Marina Del Rey Harbor Toxic Pollutants TMDL Implementation Plan

March 22, 2011

Prepared by the City of Los Angeles, the City of Culver City and Caltrans

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ES.1 Introduction

The Marina del Rey Harbor Toxic Pollutants TMDL Implementation Plan (Implementation Plan) defines the approaches that the cities of Los Angeles (lead agency for developing this Implementation Plan) and Culver City and the California Department of Transportation (Caltrans), (collectively the Marina del Rey Watershed Agencies), propose to comply with the implementation requirements of the *Marina del Rey Harbor Toxic Pollutants TMDL* (Toxics TMDL). This TMDL limits the discharge of specific pollutants to the three Back Basins of Marina del Rey Harbor – Basins D, E and F (see Figure **ES-1**). The County of Angeles, the designated lead agency for the Toxics TMDL, elected to develop its own implementation plan to comply with the implementation requirements of the Toxics TMDL.

Following the principles of the Water Quality Compliance Master Plan for Urban Runoff and City of Los Angeles Integrated Resources Plan (City of Los Angeles, 2004), this Implementation Plan uses the following guiding principles:

- ***Watershed-Wide Approach***: Characterize the watershed as a whole and identify and select projects independent of jurisdictional boundaries in order to develop the most beneficial plan for the watershed.

- ***Integrated Plan***: Identify urban runoff management projects that have multiple benefits and treat multiple pollutants.

- ***Green Solutions***: Wherever possible, implement solutions that are "green," sustainable, and work with the existing natural environment.

- ***Build on Existing Programs:*** Review existing urban runoff programs and identify opportunities to improve current water quality programs.

- ***Adaptive Management***: Develop a plan that can be refined based on the information gathered over time through lessons learned from the implementation of both successful and unsuccessful programs and projects.

ES.2 Regulatory and Permitting Requirements

Marina del Rey Back Basins are on a regulatory list of impaired waterbodies in the Los Angeles region, referred to as the 303(d) list. The Los Angeles Regional Water Quality Control Board (LARWQCB) biennially prepares the 303(d) list which identifies the impaired waterbody and the specific pollutant(s) for which it is impaired. All waterbodies on the 303(d) list are subject to the development of a Total Maximum Daily Load (TMDL). A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still meet the applicable water quality standards for that pollutant. Depending on the nature of the pollutant, TMDL implementation may require a cap on pollutant contributions from point sources (e.g., centralized pipe outfall discharges into the Back Basins from wastewater treatment plants), nonpoint sources (e.g., dispersed urban runoff from the storm drainage system), or both.

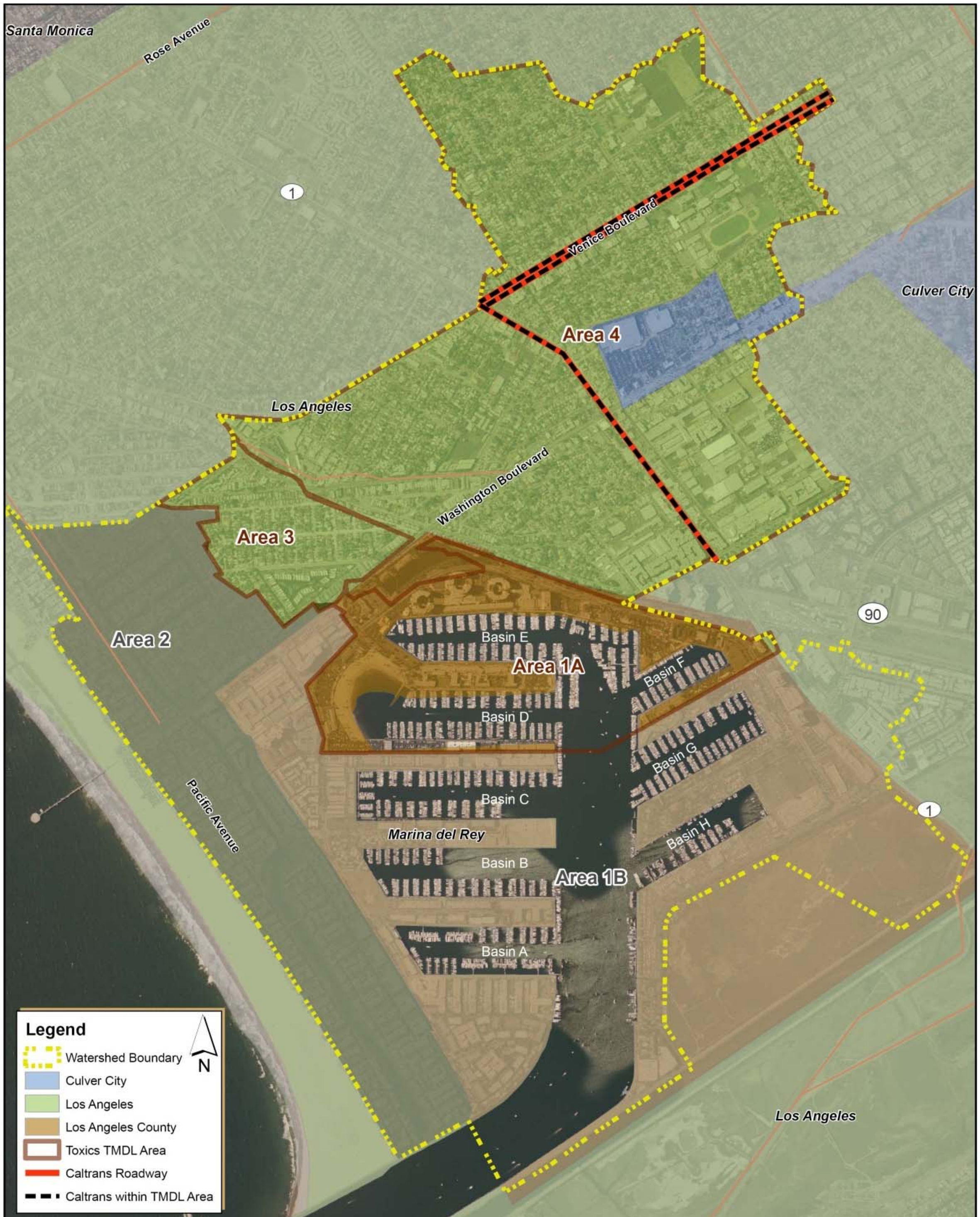


Figure ES-1 Watershed Layout

Adoption of the Marina del Rey Harbor Toxics TMDL required an amendment to the regional water quality regulations (Basin Plan) and the LARWQCB adopted the Toxics TMDL October 6, 2005. Subsequent approvals were by the State Board on January 13, 2006, the State Office of Administrative Law approved the TMDL on March 13, 2006, and EPA Region 9 on March 16, 2006. The Toxics TMDL became effective on March 22, 2006.

ES.3 Toxics TMDL Numeric Limits

Table **ES-1** summarizes the Toxics TMDL numeric targets which are based on the sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration and the corresponding waste load allocations (WLA). Throughout this Implementation Plan, the term "toxic pollutants" refers to the constituents that are listed in the Toxics TMDL (e.g., both metals and organics).

The Toxics TMDL numeric targets include concentrations of toxic pollutants in the Back Basins of the harbor, i.e., Basins D, E and F (Figure ES-1). The WLA are for the maximum amount of each of these constituents that can be transported from the Marina del Rey Watershed to the Back Basins. A majority of these constituents are bound to sediment and transported as storm-borne sediment during wet weather runoff events.

Table ES-1
Marina del Rey Harbor Numeric Targets and Waste Load Allocations

Metals	Numeric Target (mg/kg)	WLA (kg/yr)
Copper	34	2.06
Lead	46.7	2.83
Zinc	150	9.11
Organics	**Numeric Target (µg/kg)**	**TMDL (g/yr)**
Chlordane	0.5	0.03
Total PCBs	22.7	1.38

Source: Attachment A to Resolution No. 2005-012, Basin Plan Amendment.

ES.4 Toxics TMDL Compliance Milestones

The Toxics TMDL defines milestones for achieving compliance as follows:

- By **March 22, 2011**, Municipal Separate Storm Sewer (MS4) and Caltrans stormwater NPDES permittees shall provide a written draft report to the LARWQCB outlining how they will achieve the WLA for sediment in the Marina del Rey Harbor.

- By **September 22, 2011**, MS4 and Caltrans stormwater NPDES permittees shall provide a written final report to the Regional Board outlining how they will achieve the WLA for sediment in the Marina del Rey Harbor.

- By **March 22, 2012**, the Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.

- By **March 22, 2013**, demonstrate that 25 % of the total drainage area is effectively meeting the waste load allocation for sediment.

- By **March 22, 2015,** demonstrate that 50 % of the total drainage area is effectively meeting the waste load allocation for sediment.
- By **March 22, 2017,** demonstrate that 75 % of the total drainage area is effectively meeting the waste load allocation for sediment.
- By **March 22, 2021,** demonstrate that 100 % of the total drainage area is effectively meeting the waste load allocation for sediment.

ES.5 Coordinated Monitoring Plan (CMP) Requirements

The Toxics TMDL requires that the responsible jurisdictions (County of Los Angeles, cities of Los Angeles and Culver City, Caltrans) submit and implement a CMP. A draft CMP was submitted to the LARWQCB on March 22, 2007. The revised CMP was submitted on March 31, 2008, which was subsequently approved by the LARWQCB. On August 31, 2009, the responsible jurisdictions submitted an addendum with additional monitoring locations and procedures for sampling in the watershed areas that are under tidal influence (LARWQCB approval received on October 28, 2009).

