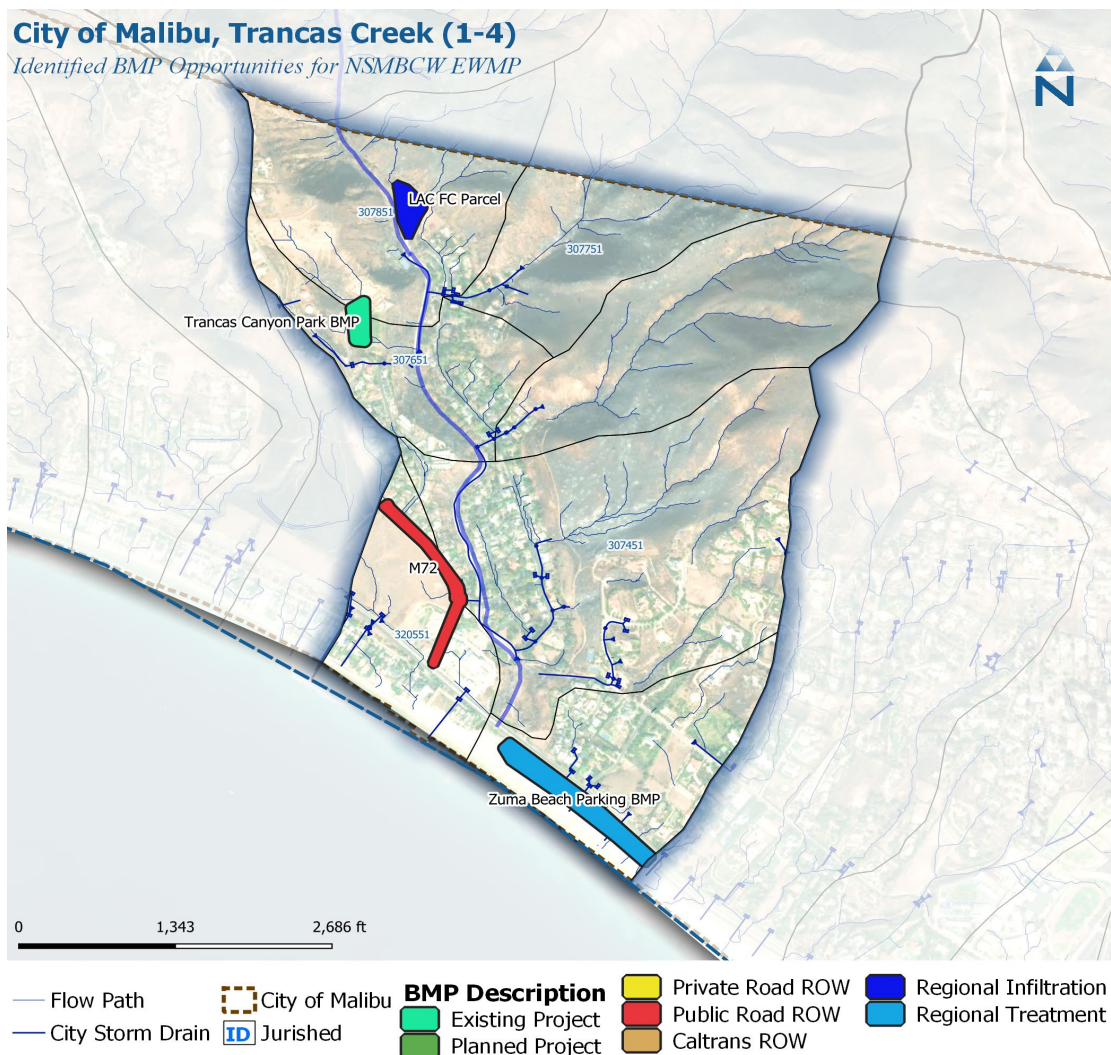


Figure 5B-14. City of Malibu, Trancas Creek (1-4) EWMP implementation strategy screened BMP opportunity type and location.

City of Malibu, Trancas Creek (1-4)

Regional Control Measures in EWMP Implementation Plan

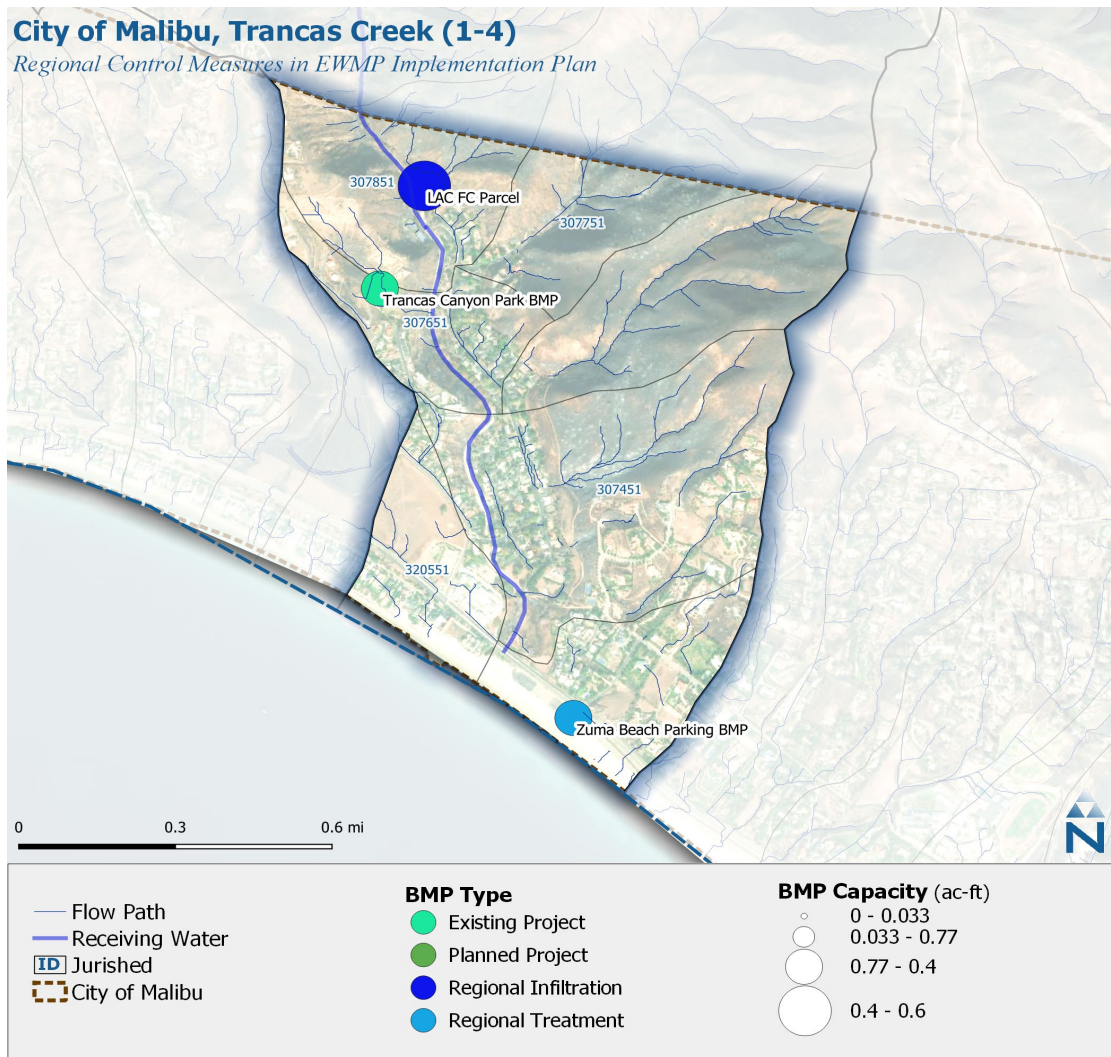


Figure 5B-15. City of Malibu, Trancas Creek (1-4) EWMP implementation strategy selected project BMP type and footprint.