The CMP includes both ambient and TMDL effectiveness monitoring locations:

- *Ambient monitoring* - The CMP establishes 14 monitoring points, five in the watershed and nine within the Harbor.
- *Effectiveness monitoring* - Eleven locations have been established, seven in the watershed and four within the Back Basins.

The TMDL requires bioaccumulation monitoring, but only within the Back Basins. This monitoring, which occurs at three locations, samples the tissue of two or three species of fish and mussels.

The ambient monitoring program was started in August 2010 upon execution of an agreement for cost sharing by the responsible jurisdictions.

ES.6 Marina del Rey Watershed Characteristics

The Marina del Rey Watershed is approximately 1,855 acres (2.9 square miles) in size (Figure ES-1) and lies within the jurisdictions of the City of Los Angeles (53%), County of Los Angeles (44%), City of Culver City (2%), and Caltrans (1%). The watershed is bordered by the Santa Monica Bay Watershed and the Ballona Creek Watershed. Marina del Rey Harbor is open to Santa Monica Bay through the Main Channel and it shares a common breakwater with Ballona Creek. The Harbor consists of the Main Channel and eight basins (A-H). Figure ES-1 shows that there are five subwatersheds (or Areas) within the Marina del Rey Watershed. Subwatersheds 1A, 3 and 4 are tributary directly to the Back Basins (Basins D, E and F). Subwatershed Area 1B drains to the other basins of the Harbor. Subwatershed Area 2 does not drain to the Harbor but to Ballona Lagoon.

The land area under the jurisdictions of the City of Los Angeles, City of Culver City and Caltrans is almost exclusively in Areas 3 and 4, therefore, this Implementation Plan only addresses those two Areas.

Land Use: Areas 3 and 4 of the watershed are made up of the following land uses: 62% residential, 25% commercial/institutional, 10% industrial and very minor portions that are natural/vacant, open space/recreation, or water/wetlands.

Sediment Quality: Available sediment quality data, which included sediment quality data from the bottom of the harbor and water column data from the watershed, are not directly applicable to estimate the baseline pollutant loadings in storm borne sediment from Areas 3 and 4 for comparison to the WLAs. Sediment samples taken from the Harbor bottom not only reflect discharges of storm borne sediment from the upper watershed, but also the discharges from Harbor activities and from the areas adjacent to the basins. These discharges from the Harbor and adjacent area could be significant, as is recognized in the TMDL Staff Report to be sources of pollutants[1]. Therefore, the use of Harbor sediment data would result in an overestimation of the actual baseline pollutant loadings from Areas 3 and 4. A more accurate estimation of the baseline pollutant loading would require the analysis of storm borne sediment collected from stormwater in Areas 3 and 4, but these data will only become available as CMP implementation progresses over the upcoming years.

Due to the current lack of appropriate data, this Implementation Plan relied on data developed from the Toxicity Identification Evaluation (TIE) study recently completed in the adjacent Ballona Creek Estuary. These data are an appropriate surrogate for the following reasons:

- The upstream watershed areas of the Marina del Rey and Ballona Creek watersheds are in close proximity and have very similar in land use characteristics.
- Sediment in Ballona Creek Estuary is not impacted by harbor activities or boat discharges as Ballona Creek and its Estuary are not navigated by any vessels.

Accordingly, the TIE data were considered more representative of pollutant concentrations in storm borne sediment from Areas 3 and 4 than the Harbor sediment data.

ES.7 Recommended BMP Implementation

The Implementation Plan relies on a combination of measures designed to decrease introduction and transport of sediment bound toxics, as well as other pollutants such as bacteria and organics, by (1) reducing the introduction of pollutants, (2) reducing the amount of dry weather and wet weather anthropogenic/urban runoff, and (3) providing

[1] Per the LARWQCB Staff Report, page 28, sources of pollutants from marina activities (under County of Los Angeles jurisdiction, which are not included in this Implementation Plan) include: "Elevated metal concentrations occur in the middle and back basins of Marina del Rey Harbor. The numerous boats that utilize the Marina are a likely contributor to the metals impairment in this area. Boats have metal components and engines that constantly corrode from salt water and air. Anti-fouling paints contain heavy metals such as copper that are designed to constantly ablate or leach out (passive leaching) to effectively reduce fouling organisms. Lead and zinc concentrations were also found in high amounts in the back harbor sediments. These metals might have originated from the historical industrial land uses of the Marina or have been derived from boating activity, including copper and lead in the boat paints, and zinc in the anodes of boat engines."

localized BMPs to reduce pollutant loads. A phased approach to BMP implementation is recommended which aligns with the interim compliance milestones included in the TMDL. Phase 1 includes the period from 2010 through January 2013, Phase 2 includes the period from 2013 through January 2015, Phase 3 includes the period from 2015 through January 2017, and Phase 4 includes the period from 2017 through January 2021.

Recommended BMPs for implementation and BMPs already in place and contributing to reducing pollutants include:

- **Vehicle Brake Pad Product Replacement**. The purpose of this BMP is to reduce a significant source of metals and other toxic pollutants in the environment by developing safe alternative products. This BMP applies specifically to reducing copper loading by modifying the copper content in vehicle brake pads. California Senate Bill (SB) 346 was signed by former Governor Arnold Schwarzenegger in 2010, thereby requiring that brake pads contain no more than 5 % copper by 2021 and no more than 0.5 % copper by 2025;

- **Enhanced Street Sweeping**. Metals released to the urban environment during dry weather conditions are likely to adsorb on street sediments, which provides a transport mechanism for metals to reach downstream waterbodies. Street sweeping removes sediment, debris, and other pollutants from road and parking lot surfaces. This Implementation Plan proposes to increase sediment removal by 15 % through enhancements to the existing street sweeping program;

- **Education and outreach**. The Marina del Rey Watershed Agencies conduct education and outreach programs for residents and businesses which could include information about water quality impacts from controllable sources of metals. Outreach mechanisms include brochures, posters, websites, event attendance, utility bill inserts, and surveys;

- **Catch basin cleaning**. Continuation of catch basin cleaning programs will contribute to removal of sediments prior to entering the storm drains;

- **Downspout disconnection**. The City of Los Angeles currently has a pilot program in place for downspout retrofit of single family residential roofs. Pending the results of the pilot program, the City of Los Angeles may expand the program citywide, including watersheds draining to Marina del Rey;

- **SUSMP implementation**. The SUSMP requirements of the existing MS4 permit apply to new development and significant redevelopment projects. The BMPs installed on-site must be able to infiltrate, capture and reuse, or treat all of the runoff from an 85th percentile storm, which is approximately a 3/4-inch, 24-hour storm in the Marina del Rey Watershed. Based on the current rate of SUSMP implementation in the City of Los Angeles, it is anticipated that within Areas 3 and 4 of the Marina del Rey watershed approximately 85 acres within the watershed will have BMPs installed to treat or capture stormwater runoff by 2021. Implementation of the recently adopted LID ordinance by the City of Los Angeles will provide additional water quality benefits;

- **Trash TMDL implementation**. To meet the requirements of the various Trash TMDLs throughout the waterbodies in the region, the City of Los Angeles will be installing 100 opening screen covers which will capture trash and debris as well as sediments, with completion estimated to be June 30, 2011; and

- BMPs already installed to meet other TMDL requirements in the area are expected to reduce the discharge of the metals and organics to Marina del Rey. These BMPs include: three Low Flow Diversions (LFDs) (owned and operated by the County) and five tree wells (owned and operated by the County).

ES.8 Quantification of Water Quality Benefits

The Implementation Plan estimates the water quality benefits expected from the implementation of BMPs described above. This estimate only considers the sediment load that the Agencies are responsible for (i.e., the City of Los Angeles, the City of Culver City and Caltrans) (**Table ES-2**). **Table ES-3** presents the expected outcome after implementation of institutional BMPs.

Table ES-2
Baseline Load

Constituent	Average of Measured Concentrations in BC Estuary[1]	Area 1A, 3 and 4 of MDR Watershed Baseline Load[2]	Baseline Load (MS4 Portion and Caltrans)[3]	Baseline Load City of LA, Culver City and Caltrans Only[4]
Metals	**(mg/kg)**	**(kg/yr)**	**(kg/yr)**	**(kg/yr)**
Copper	35.58	2.283	2.242	1.718
Lead	26.96	1.730	1.699	1.301
Zinc	147.67	9.475	9.305	7.128
Organics	**(µg/kg)**	**(g/yr)**	**(g/yr)**	**(g/yr)**
Chlordane	2.53	0.162	0.159	0.122
PCBs	1.96	0.126	0.124	0.095

Notes:

[1]The average measured concentrations of each constituent were based on the measured data reported in the 2007-2009 TIE Study performed by SCCWRP and the City of Los Angeles. These data provided representative concentrations of these constituents in stormwater runoff.

[2]The baseline load is the concentration of each constituent (column 2) multiplied by the fine sediment load of 64,166 kg/yr (Regional Board, Toxics TMDL Staff Report).

[3]The load that the MS4 permittees and Caltrans are responsible for is based on the portion of the loading capacity that they are responsible for, as listed in the TMDL. The MS4 Permittees and Caltrans are responsible for 98.2 % of the load; therefore the watershed-wide baseline load (column 3) was multiplied by 98.2 %.

[4] Portion of Areas 1A,1B, 3 and 4 that is under the jurisdiction of City of Los Angeles, City of Culver City and Caltrans (the preparers of this Implementation Plan), which is 76 % (based on GIS analysis); therefore the MS4 portion (column 4) was multiplied by 76 %.

Table ES-3
Load Reduction from Quantified BMPs

Constituent	Baseline Load[1]	Load Reduction from BMPs[2]		Estimated Post-BMP Load[3]	TDML Wasteload Allocation[4]	Estimated Post-BMP Load as % of WLA
		Vehicle Brake Pad Product Replacement	Enhanced Street Sweeping			
Metals	(kg/yr)					
Copper	1.72	0.56	0.25	0.908	1.557	58%
Lead	1.30	-	0.34	0.967	2.130	45%
Zinc	7.13	-	0.93	6.194	6.853	90%
Organics	(g/yr)					
Chlordane	0.12	-	-	0.122	0.023	535%
PCBs	0.09	-	-	0.095	1.029	9%

Notes:
1 – Baseline Load City of Los Angeles, City of Culver City and Caltrans only (see Table ES-2, column 5)
2 – Based on build-up and wash-off analysis.
3 – Baseline load (column 1) less BMPs load reductions (columns 2 and 3).
4 – WLAs for stormwater (Table 1-1) multiplied by the percentage watershed area under the jurisdiction of City of Los Angeles, City of Culver City and Caltrans (76%).

Table ES-3 shows that lead and PCB concentrations already meet the TMDL WLA. Table ES-3 also demonstrates that implementation of just two BMPs (vehicle brake pad product replacement program and enhanced street sweeping) will result in compliance with the WLAs for all remaining constituents (copper and zinc), except chlordane.

Chlordane Sediment Exceedances
Chlordane was used as an insecticide until 1983 when it was banned for all uses except termite control. It was completely banned from any use in 1988. The soil half-life for chlordane is estimated at 350 days but can range from 37 days to 3,500 days (or approximately 10 years) (NPIC, 2001).

As described above, the method for establishing the baseline load used the measured constituent concentrations found in the adjacent Ballona Creek Estuary bottom sediments as determined by the Ballona Creek Estuary TIE study. Since this study represents sediments deposited over multiple years, it is possible that sediments deposited many years ago are erroneously indicating that chlordane concentrations are still high. Over time with the collection of additional data, the benefits of the ban on chlordane use are expected to become more apparent.

Water Column and Fish Tissue Components of the TMDL
The Toxics TMDL contains targets for PCBs in the water column and PCBs in fish tissue. The LARWQCB Staff Report recognizes that PCBs are a legacy pollutant similar to chlordane. The presence of this constituent is expected to be reduced overtime as it is no longer used. **Table ES-4** summarizes the interim and final PCB targets.

Table ES-4
Water Column and Fish Tissue

Condition	Numeric Limit	Concentration in Samples
Interim Target for Total PCBs in Water Column	0.03 µg/L	Non-Detect
Final Target for Total PCBs in Water Column	0.00017 µg/L	Non-Detect
PCBs in Fish Tissue	5.3 µg/kg	No data available

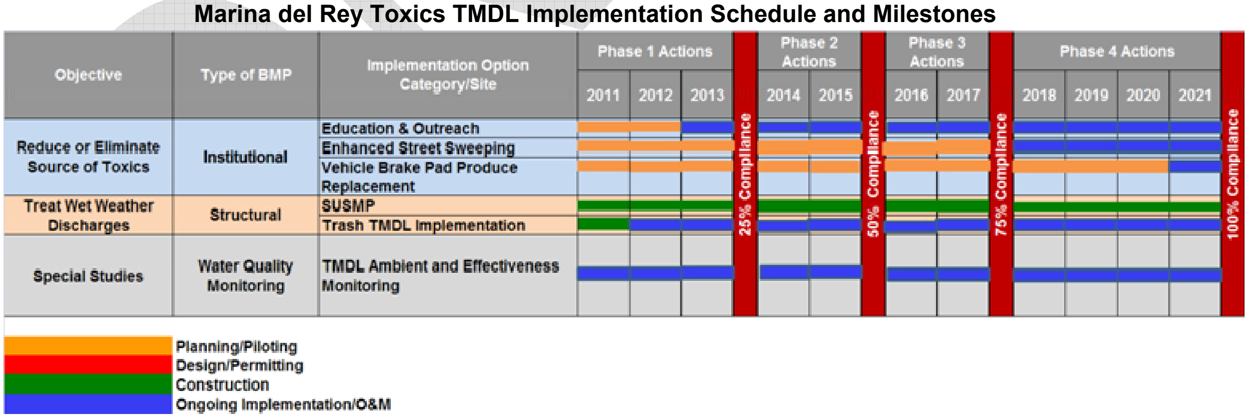
Note:
Results are from the first quarterly report prepared as part of the Marina del Rey Toxics CMP. Concentrations of PCBs were not detected in the samples. However, the detection limit, 0.1 µg/L, is above the interim and final targets. Therefore it is not conclusive whether any exceedances of the numeric targets exist.

CMP results show that concentrations of PCBs were not detected in water column samples. However, the detection limit of 0.1 µg/L is above the interim and final targets. Therefore, it is not conclusive whether any exceedances of numeric targets exist. Concentrations of PCBs in fish tissue were not available for the preparation of this Implementation Plan.

ES.9 Interim Compliance

The TMDL requires that interim compliance milestones be achieved (Section ES.4). Copper and zinc are the only non-banned constituents that currently are not meeting the final WLAs of 2021 (Table ES-3). Analyses of the current street sweeping program indicate that over 90% of the upstream watershed area under the jurisdiction of the Marina del Rey Watershed Agencies is already in compliance. As such, since the Toxics TMDL requires that 75% of this watershed area be in compliance by 2017, it can be assumed that this (and previous) interim compliance requirements have already been met. Compliance of the final WLAs by 2021 could be met through implementation of the proposed enhanced street sweeping program. Further, implementation of additional BMPs listed in section ES-8 will also reduce the load of these constituents, though their load reduction benefits have not been quantified. The schedule shown in **Table ES-5** illustrates the proposed implementation of these BMPs.

Table ES-5
Marina del Rey Toxics TMDL Implementation Schedule and Milestones



ES.10 Integrated Water Resources Benefits

One of the goals of the Implementation Plan is to develop an integrated plan consistent with the Integrated Water Resources Approach:

- Enhanced Street Sweeping – Removal of the additional street sediments thought the enhanced program will not only remove the pollutants listed in the Toxics TMDL but also metals, bacteria, organics and other potential pollutants.

- Public Education – The public education program will have a wider impact beyond the pollutants listed in the Toxics TMDL.

- SUSMP and LID Ordinances Implementation – Through the implementation of the ongoing SUSMP and the new LID ordinance, property owners will be required to manage discharges of runoff from their property, predominantly by on-site infiltration of the runoff. This will reduce not only the discharge of the pollutants listed in the Toxics TMDL but also any additional pollutant that would have otherwise discharged from the properties and into the Back Basins. Additionally, the Marina del Rey Watershed Agencies will continue evaluating opportunities for green infrastructure projects on the public right-of-way, public lands and land owned by others.

- Trash TMDL Implementation – As discussed, the removal of trash from the waterbodies not only results in the removal of trash, but also the removal of pollutants attached to the trash, including the pollutants listed in the Toxics TMDL as well as other pollutants such as other metals, organics and bacteria.

ES.11 Implementation Plan Cost Estimates

Table ES-6 presents the cost for implementation of the Toxics TMDL Implementation Plan. The total capital cost is estimated to be $248,000, with $16,300 in annual O & M costs. This includes the cost associated with the enhanced street sweeping program and an increase in the education program. The costs associated with the other BMPs are expected to be incurred by home owners or product manufacturers (vehicle brake pad product replacement), or do not constitute additional cost for TMDL implementation.

Implementation of this plan is subject to the availability of the necessary funding. Currently, none of the BMPs and projects identified in this plan are funded, except for some of the institutional measures. The Agencies continue to pursue funding alternatives in partnership with each other.

Table ES-6
Estimated Costs for the Marina del Rey Toxics TMDL Implementation Plan for the City of Los Angeles, Culver City, and Caltrans

Marina del Rey Watershed BMPs	Total Capital Cost	Annual O & M
Enhanced Street Sweeping[1, 2]	$160,000	$12,000
Education Program[1]	$5,000	$500
Subtotal (rounded)	**$165,000**	**$12,500**
Program Management, Engineering, Administration, and Monitoring (20% of capital cost)[4]	$33,000	
Program Contingency (30%)	$50,000	$3,800
Total Cost	**$248,000**	**$16,300**

[1] Will address multiple pollutants including bacteria, metals and toxicity.
[2] Assumes one new mechanical sweeper will be purchased as the mid-level cost between $0 (no additional sweeper purchased) and $315,000 (vacuum sweeper purchased).

Section 1 Introduction

The Marina del Rey Harbor Toxic Pollutants TMDL Implementation Plan (Implementation Plan) defines the approaches that the cities of Los Angeles (lead agency for developing this plan) and Culver City and the California Department of Transportation (Caltrans), (collectively the Marina del Rey watershed agencies), propose to comply with the implementation requirements of the *Marina del Rey Harbor Toxic Pollutants TMDL* (Toxics TMDL). This TMDL limits the discharge of specific pollutants to the three Back Basins of Marina del Rey Harbor – Basins D, E and F (see Figure 1-1). The County of Angeles, the designated lead agency for the Toxics TMDL, elected to develop its own implementation plan to comply with the implementation requirements of the Toxics TMDL.