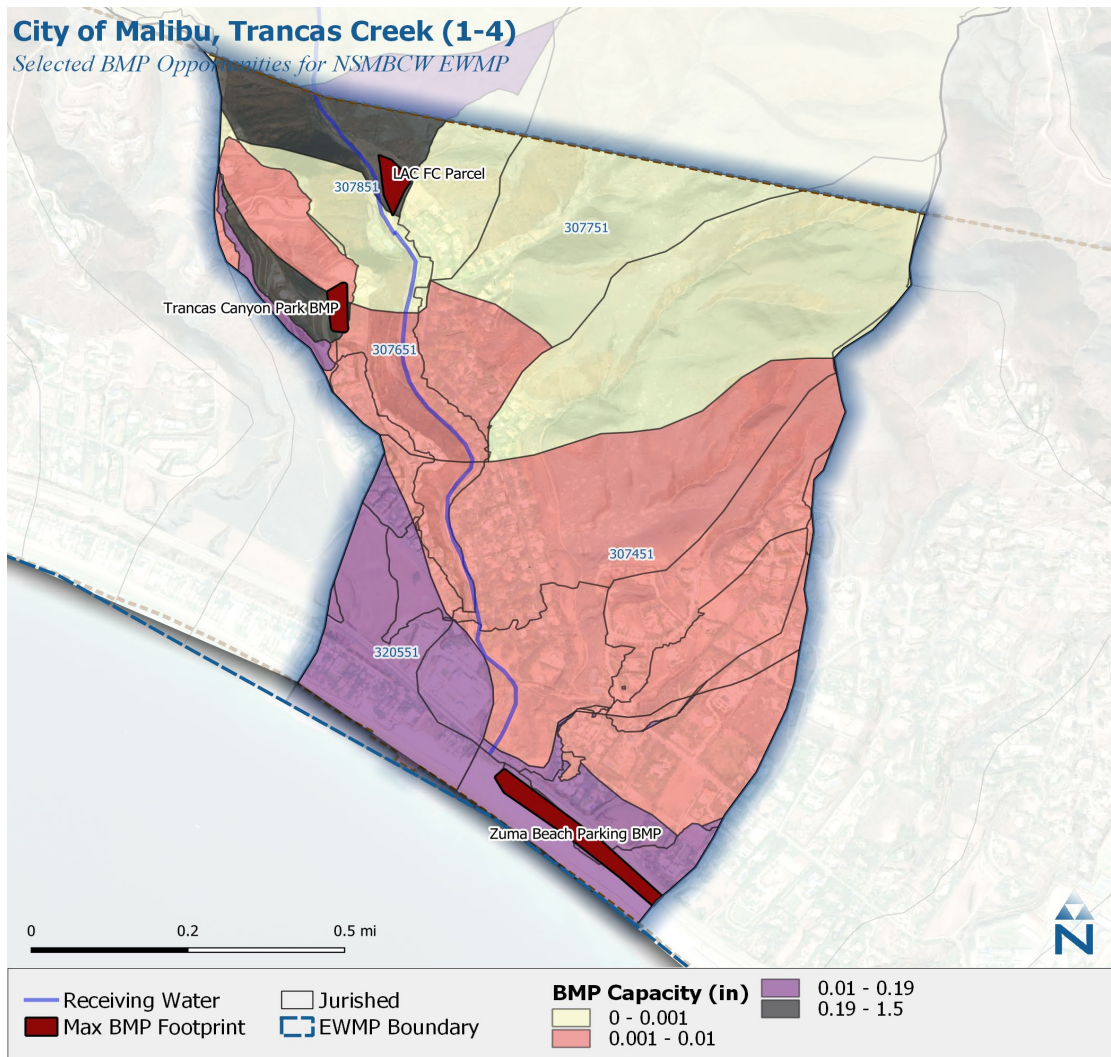


Figure 5B-16. City of Malibu, Trancas Creek (1-4) EWMP implementation strategy selected project treatment depth (inches).

Uninc. LA County, Marie Canyon (1-12)

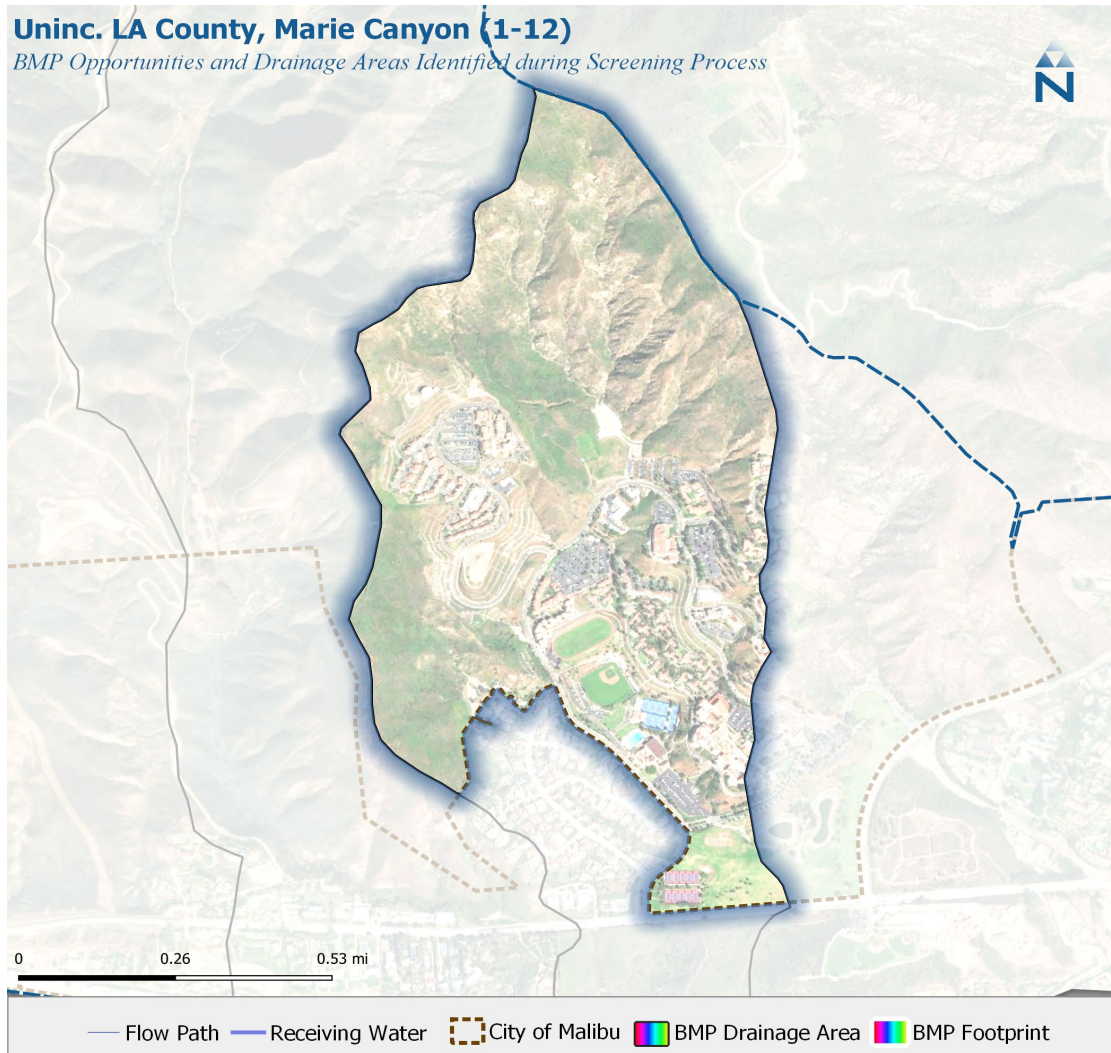


Figure 5B-17. Uninc. LA County, Marie Canyon (1-12) EWMP implementation strategy screened BMP opportunity maximum footprint.

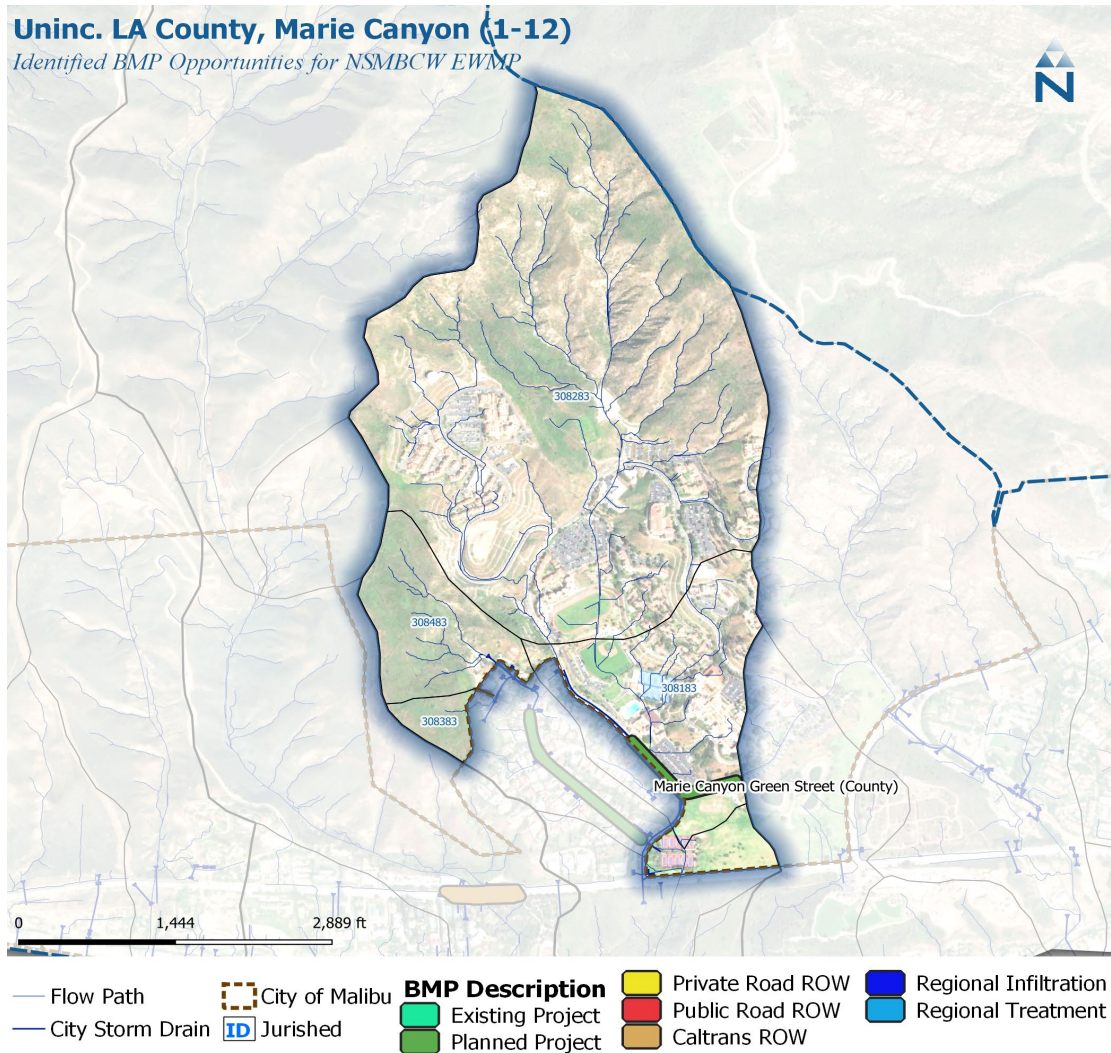


Figure 5B-18. Uninc. LA County, Marie Canyon (1-12) EWMP implementation strategy screened BMP opportunity type and location.