1.1 Guiding Principles

A guide to the development of this Implementation Plan is the City of Los Angeles Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR). Although the WQCMPUR is a strategic plan for the City of Los Angeles, its guidelines and directions apply to the entire region and were developed in concurrence with all watershed stakeholders, including the Marina del Rey watershed Agencies. The WQCMPUR includes three initiatives (City of Los Angeles, 2009):

- Water Quality Management Initiative for project identification;
- Citywide Coordination Initiative to develop ordinances and collaborative approaches within and among agencies; and
- Outreach Initiative for pollutant source control.

This Implementation Plan addresses these three initiatives. Further, the WQCMPUR included an Action Plan (Table ES-3 of the WQCMPUR executive summary). The Action Plan identifies high priority items including the development of multiple TMDL Implementation Plans and watershed-specific Water Quality Management Plans, which are currently in development. At the time of the development of this Implementation Plan, three TMDL Implementation Plans have been prepared for the Ballona Creek Watershed (Bacteria, Metals and Estuary Toxics), as well as the Los Angeles River Metals TMDL Implementation Plan and the Machado Lake Water Quality Management Plan which was developed to address the Machado Lake Nutrients TMDL. The Ballona Creek and Los Angeles River Metals TMDL Implementation Plans have both been approved by the LARWQCB, while the other I plans are under review.

Following the WQCMPUR and City of Los Angeles Integrated Resources Plan (IRP) (City of Los Angeles, 2004), this Implementation Plan uses the following guiding principles:

- ***Watershed-Wide Approach***: Characterize the watershed as a whole and identify and select projects independent of jurisdictional boundaries in order to develop the most beneficial plan for the watershed.

- ***Integrated Plan***: Identify urban runoff management projects that have multiple benefits and treat multiple pollutants.

- ***Green Solutions***: Wherever possible, implement solutions that are "green," sustainable, and work with the existing natural environment.

- ***Build on Existing Programs:*** Review existing urban runoff programs and identify opportunities to improve current water quality programs.

- ***Adaptive Management***: Develop a plan that can be refined based on the information gathered over time through lessons learned from the implementation of both successful and unsuccessful programs and projects.

1.2 Regulatory and Permitting Requirements

1.2.1 Background

The Clean Water Act of 1972 (CWA) provides the basis for the protection of all inland surface waters, estuaries, and coastal waters. The federal Environmental Protection Agency (EPA) is responsible for administering the CWA and developing regulations, but may delegate its authority to the State.

The State of California (State) implements the CWA by establishing water quality protection laws and regulations and issuing discharge permits through State regulatory agencies. At its own discretion, the State has established requirements in many instances that are more stringent than federal requirements for CWA implementation.

California's primary statute governing water quality is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act). The Porter-Cologne Act grants the California State Water Resources Control Board (State Board) and nine California Regional Water Quality Control Boards broad powers to protect water quality, and it is the primary vehicle for the administration of California's regulations under the federally delegated responsibilities of the CWA. The governing Regional Board for the Los Angeles area watersheds is the Los Angeles Regional Water Quality Control Board (LARWQCB).

Biennially, the LARWQCB prepares a list of impaired waterbodies in the region, referred to as the 303(d) list. The 303(d) list outlines the impaired waterbody and the specific pollutant(s) for which it is impaired. All waterbodies on the 303(d) list are subject to the development of a TMDL. A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still meet the applicable water quality standard for that pollutant. Depending on the nature of the pollutant, TMDL implementation may require a cap on pollutant contributions from point sources (wasteload allocation), nonpoint sources (load allocation), or both.

The development of TMDLs affecting waters in the Los Angeles area watersheds is the responsibility of the LARWQCB. Adoption of a TMDL requires an amendment to the regional water quality regulations (Basin Plan) and is subject to a substantial public review process. After the LARWQCB adopts the TMDL as a Basin Plan amendment, it is submitted to the State Board for approval. If approved by the State Board, the TMDL is submitted to EPA Region 9 for final review and federal approval. The TMDL does not take effect until the EPA has issued its formal approval.

Once a TMDL becomes effective, the schedule for TMDL implementation by each named responsible jurisdiction becomes active. TMDL-specific implementation requirements vary, but typically include preparation of a Coordinated Monitoring Plan (CMP) for the affected watershed, and development of an Implementation Plan detailing how the Agencies plan to achieve compliance with the TMDL requirements. This Implementation Plan is written in response to requirements contained in the Toxics TMDL (LARWQCB, 2005a).

1.2.2 Toxics TMDL Development History

In order to address the Toxics TMDL development requirements, the LARWQCB published for public review, draft technical documents, including the Draft Staff Report (LARWQCB, 2005b), a Proposed Basin Plan Amendment, a Tentative Resolution, and the California Environmental Quality Act (CEQA) Requirements Checklist and Determination. After comments were received, these documents were revised and finalized on October 6, 2005.

The LARWQCB adopted the Toxics TMDL October 6, 2005 by Resolution No. 2005-012 (Appendix A). Subsequently, the Toxics TMDL was approved by the State Board on January 13, 2006, by the State Office of Administrative Law on March 13, 2006, and by EPA Region 9 on March 6, 2006. The Toxics TMDL became effective on March 22, 2006.

1.2.3 Toxics TMDL Numeric Targets

Table 1-1 summarizes the Toxics TMDL numeric targets which are based on the sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration and the corresponding waste load allocations (WLA). Throughout this Implementation Plan, the term “toxic pollutants” refers to the constituents that are listed in the Toxics TMDL (e.g., both metals and organics).

The Toxics TMDL numeric targets include concentrations of the constituents of toxic pollutants in the Back Basins of the Harbor, i.e. Basins D, E and F (Figure 1-1). The WLA are for the maximum amount of each of these constituents that can be transported from the Marina del Rey Watershed to the Back Basins. A majority of these constituents are bound to sediment and transported as storm-borne sediment during wet weather runoff events.

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Total PCBs	22.7	1.38

Source: Attachment A to Resolution No. 2005-012, Basin Plan Amendment (see Appendix A).

1.2.4 Additional TMDLs and Watershed Impairments

Water quality concerns in the Marina del Rey Watershed extend beyond elevated toxic pollutant concentrations addressed by the Toxics TMDL. These concerns have resulted in the adoption of other TMDLs and 303(d) listed impairments, as described below.

Adopted TMDLs

One additional TMDL is effective in the Marina del Rey Watershed. *The Marina del Rey Mothers' Beach and Back Basins Bacteria TMDL (Bacteria TMDL)* includes numeric targets and WLAs applicable to urban runoff for total coliform, fecal coliform, and enterococcus (LARWQCB 2003). The Bacteria TMDL became effective on March 18, 2004, and the Final Bacteria TMDL Implementation Plan was approved by the LARWQCB on April 6, 2006. The Bacteria TMDL Implementation Plan was developed by the County of Los Angeles as the TMDL lead agency, the cities of Los Angeles and Culver City and Caltrans (County of Los Angeles et al., 2005).

Many of the BMPs listed in the Final Bacteria TMDL Implementation Plan have been included in this Implementation Plan since they serve to reduce multiple pollutants of concern. Similarly, new BMPs proposed in this Implementation Plan (Section 3) for reducing toxic pollutants in urban runoff discharges from the watershed will also support the removal of bacteria. This multi-pollutant approach for BMP implementation is compatible with the Integrated Water Resources Approach (IWRA) for stormwater management and improving urban runoff quality.

303(d) List of Impaired Waters

The EPA-approved 303(d) list for California was most recently updated in 2010. Within the Marina del Rey Watershed, the 2010 303(d) list identifies the following impairments in addition to those already issued a TMDL:

- Marina del Rey Harbor – Back Basins:
  - Fish Consumption Advisory
  - Sediment Toxicity

These listings have been included on the 303d list since 1998. As discussed in the Toxics TMDL Staff Report, the "sediment toxicity and fish advisory listing will be addressed by the TMDLs [referring to the Toxics TMDL] waste load allocations (WLAs) and load allocations (LAs) for these toxic pollutants." As such, there are no additional pollutants listed on the 303d list for which TMDLs will be forthcoming.

1.2.5 Coordinated Monitoring Plan (CMP) Requirements

The Toxics TMDL requires that the responsible jurisdictions (County of Los Angeles, cities of Los Angeles and Culver City, Caltrans) submit and implement a CMP. A draft CMP was submitted to the LARWQCB on March 22, 2007. The revised CMP was submitted on March 31, 2008 (County of Los Angeles et al., 2008), which was subsequently approved by the LARWQCB. On August 31, 2009, the responsible jurisdictions submitted an addendum with additional monitoring locations and procedures for sampling in the watershed areas that are under tidal influence (LARWQCB approval received on October 28, 2009).

The CMP includes both ambient and TMDL effectiveness monitoring locations as illustrated in **Figure 1-1**:

- *Ambient monitoring* - The CMP establishes 14 monitoring points (**Tables 1-2**, **1-3**, and **1-5**), five in the watershed and nine within the Harbor (MdR-3 through MdR-5, MdRH-B-1 through MdRH-B-4, MdRH-F-1 through MdRH-F-5 and MdRU-C-1 through MdRU-C-2).

- *Effectiveness monitoring* - Eleven locations have been established, seven in the watershed and four within the Back Basins (MdR-1 though MdR-5, MdRH-B-1 through MdRH-B-4 and MdRU-C-1 through MdRU-C-2) (Table 1-2, **Table 1-4** and Table 1-5).

The TMDL requires bioaccumulation monitoring, but only within the Back Basins. This monitoring, which occurs at three locations (MdRH-B-1 through MdRH-B-3) (Table 1-2), samples the tissue of two or three species of fish and mussels.

The CMP includes two sites to monitor the runoff from 282 acres that drains to the Harbor via sheet flow directly to the Back Basins (Table 1-5). The drainage pattern and tidal conditions prohibit the use of direct sampling in this area due to the possibility of contamination of storm samples and sampling equipment by the rising tide. Instead, two sample locations were selected to capture two representative land uses, commercial land use and high-density residential land use. The samples are collected from catch basins instead of the end of pipe to avoid tidal influence.

The ambient monitoring program was started in August 2010 upon execution of an agreement for cost sharing by the responsible jurisdictions.

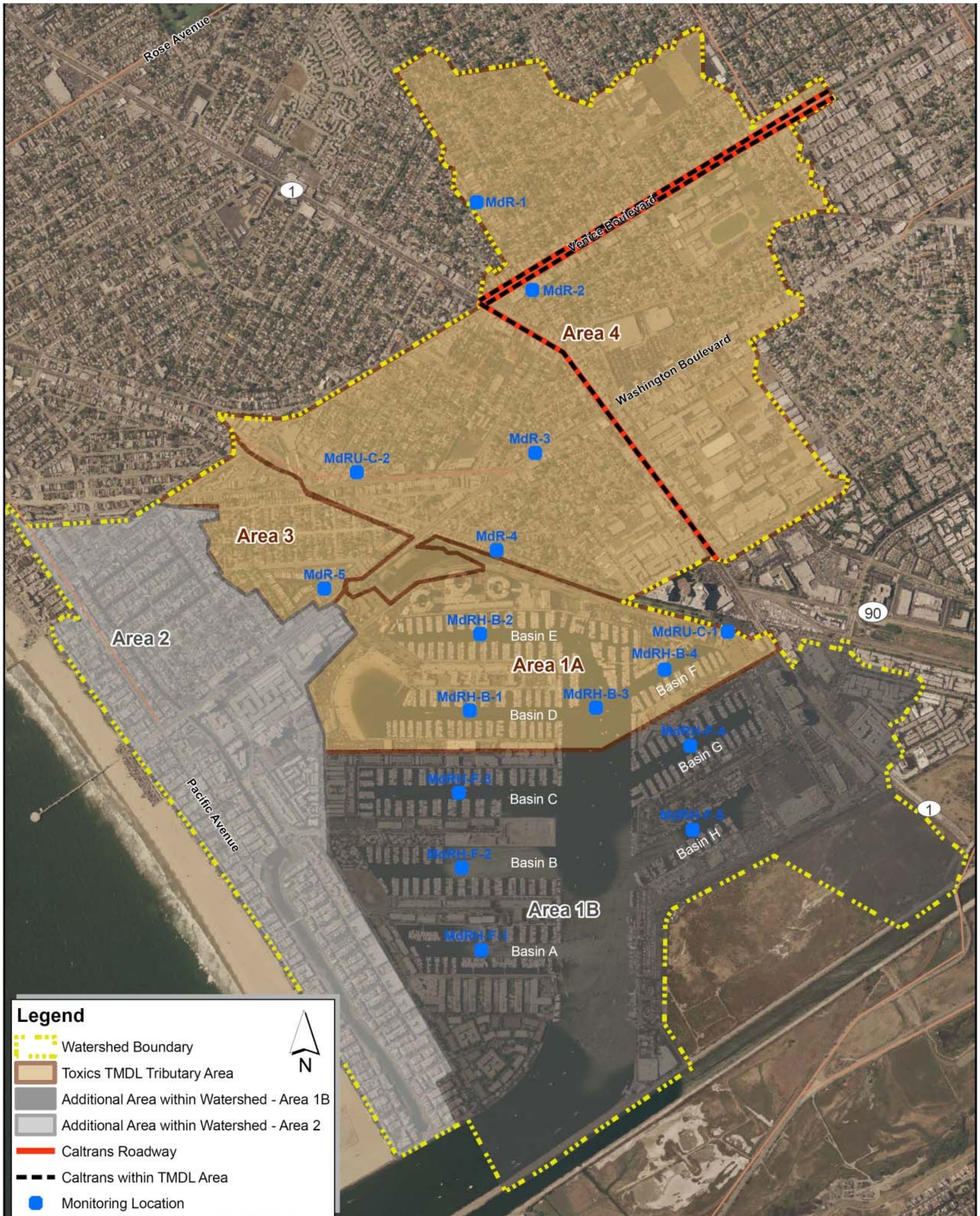

Figure 1-1 CMP Monitoring Locations

Table 1-2
TMDL Watershed Monitoring Sites

Station ID	MdR-1	MdR-2	MdR-3	MdR-4	MdR-5
Location	Victoria Ave & Penmar Ave.	200-ft south on Penmar Ave from intersection with Venice Blvd.	LFD[1] at Washington Blvd and Thatcher Ave.	LFD at east end of Oxford Flood Control Basin	LFD at Boone-Olive Pump Station control house
Subwatershed	Area 4	Area 4	Area 4	Area 4	Area 3
% of Watershed Tributary	10.4%	20.2%	40.9%	16.5	6.7%
Sampling Program	Effectiveness	Effectiveness	Effectiveness and Ambient	Effectiveness and Ambient	Effectiveness and Ambient

Notes:
1-LFD = Low Flow Diversions

Table 1-3
TMDL Harbor Monitoring Sites

Station ID	MdRH-F-1	MdRH-F-2	MdRH-F-3	MdRH-F-4	MdRH-F-5
Location	Mid-channel of Basin A	Mid-channel of Basin B	Mid-channel of Basin C	Mid-channel of Basin G	Mid-channel of Basin H
Subwatershed	1B	1B	1B	1B	1B
Sampling Program	Copper in water column during ambient monitoring	Copper in water column during ambient monitoring	Copper in water column during ambient monitoring	Copper in water column during ambient monitoring	Copper in water column during ambient monitoring

Table 1-4
TMDL Harbor Back Basins Monitoring Sites

Station ID	MdRH-B-1	MdRH-B-2	MdRH-B-3	MdRH-B-4
Location	Mid-channel of Basin D	Mid-channel of Basin E	Mid-channel of Basin F	End of Main Channel
Subwatershed	1A	1A	1A	1A
Sampling Program	Water quality, benthic sediment quality and bioaccumulation	Water quality, benthic sediment quality and bioaccumulation	Water quality, benthic sediment quality and bioaccumulation	Water quality, and benthic sediment quality

Table 1-5
TMDL Land Use Specific Monitoring Sites

Station ID	MdRU-C-1	MdRU-C-2
Location	North of Bali and Admiralty Ways	North of Abbot Kinney Blvd and Woodlawn Ave
Subwatershed	1A	1A
% of Watershed Tributary	5.8% of total commercial land use within area not represented by other monitoring sites	12.2% of total high-density residential land use within area not represented by other monitoring sites
Sampling Program	Ambient – wet-weather event/stormwater quality only Effectiveness – wet-weather event/stormwater quality and storm-borne sediment	

1.2.6 Toxics TMDL Compliance Requirements

The Toxics TMDL defines milestones for achieving compliance as follows:

- By **March 22, 2011**, MS4 and Caltrans stormwater NPDES permittees shall provide a written draft report to the LARWQCB outlining how they will achieve the waste load allocations for sediment in the Marina del Rey Harbor.

- By **September 22, 2011**, MS4 and Caltrans stormwater NPDES permittees shall provide a written final report to the Regional Board outlining how they will achieve the waste load allocations for sediment in the Marina del Rey Harbor.

- By **March 22, 2012**, the Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.

- By **March 22, 2013**, demonstrate that 25 % of the total drainage area is effectively meeting the waste load allocation for sediment (Table 1-1).

- By **March 22, 2015,** demonstrate that 50 % of the total drainage area is effectively meeting the waste load allocation for sediment (Table 1-1).

- By **March 22, 2017,** demonstrate that 75 % of the total drainage area is effectively meeting the waste load allocation for sediment (Table 1-1).

- By **March 22, 2021,** demonstrate that 100 % of the total drainage area is effectively meeting the waste load allocation for sediment (Table 1-1).

1.3 Adaptive Management

The Toxics TMDL requirement to re-evaluate the WLAs and implementation schedule by March 22, 2012 is consistent with the adaptive management approach incorporated into this Implementation Plan. Adaptive management recognizes that there is uncertainty associated with the development of the numeric targets and WLA of the Toxics TMDL.