Uninc. LA County, Marie Canyon (1-12)

Regional Control Measures in EWMP Implementation Plan

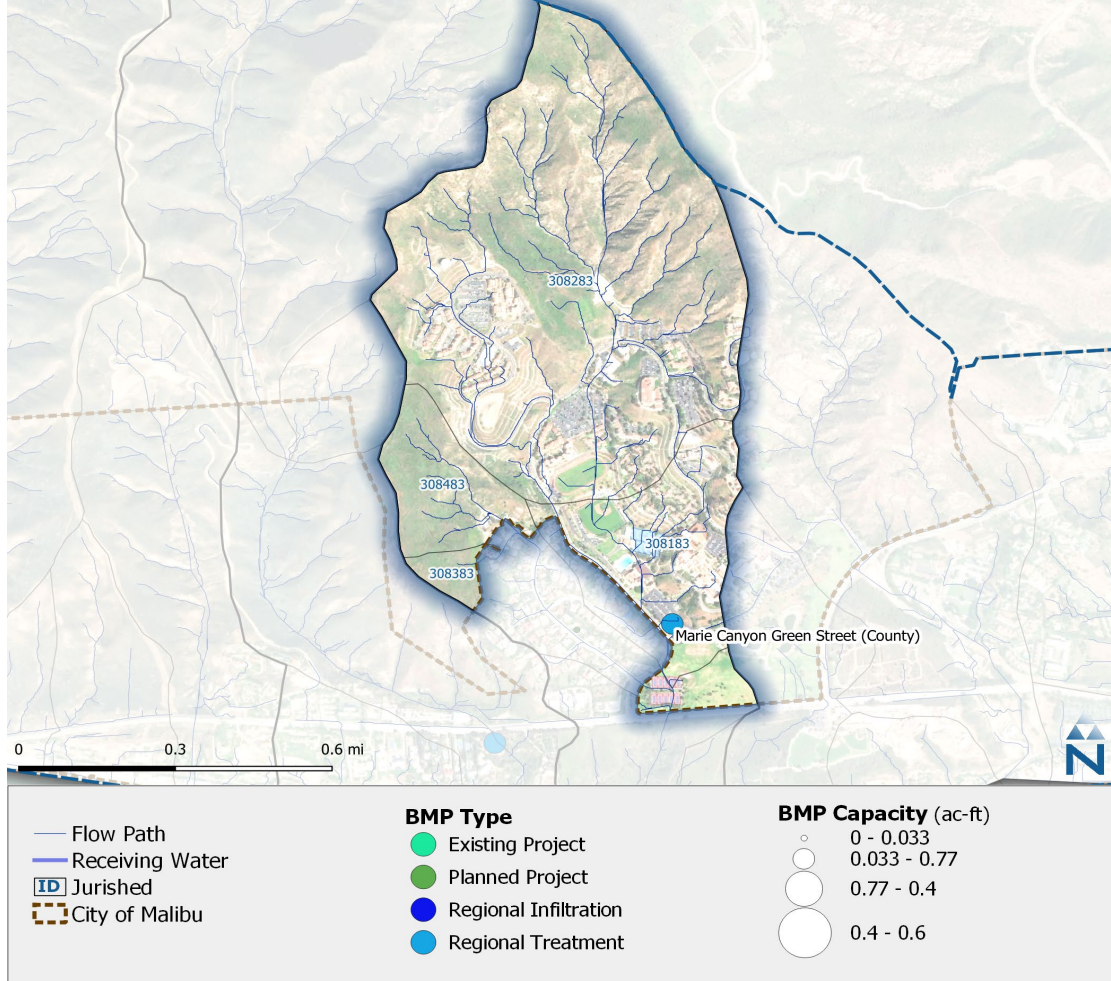


Figure 5B-19. Uninc. LA County, Marie Canyon (1-12) EWMP implementation strategy selected project BMP type and footprint.

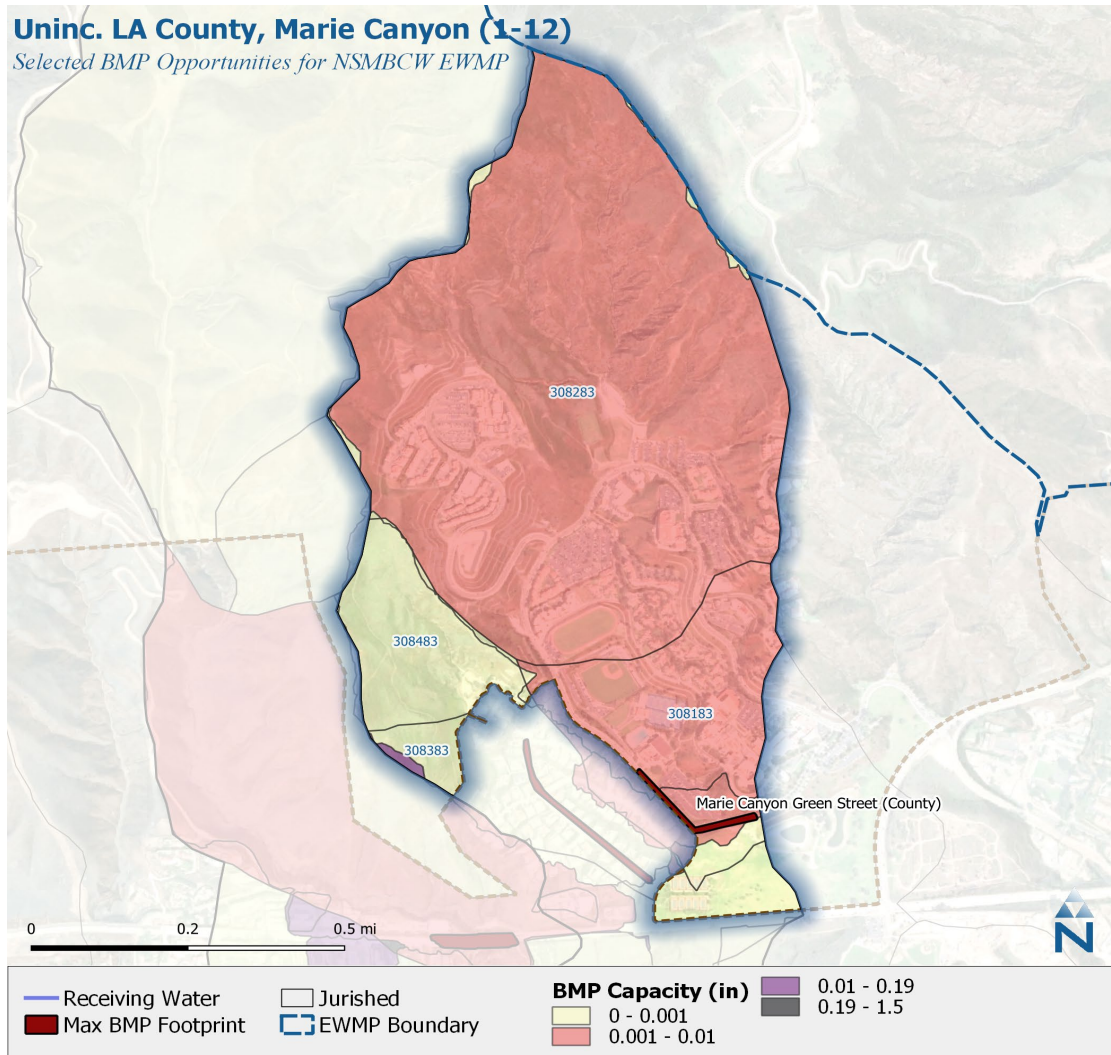


Figure 5B-20. Uninc. LA County, Marie Canyon (1-12) EWMP implementation strategy selected project treatment depth (inches).

Uninc. LA County, Puerco Canyon (0-2)

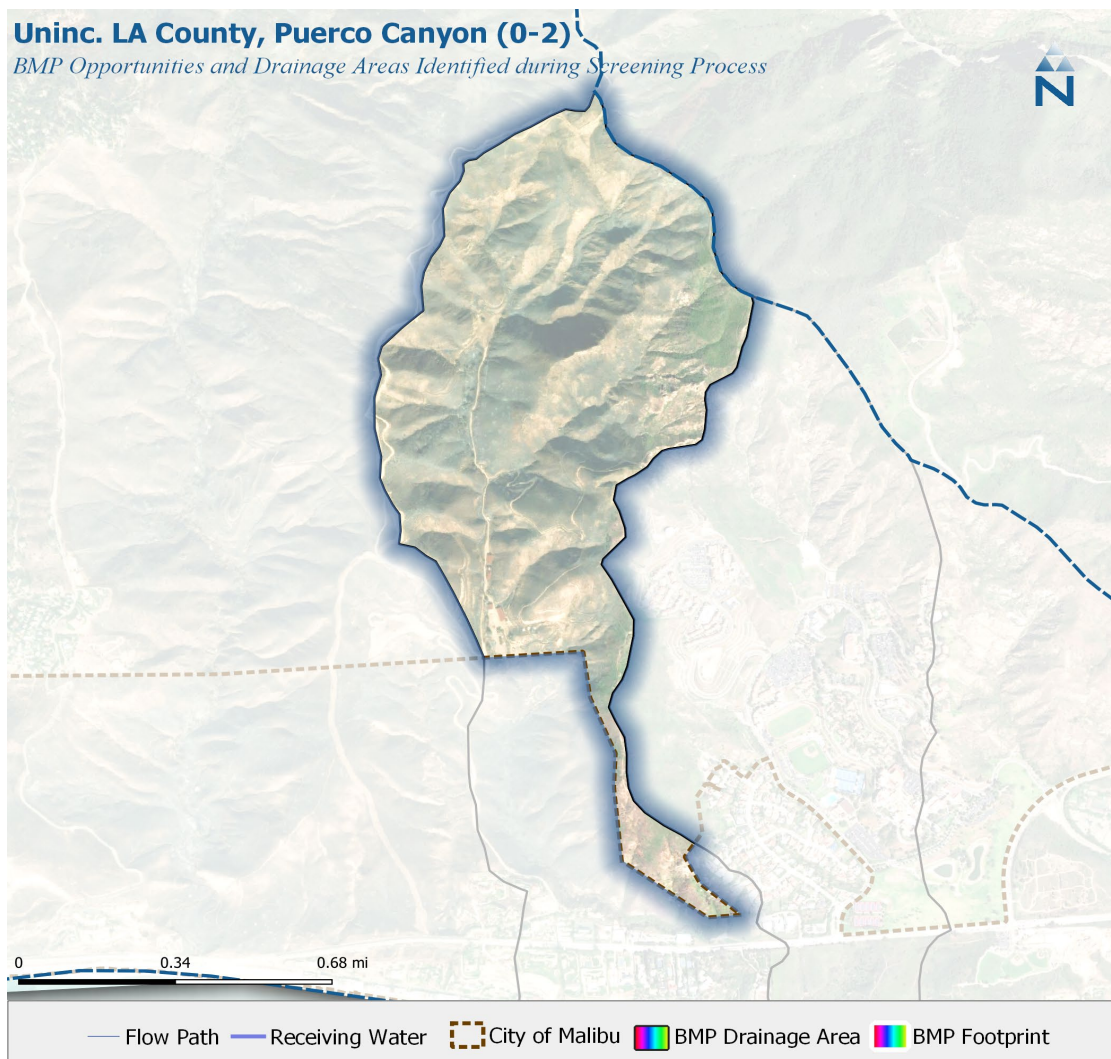


Figure 5B-21. Uninc. LA County, Puerco Canyon (0-2) EWMP implementation strategy screened BMP opportunity maximum footprint.

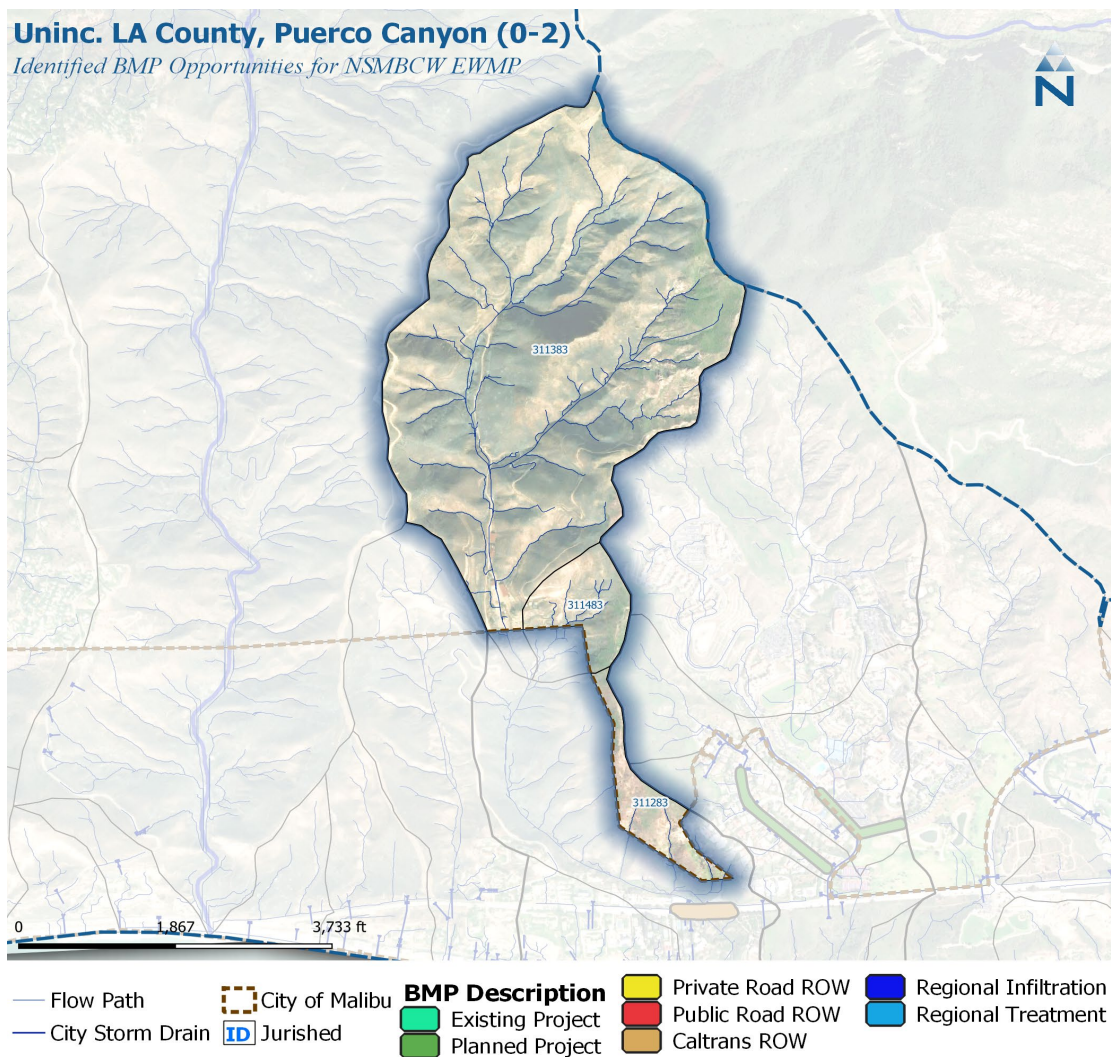


Figure 5B-22. Uninc. LA County, Puerco Canyon (0-2) EWMP implementation strategy screened BMP opportunity type and location.