Adaptive management, or in this case, "adaptive implementation" is an iterative process whereby the Marina del Rey Watershed Agencies will implement an initial suite of priority BMPs, meanwhile continuing with monitoring under the CMP to quantify progress towards meeting the TMDL's numeric targets. Adaptive management only addresses uncertainty regarding the efficacy of BMPs and the monitoring data used to characterize the impacted waterbodies. Refinements or improvements to BMPs or the analytical tools such as water quality models will also be undertaken, if necessary, after initiation of the Implementation Plan. Under the adaptive management process, the Marina Del Rey Watershed Agencies, in coordination with the LARWQCB, would identify and implement improved BMPs and apply the refined analytical tools using current water quality monitoring data. The adaptive management approach enables implementation of new BMPs with reduced uncertainty of their performance, and potentially improved cost-effectiveness. The outcome of this process could result in future periodic revisions to the Implementation Plan.

Section 2
Watershed Background

This section provides an overview of physical conditions (e.g., land use, topography and soils types), hydrologic conditions (e.g., precipitation and storm drain connectivity), and historic water quality in the Marina del Rey Watershed.

2.1 Marina del Rey Watershed

The Marina del Rey Watershed is approximately 1,855 acres (2.9 square miles) in size (**Figure 2-1**) and lies within the jurisdictions of the City of Los Angeles (53%), County of Los Angeles (44%), City of Culver City (2%), and Caltrans (1%). The watershed is bordered by the Santa Monica Bay Watershed and the Ballona Creek Watershed. Marina del Rey Harbor is open to Santa Monica Bay through the Main Channel and it shares a common breakwater with Ballona Creek. The Harbor consists of the Main Channel and eight basins (A-H). Mother's Beach is located at the west end of Basin D. Figure 2-1 shows that there are five subwatersheds (or Areas) within the Marina del Rey Watershed. Subwatersheds 1A, 3 and 4 are tributary directly to the Back Basins (Basins D, E and F). Subwatershed Area 1B drains to the other basins of the Harbor. Subwatershed Area 2 does not drain to the Harbor but to the Ballona Lagoon.

The Marina del Rey Watershed was developed in two general stages. The area surrounding the Harbor was developed from the late 1800's into the early 1900's. The Marina was constructed in the early 1960s from the remnants of the Ballona Creek Wetlands and Estuary. Subsequently, Marina del Rey developed with construction of a variety of different facilities including housing, restaurants, commercial/retail, office, and marine/boating.

The Marina del Rey Watershed is unique in that it includes the Harbor, the area adjacent to the Harbor and the upper watershed, all of which have distinct activities and characteristics associated with them:

- The Harbor Area includes the docks, Front and Back Basins, Marina Beach, and the Main Channel. This area is part of the Los Angeles County unincorporated area.

- The land adjacent to the Front and Back Basins includes individual parcels, streets, and other facilities. This area is also part of the Los Angeles County unincorporated area and drains directly to the Harbor by sheet flow or through small, local drains.

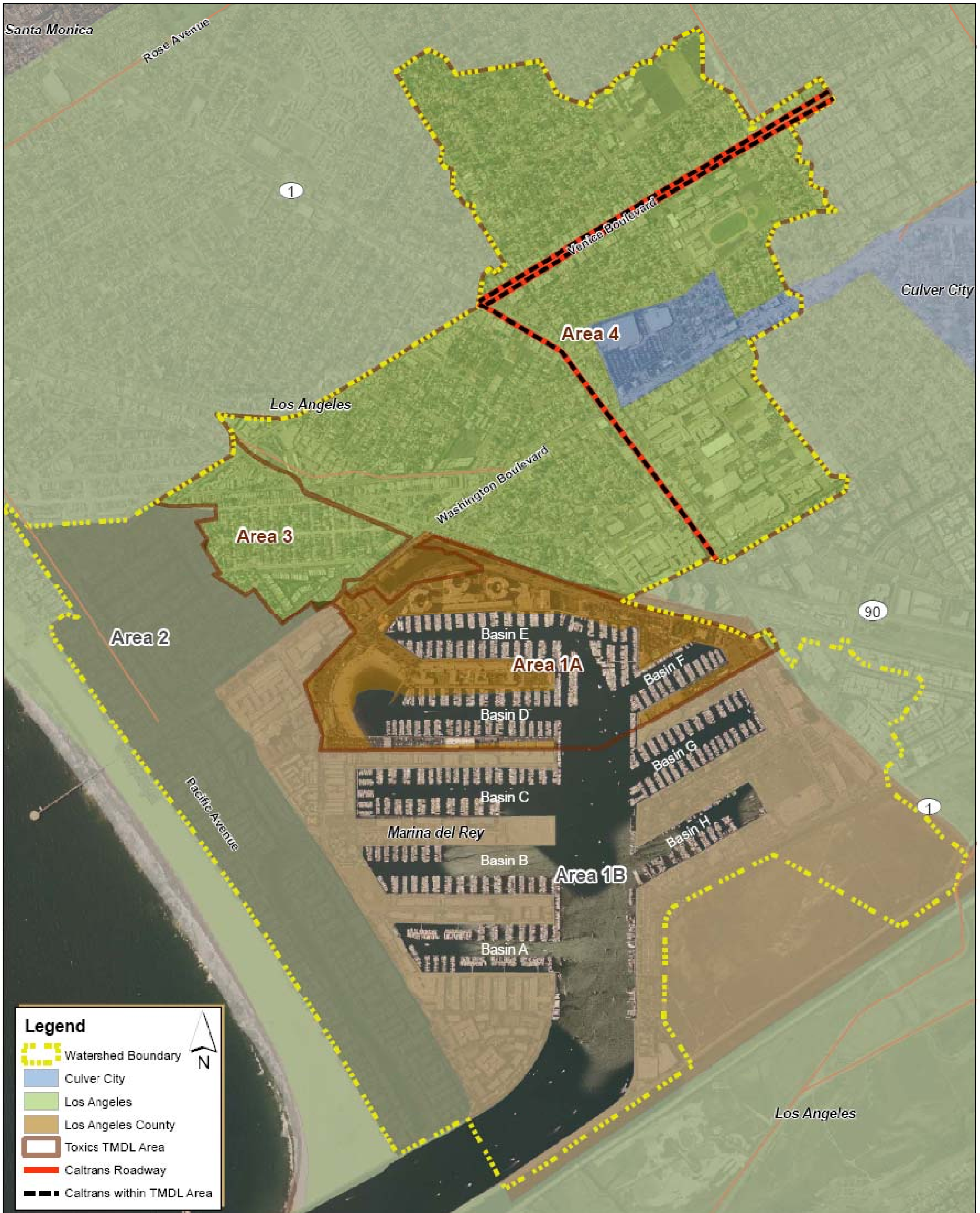

Figure 2-1 Watershed Layout

- The Upper Watershed Area drains to the Harbor via the storm drain network. This area is outside the Los Angeles County unincorporated area and includes the Cities of Los Angeles and Culver City, and Caltrans right-of-ways, with the exception of the Oxford Retention Basin (Oxford Basin) which is within the County of Los Angeles unincorporated area.

Because this Implementation Plan applies to the Cities of Los Angeles and Culver City and Caltrans, this plan only addresses pollutant load management in the upper watershed area.

2.2 Watershed Characteristics

2.2.1 Topography

Figure 2-2 illustrates the topography of the Marina del Rey Watershed. The area is relatively flat, draining towards the Harbor, and elevations range from sea level to approximately 15 feet above sea level at the uppermost part of the watershed.

2.2.2 Hydrologic Connectivity and Storm Drain Network

Hydrologic connectivity refers to the physical connections between a river or channel and its tributaries, between surface water and groundwater, and between wetlands and waterbodies.

Storm drainage throughout most of the Marina del Rey Watershed occurs through a network of underground pipelines (**Figure 2-3**). There are both City and County catch basins throughout the watershed which drain to these pipelines.

Oxford Basin is situated at the north end of Marina del Rey Harbor and drains to Basin E through two slide gates and a culvert system. Oxford Basin serves as a retention basin for the surrounding watershed and the slide gates control tidal influence on its water level. Los Angeles County Flood Control District (LACFCD) storm drain Project No. 52431 drains into the northeast corner of Oxford Basin and Project No. 3872 drains into the east side of Oxford Basin via Oxford Pump Plant. Project No. 3874 drains into Basin E via the Boone-Olive Pump Plant.

2.2.3 Land Use and Impervious Area

Land Use

The land use within Areas 1A, 3 and 4 are presented in **Table 2-1**.