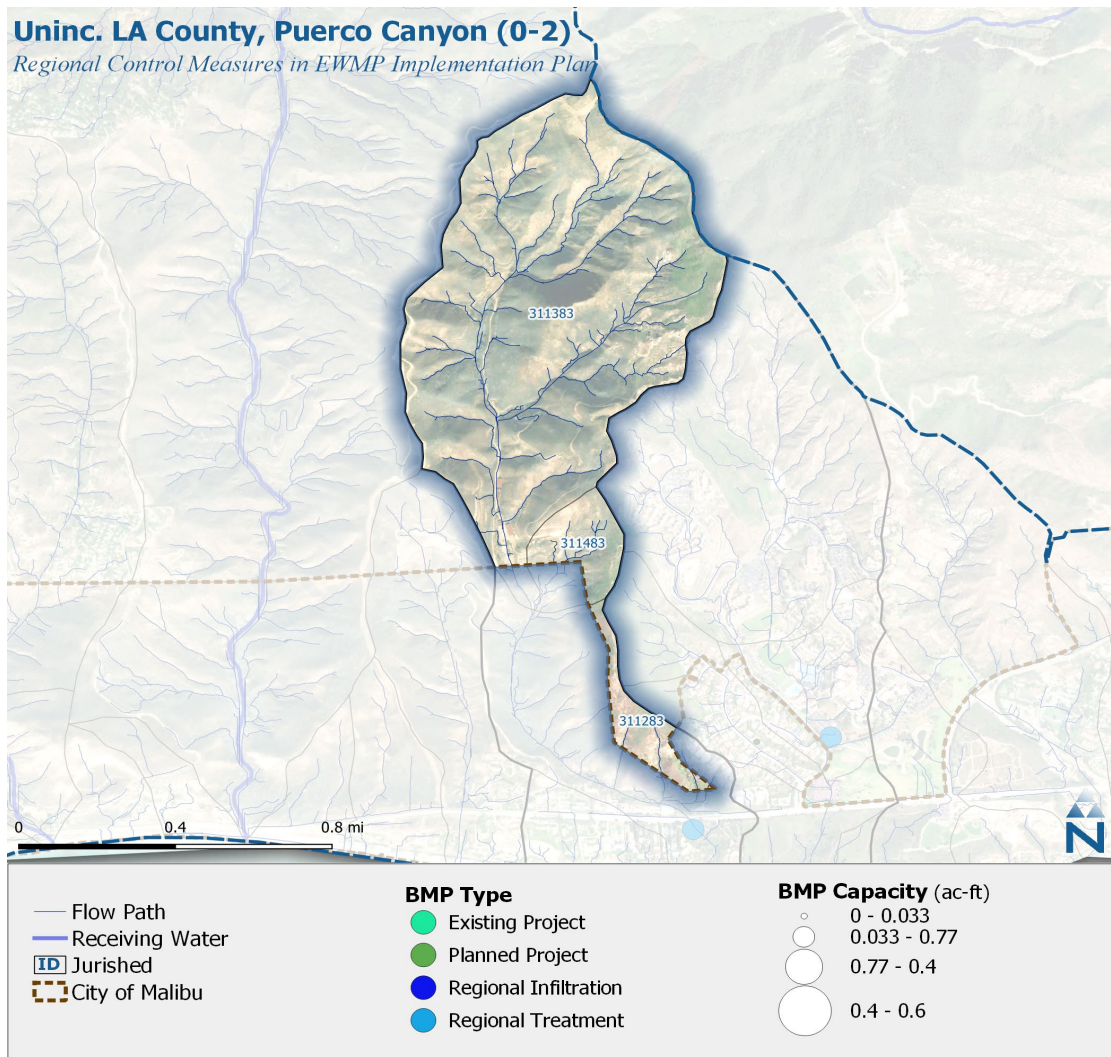


Figure 5B-23. Uninc. LA County, Puerco Canyon (0-2) EWMP implementation strategy selected project BMP type and footprint.

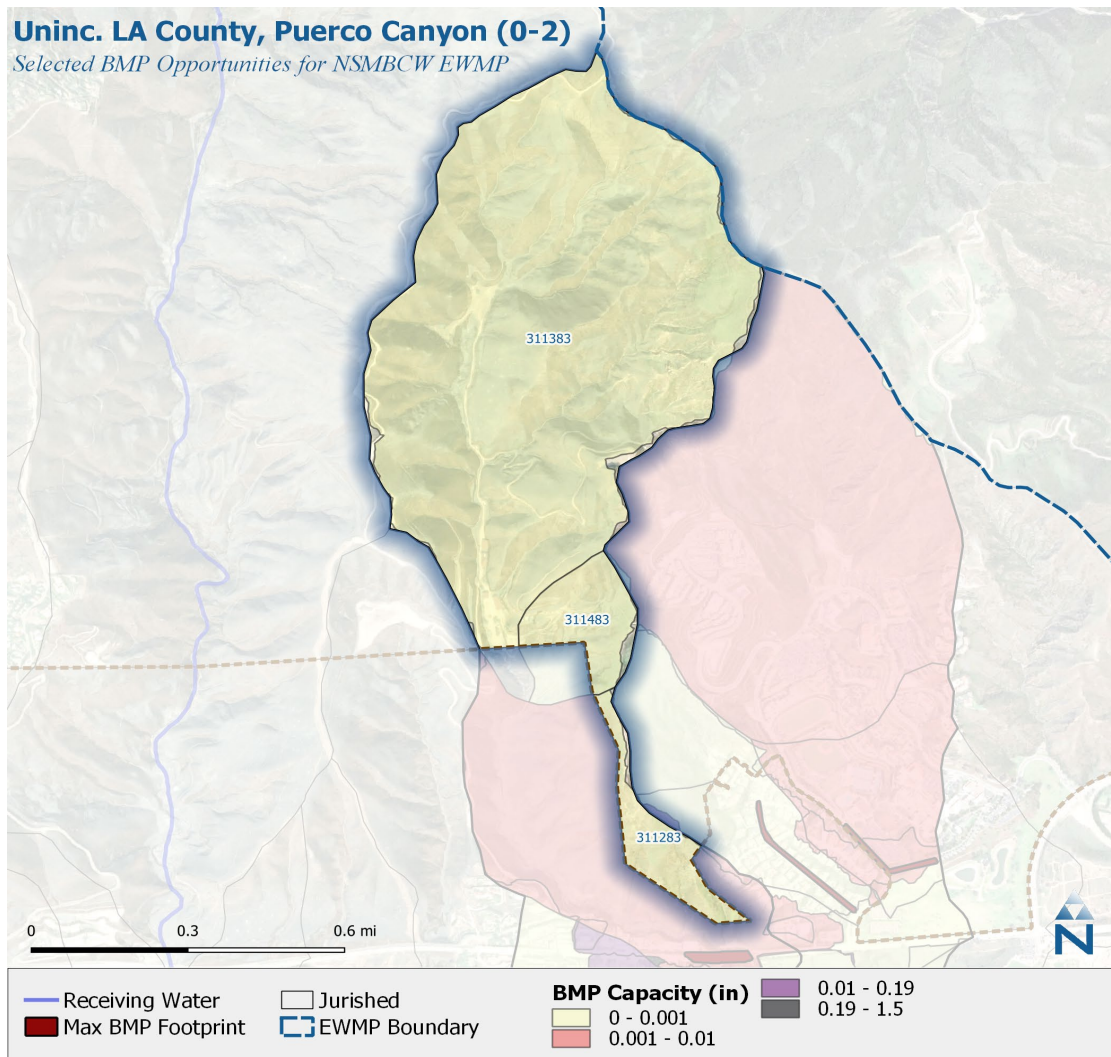


Figure 5B-24. Uninc. LA County, Puerco Canyon (0-2) EWMP implementation strategy selected project treatment depth (inches).

Uninc. LA County, Topanga Canyon (1-18)

Uninc. LA County, Topanga Canyon

BMP Opportunities and Drainage Areas Identified during Screening Process

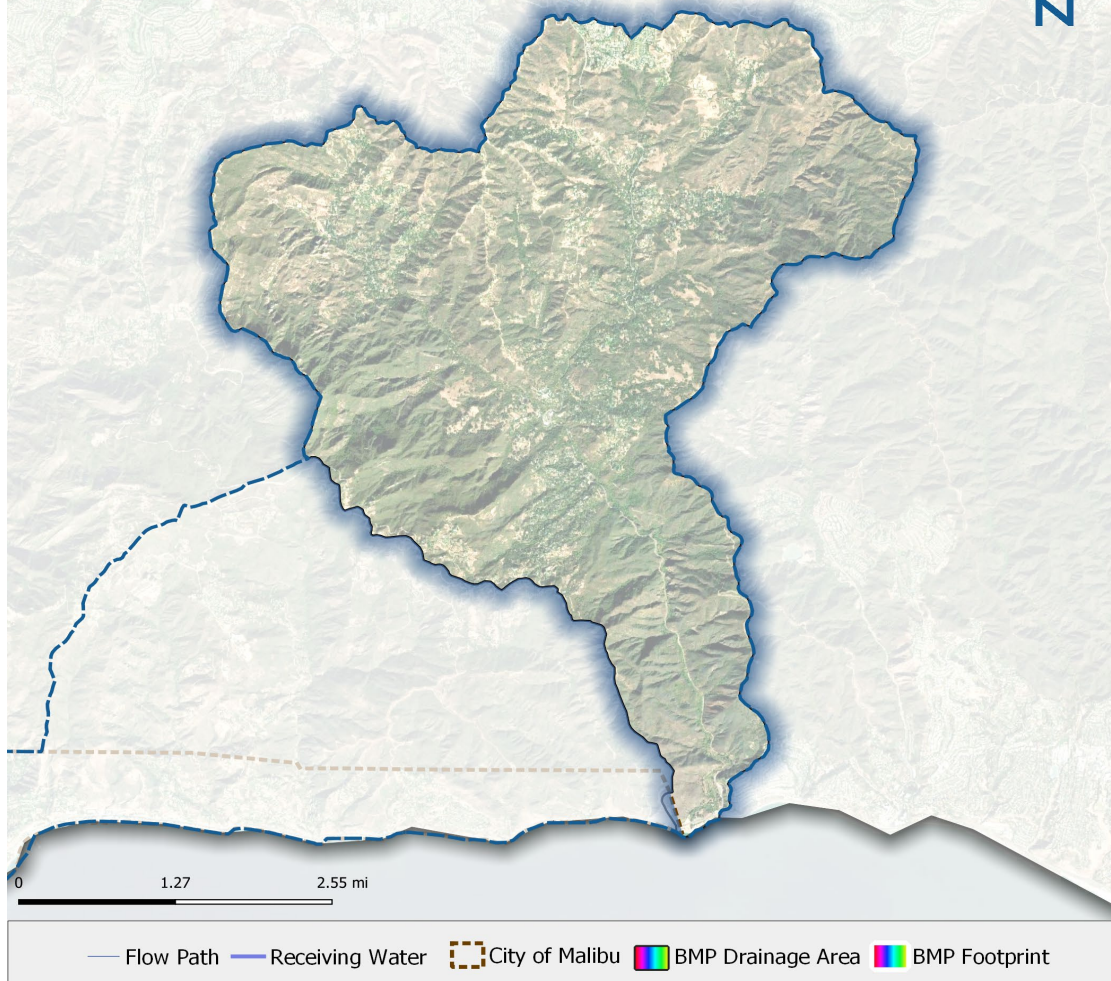


Figure 5B-25. Uninc. LA County, Topanga Canyon (1-18) EWMP implementation strategy screened BMP opportunity maximum footprint.

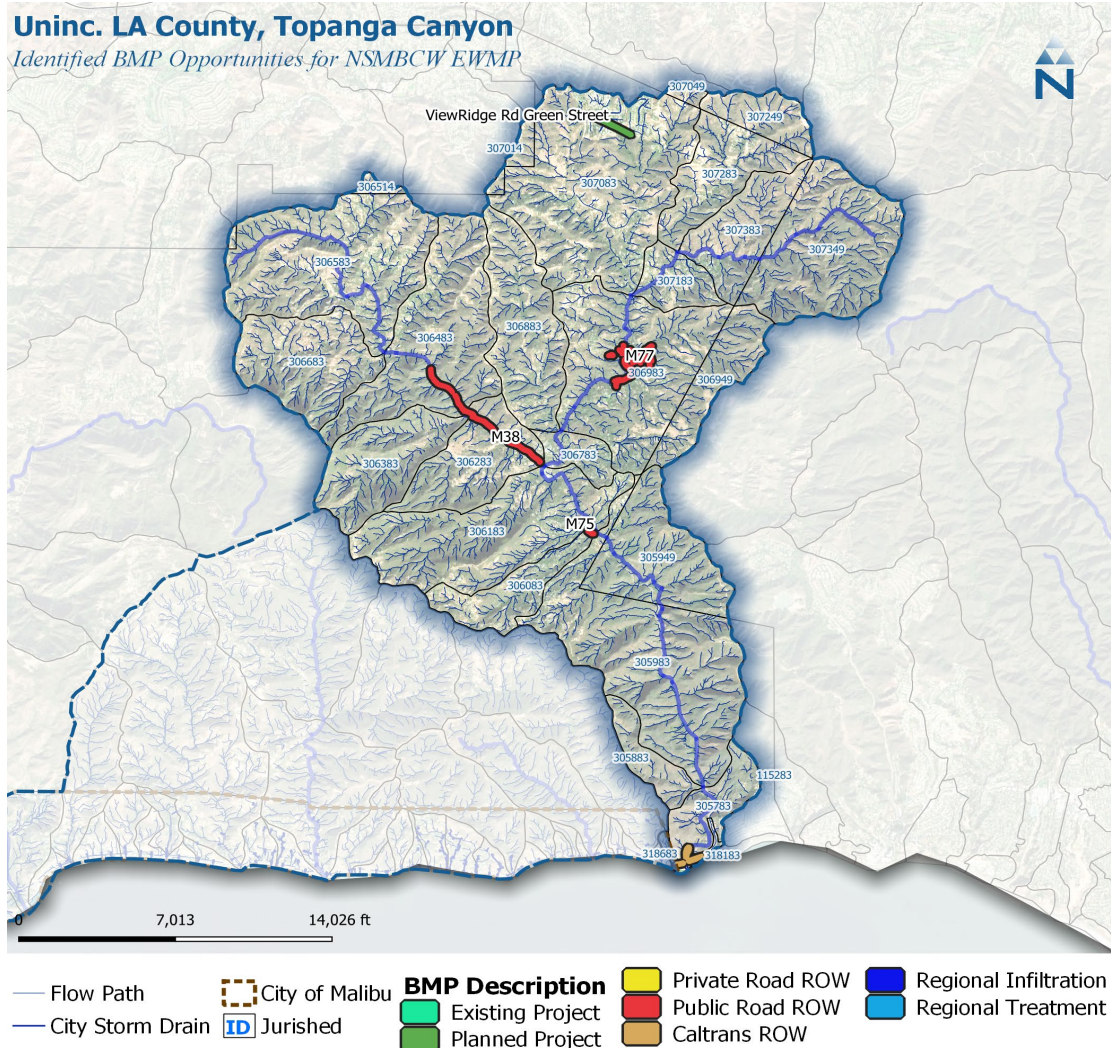


Figure 5B-26. Uninc. LA County, Topanga Canyon (1-18) EWMP implementation strategy screened BMP opportunity type and location.

Uninc. LA County, Topanga Canyon *Regional Control Measures in EWMP Implementation Plan*

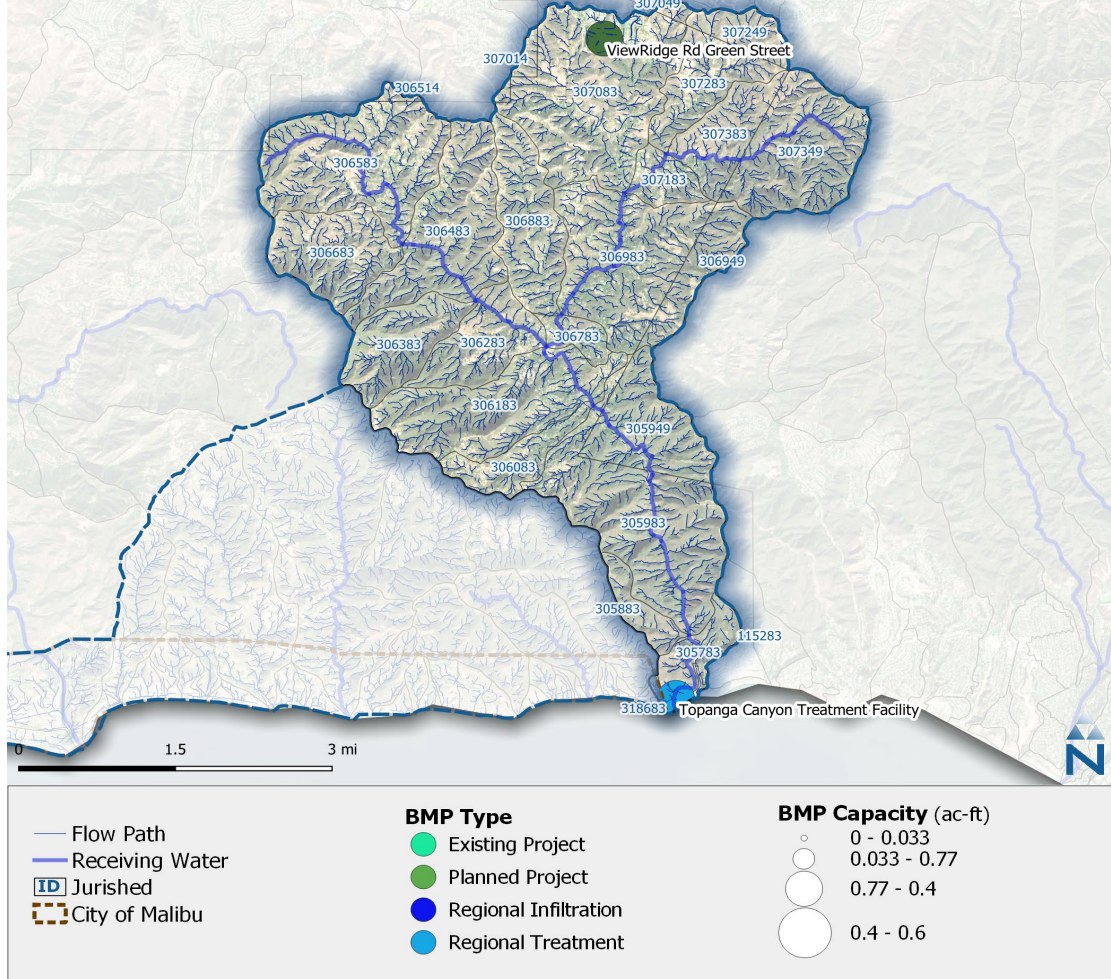


Figure 5B-27. Uninc. LA County, Topanga Canyon (1-18) EWMP implementation strategy selected project BMP type and footprint.