Figure 2-2 Topography

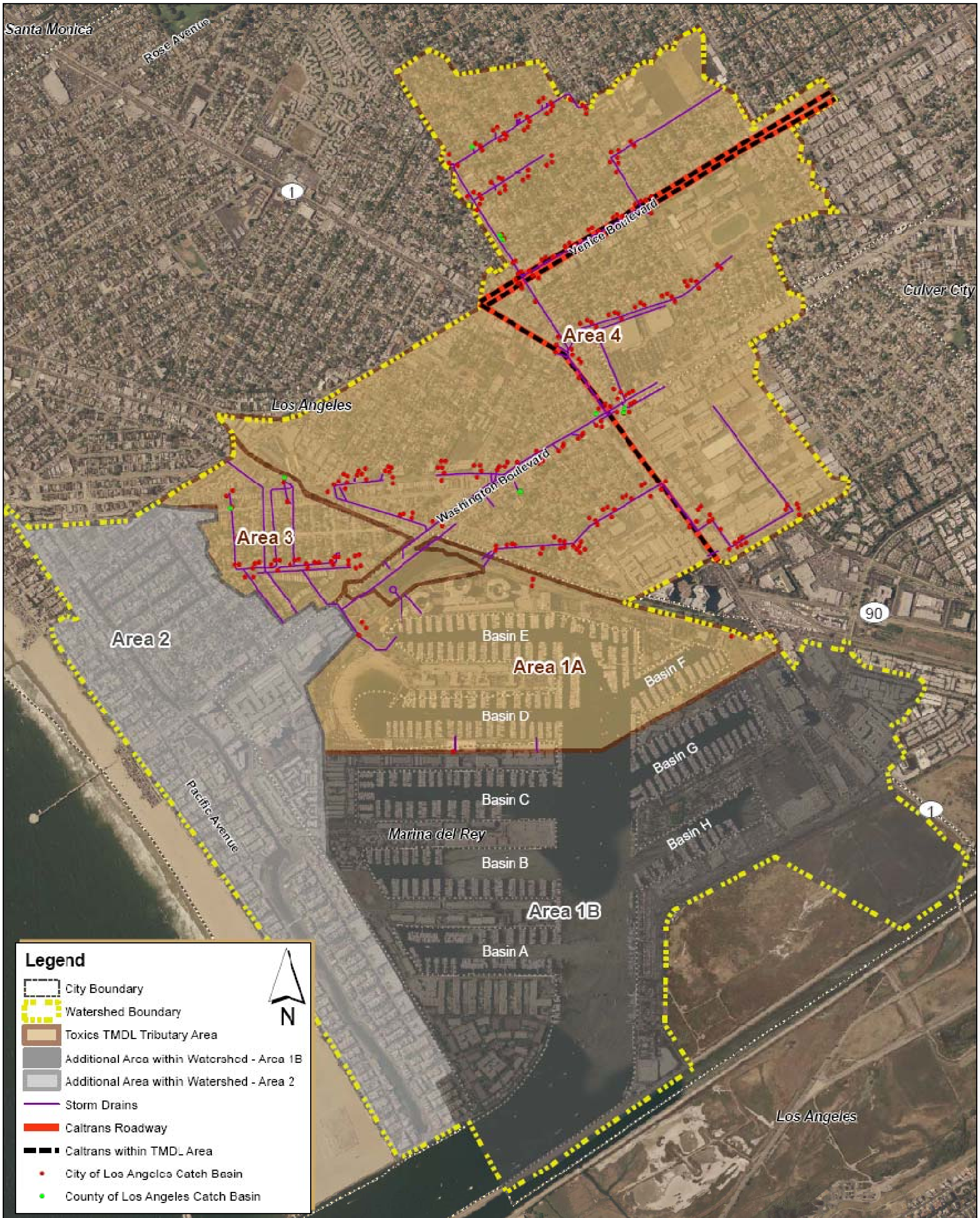

Figure 2-3 Storm Drains

Table 2-1
Marina del Rey Watershed Land Use in Areas 1A, 3 and 4

		Los Angeles, Culver City and Caltrans		**County**	
	Total (acres)	**Total (acres)**	**% of Total**	**Total (acres)**	**% of Total**
Area 1A					
Commercial / Institutional	47.67	0.17	0.1%	47.50	22.7%
Residential	33.01	0.02	0.0%	32.99	15.8%
Natural / Vacant	2.50	-	-	2.50	1.2%
Open Space / Recreation	16.57	-	-	16.57	7.9%
Mixed Urban	-	-	-	-	-
Industrial	-	-	-	-	-
Water / Wetlands	109.06	-	-	109.06	52.2%
Total Area 1A	**208.81**	**0.19**	**0.1%**	**208.25**	**99.9%**
Area 3					
Commercial / Institutional	1.31	1.31	1.9%	-	-
Residential	67.03	67.03	95.1%	-	-
Natural / Vacant	1.01	1.01	1.4%	-	-
Open Space / Recreation	-	-	-	-	-
Mixed Urban	-	-	-	-	-
Industrial	1.15	1.15	1.6%	-	-
Water / Wetlands	-	-	-	-	-
Total Area 3	**70.50**	**70.50**	**100.0%**	**0.0**	**0.0%**
Area 4					
Commercial / Institutional	184.98	183.06	27.3%	1.92	0.3%
Residential	393.69	391.42	58.3%	2.27	0.3%
Natural / Vacant	1.35	-	-	1.35	0.2%
Open Space / Recreation	1.22	-	-	1.22	0.2%
Mixed Urban	5.93	5.93	0.9%	-	-
Industrial	75.59	75.59	11.3%	-	-
Water / Wetlands	8.45	-	-	8.36	1.2%
Total Area 4	**671.22**	**656.10**	**97.7%**	**15.11**	**2.3%**
Total Areas 1A, 3 and 4	**950.53**	**726.79**	***76.5%***	**223.36**	***23.5%***

Note:
As Specified in LARWQCB Staff Report for the Toxics TMDL, Areas 1B and 2 do not drain to the back basins.

The City of Los Angeles, City of Culver City and Caltrans are almost exclusively in Areas 3 and 4. Unincorporated area of the County of Los Angeles is almost exclusively in Area 1A (and Area 1B that drains to the front basins), with the exception of Oxford Basin and its surrounding area which is located in Area 4.

Therefore, for the purposes of this Implementation Plan, it is assumed that the Cities of Los Angeles and Culver City and Caltrans are responsible for Areas 3 and 4 only (excluding the portions that are under the jurisdiction of the County of Los Angeles). This essentially is the Upper Watershed Area (Figure 2-1) as identified in Section 2.1.

Table 2-2 summarizes the land use breakdown for Areas 3 and 4 combined. The land use distribution in **Figure 2-4** shows that the Upper Watershed Area is predominantly residential and commercial.

Table 2-2
Land Use in Areas 3 and 4

Land Use	Area (acres)	% of Total
Commercial / Institutional	186.29	25%
Residential	460.72	62%
Natural / Vacant	2.36	0%
Open Space / Recreation	1.22	0%
Mixed Urban	5.93	1%
Industrial	76.74	10%
Water / Wetlands [1]	8.45	1%
Total	**741.72**	**100%**

Note:
[1] The water/wetlands area is 99 % under the County's jurisdiction. This area includes the Oxford Basin.

Impervious Areas

Imperviousness is a measure of the fraction of the total area covered by impervious surfaces, such as roads, rooftops, sidewalks, patios, parking areas, and highly compacted soil. Rainfall and dry weather water sources (e.g., irrigation, car washing, etc.) that fall on pervious surfaces have the best opportunity to infiltrate into the ground and reduce the total amount of runoff generated from an area. The degree to which infiltration is expected to occur in pervious areas is related to soil types and associated infiltration rates (Section 2.2.5).

The Los Angeles County Department of Public Works (LACDPW) Hydrology Manual assigns an imperviousness factor to a number of land use types (LACDPW, 2006) (Table 2-1). Higher numbers indicate greater imperviousness. With a potential range of 0 to 1, the weighted average imperviousness factor for Areas 3 and 4 of the Marina del Rey Watershed is estimated to be 0.80.

2.2.4 Soil Types

Soil types are an integral factor in determining how much runoff can infiltrate into the ground. This is an important component in evaluating the feasibility of siting an infiltration BMP. **Figure 2-5** identifies the primary soil types and presents their geographic distribution in the watershed (LACDPW Hydrology GIS Database). Note that soil type is only one factor in identifying ideal sites for infiltration BMPs. Other factors, such as depth to groundwater and geotechnical issues, are also important.