Uninc. LA County, Topanga Canyon

Selected BMP Opportunities for NSMBCW EWMP

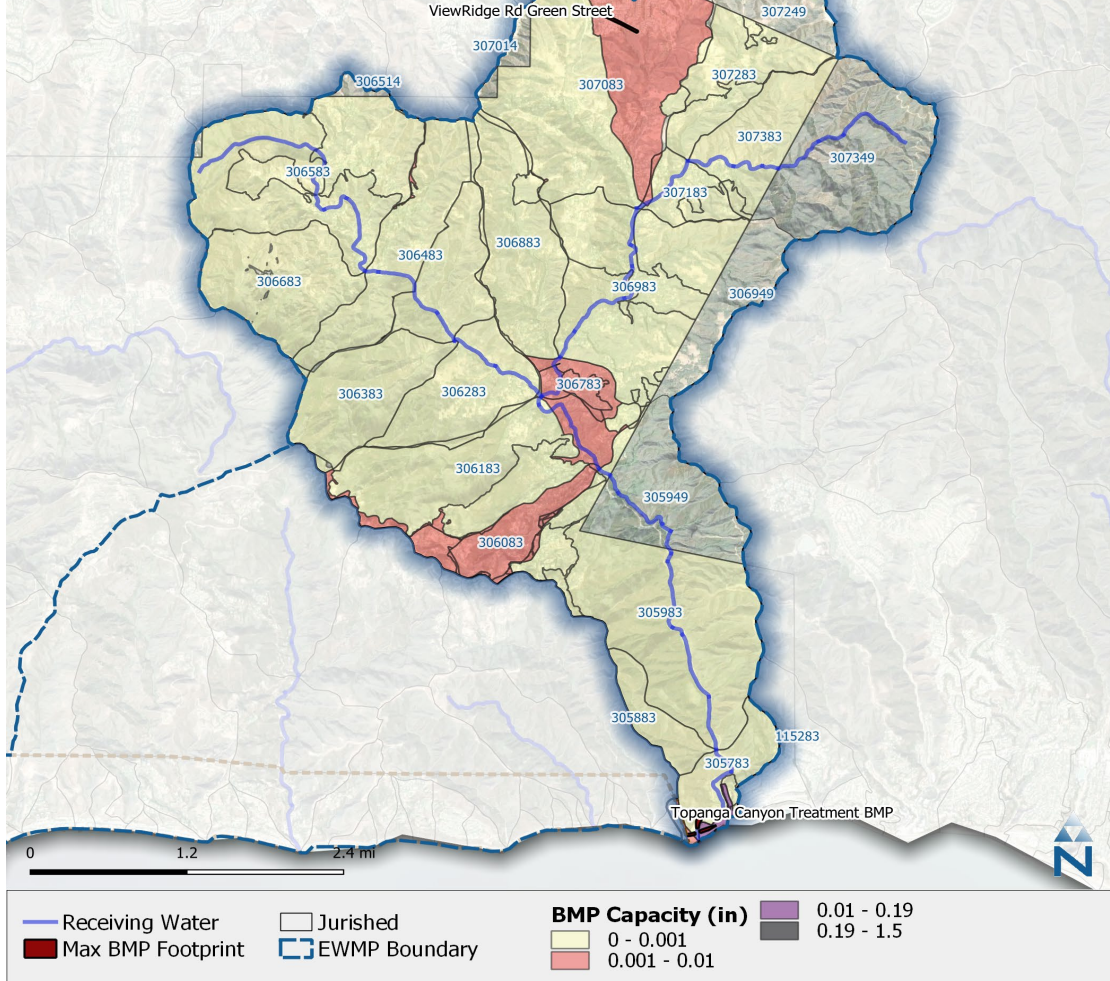


Figure 5B-28. Uninc. LA County, Topanga Canyon (1-18) EWMP implementation strategy selected project treatment depth (inches).

Uninc. LA County, Trancas Creek (1-4)

Uninc. LA County, Trancas Creek (1-4)

BMP Opportunities and Drainage Areas Identified during Screening Process

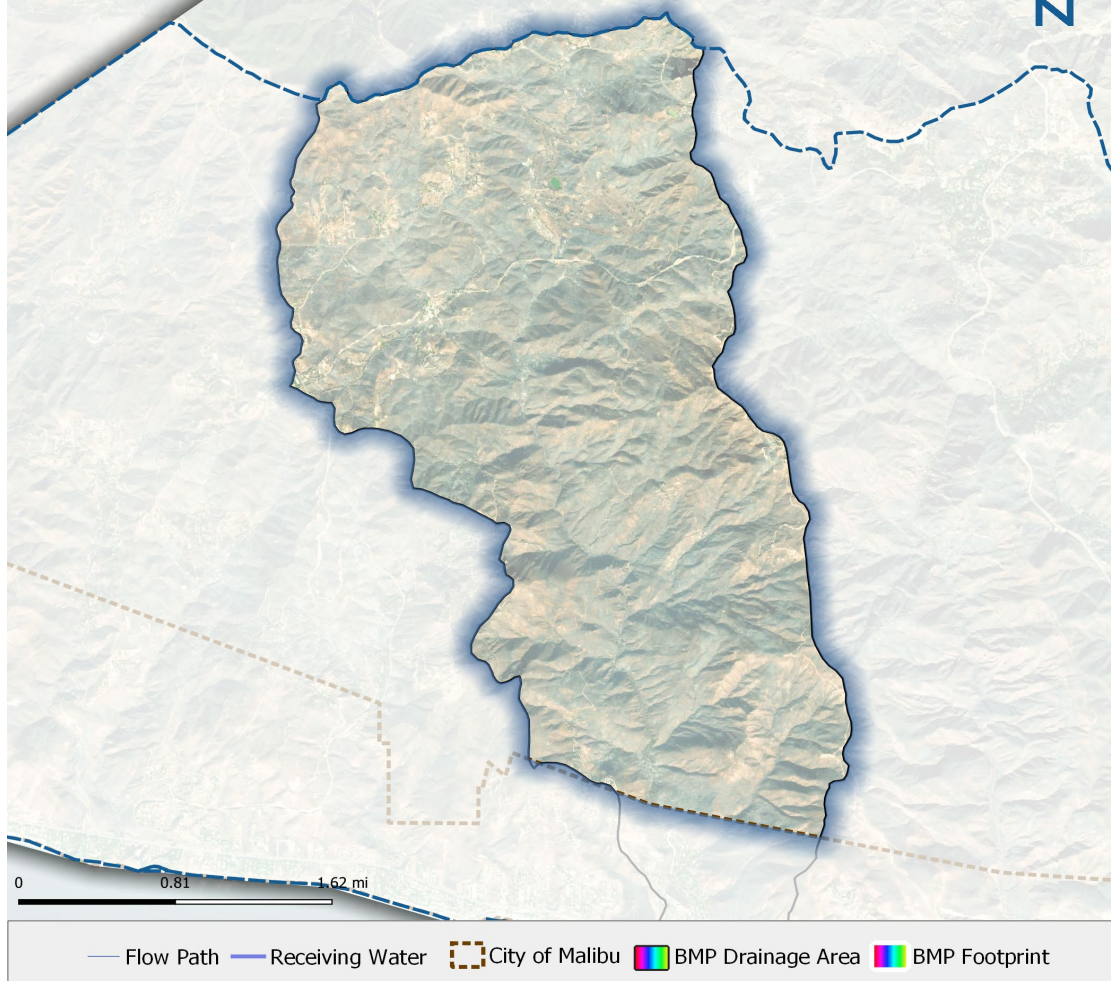


Figure 5B-29. Uninc. LA County, Trancas Creek (1-4) EWMP implementation strategy screened BMP opportunity maximum footprint.

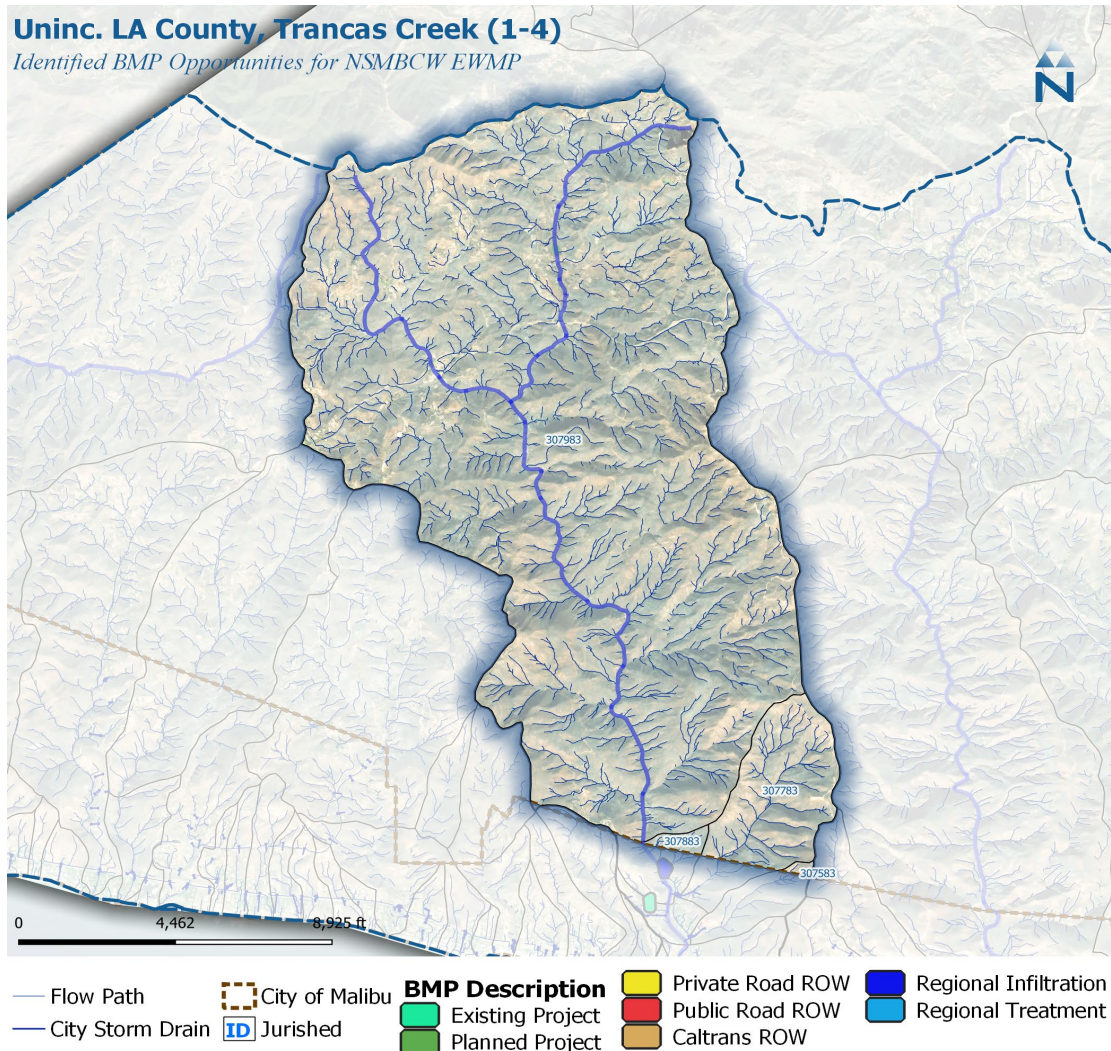


Figure 5B-30. Uninc. LA County, Trancas Creek (1-4) EWMP implementation strategy screened BMP opportunity type and location.

Uninc. LA County, Trancas Creek (1-4)

Regional Control Measures in EWMP Implementation Plan

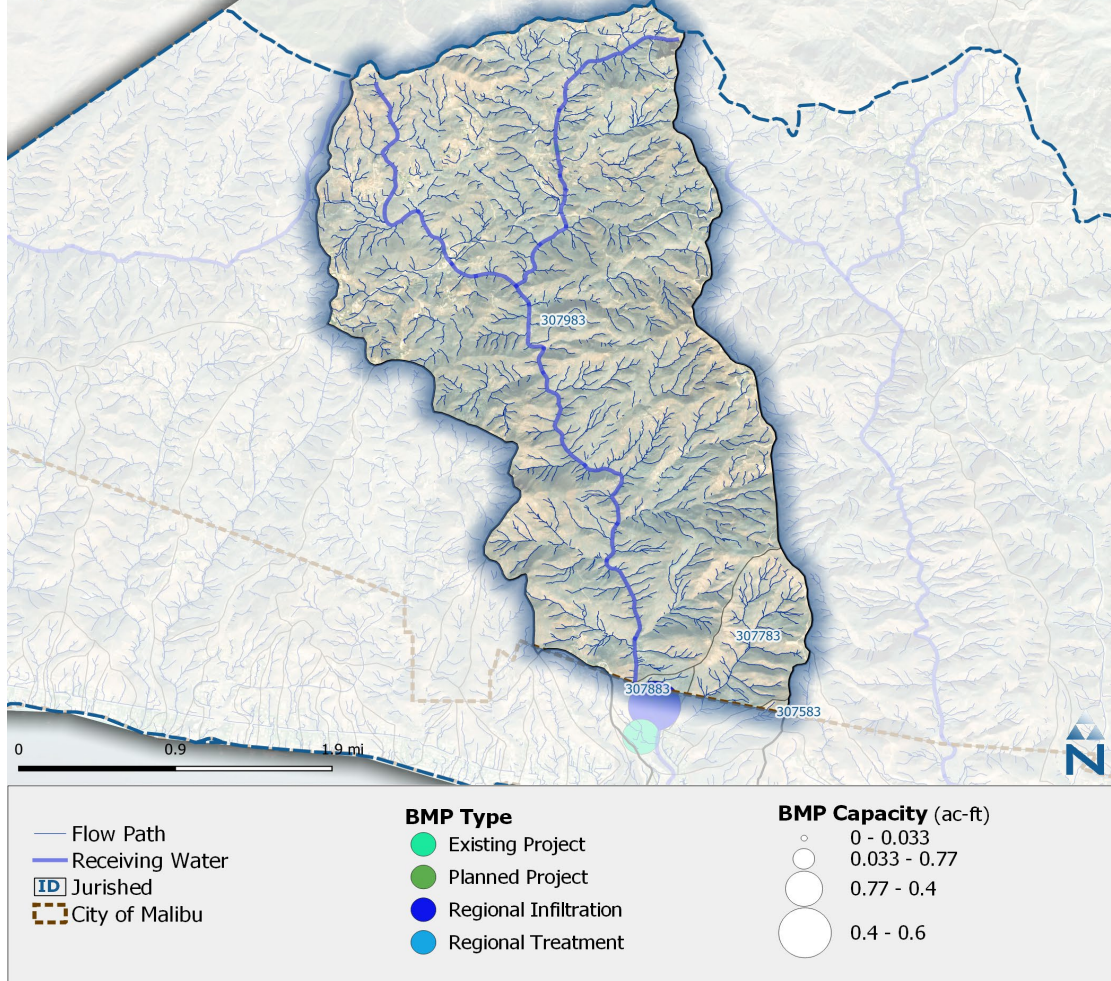


Figure 5B-31. Uninc. LA County, Trancas Creek (1-4) EWMP implementation strategy selected project BMP type and footprint.

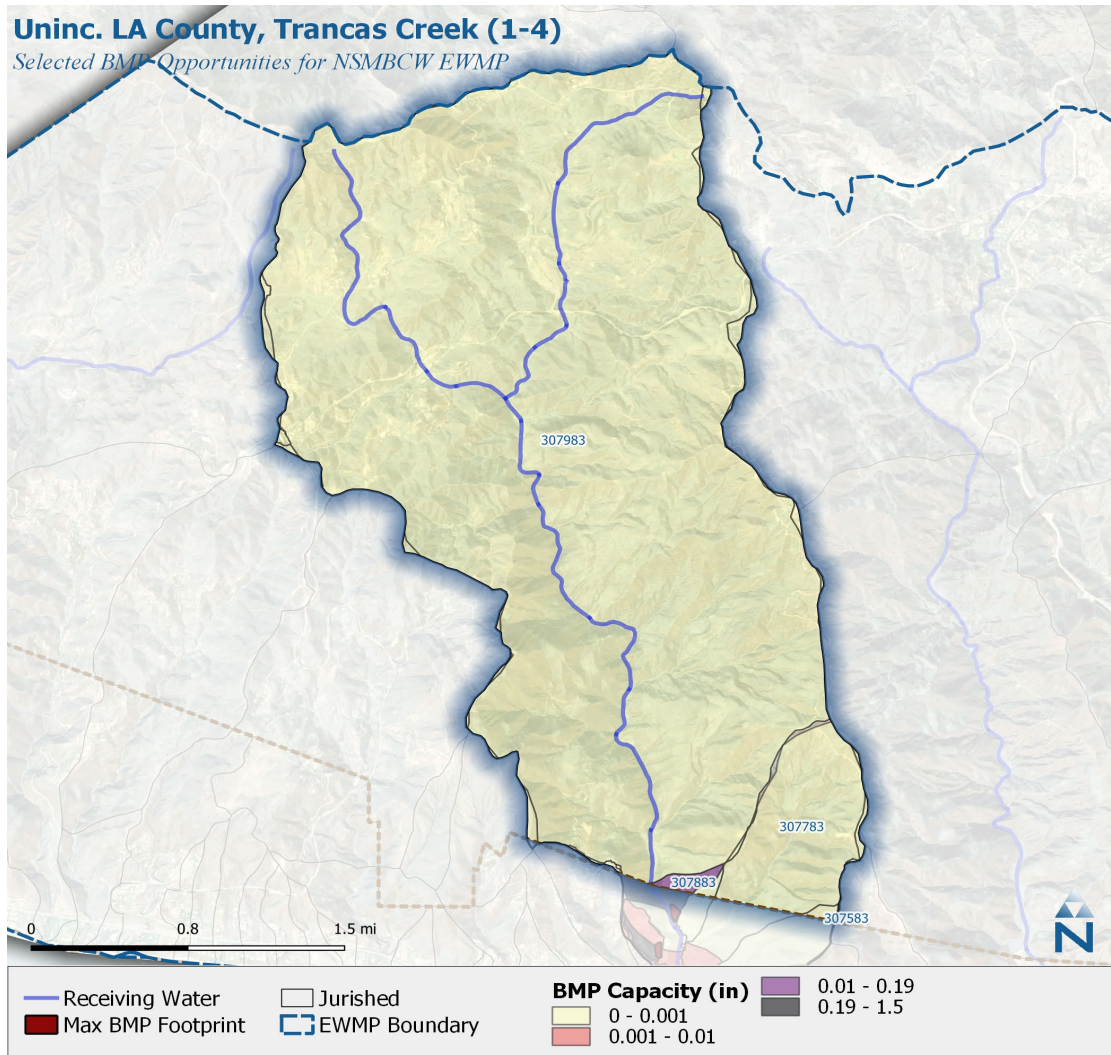


Figure 5B-32. Uninc. LA County, Trancas Creek (1-4) EWMP implementation strategy selected project treatment depth (inches).

Appendix 5C: NSMBCW EWMP RAA Recipe for Implementation

OVERVIEW:

The detailed EWMP Implementation Plan details the control measures for NSMBCW by jurisdiction, Priority Area type, and by “jurished”. See Appendix 5B for maps that show the jurished IDs.

The implementation recipe is made available in Excel format to allow for sorting by area, jurisdiction and more. The Excel file can be downloaded here: [LINK TO EWMP IMPLEMENTATION RECIPE](#)