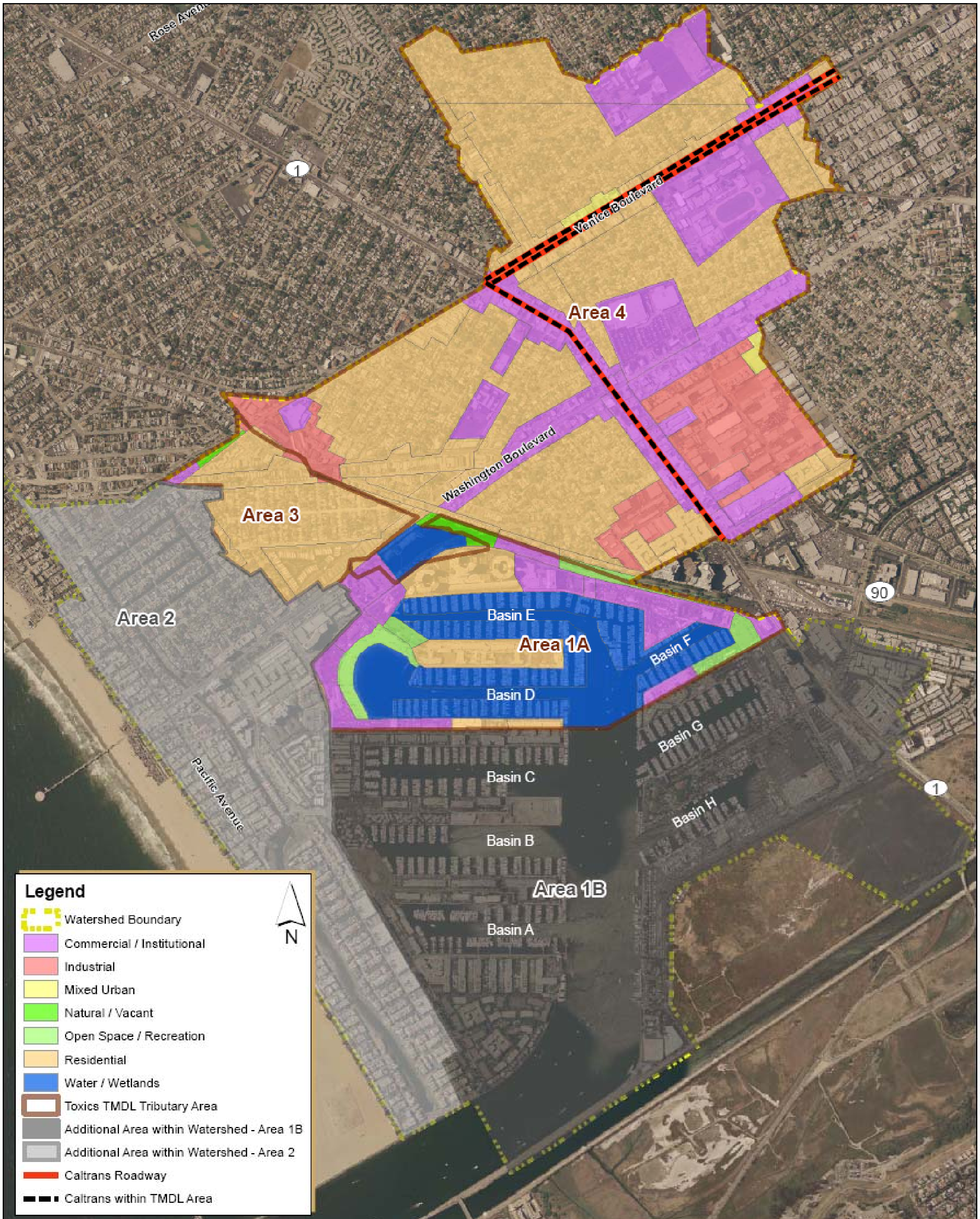

Figure 2-4 Land Use

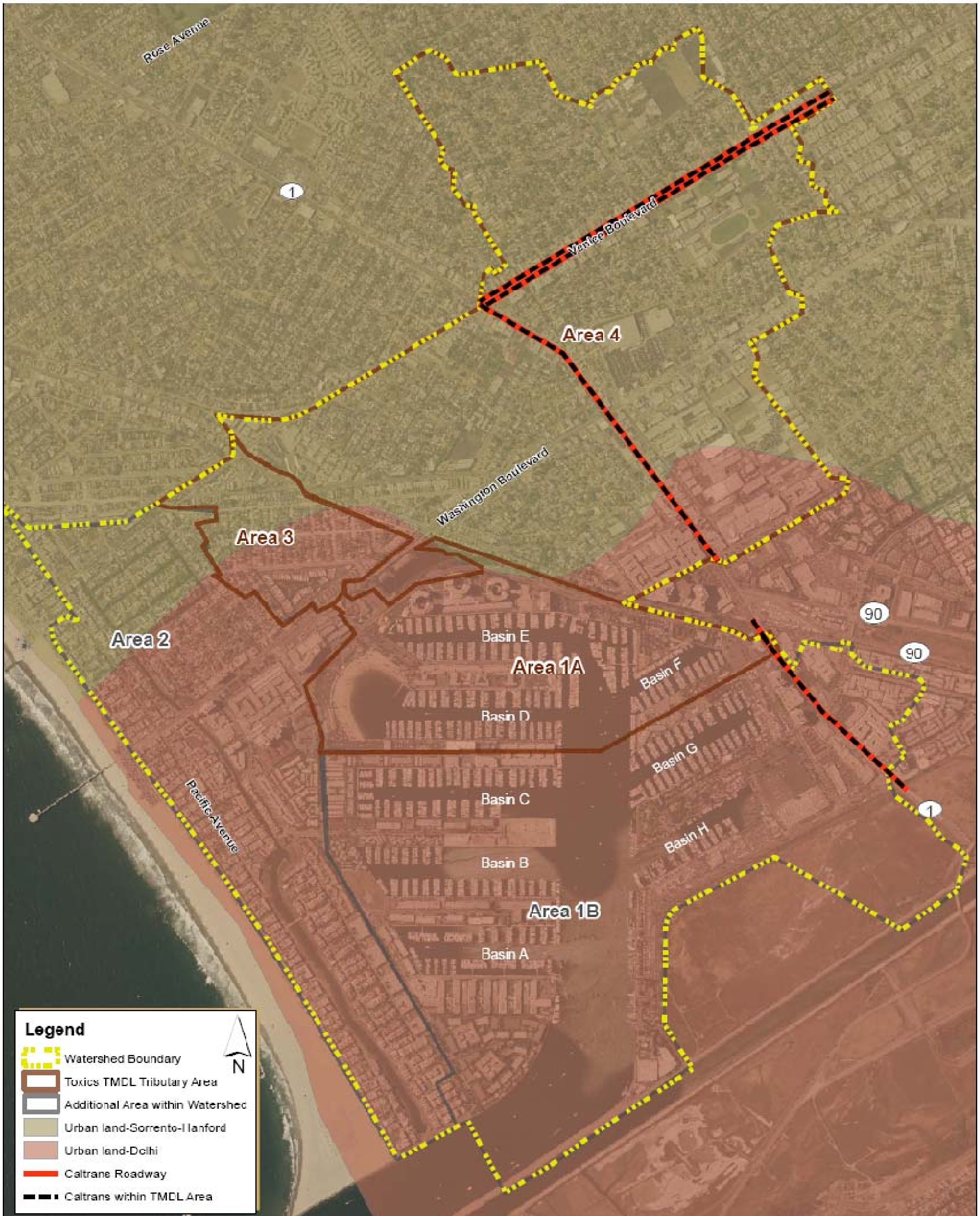

Figure 2-5 Soil Types

2.2.5 Liquefaction and Landslide Zones

Liquefaction refers to the behavior of soils (e.g. loose sand) that, under conditions such as an earthquake, shift from a solid state to a liquefied state with a consistency similar to that of a heavy liquid. This occurs in saturated soils where the water pressure increases with the earthquake event and changes the behavior of the soil. Soil liquefaction can cause tremendous damage during earthquakes. Liquefaction zone areas in the watershed are located throughout the entire watershed with the exception of the uppermost portion (**Figure 2-6**). Liquefaction potential may preclude siting of typical structural infiltration BMPs in these areas.

Landslides occur when a slope's stability changes from stable to unstable, causing the ground to move. Landslides can be caused by many natural factors, including earthquakes, increased groundwater pressure, heavy rains, and human factors, including the use of heavy machinery, blasting, and earthwork. There are no landslide areas within the Marina del Rey Watershed.

2.2.6 Rainfall Data Summaries

The Marina del Rey Watershed climate can be characterized as Mediterranean with average annual rainfall of approximately 12 inches per year over most of the watershed. **Table 2-3** summarizes rainfall data from 1998 to 2008 from Los Angeles County Gauge 634C in the Santa Monica area (monthly totals, max/min rainfall data, and yearly summaries).

2.3 Sediment Quality

The responsible agencies are required to collect water, fish tissue, mussel tissue and sediment quality data to evaluate compliance with the Toxics TMDL and to assist in the design and sizing of BMPs. At the time of the preparation of this Implementation Plan, only limited monitoring results were available. The available monitoring results are included in Appendix B:

- *Appendix B Part 1*: First Quarterly Report: August to October 2010 – includes 1) water column data which did not include analysis of constituents found in water borne sediments, and 2) benthic sediment data. All benthic sediment results were "not detectable".

- *Appendix B Part 2*: Marina del Rey Harbor Sediment Characterization Study – this report includes results of sediment samples taken from the bottom of the Harbor at various points.

Figure 2-6 Liquefaction and Land Slide Zones

Available sediment quality data are not directly applicable to estimate the baseline pollutant loadings in storm borne sediment from Areas 3 and 4 for comparison to the WLAs. Sediment samples taken from the Harbor bottom not only reflect discharges of storm borne sediment from the upper watershed, but also the discharges from Harbor activities and from the areas adjacent to the basins. As will be discussed in Section 3.3, these contributions from the Harbor and immediate surroundings could be significant (which is recognized in the TMDL Staff Report to be sources of pollutants[2]). Therefore, the use of Harbor sediment data would result in an overestimation of the actual baseline pollutant loadings from Areas 3 and 4. A more accurate estimation of the baseline pollutant loading would require the analysis of storm borne sediment collected from stormwater in Areas 3 and 4, but these data will only become available as CMP implementation progresses over the upcoming years.

Due to the lack of appropriate data at the time of developing this Implementation Plan, it was decided to use the data of the Toxicity Identification Study (TIE) study that was recently completed for the adjacent Ballona Creek Estuary. The use of TIE is the best option available at this time because:

- The upstream watershed areas of the Marina del Rey and Ballona Creek watersheds are in close vicinity and very similar in land use characteristics.

- Sediment in Ballona Creek Estuary is not impacted by harbor activities or boat discharges as Ballona Creek and its Estuary are not navigated by any vessels.

Accordingly, the TIE data were considered more representative of pollutant concentrations in storm borne sediment from Areas 3 and 4 than the Harbor sediment data.

The TIE sediment quality data used for developing this Implementation Plan cover the period from September 2007 to September 2009 and were from six locations in Ballona Creek Estuary (Appendix B Part 3). A summary of the TIE results is presented in **Table 2-4**, which includes a comparison of the average pollutant concentrations in sediment with the numeric limits for the same pollutants specified in the Marina del Rey Toxics TMDL.

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[2] Per the LARWQCB Staff Report, page 28, sources of pollutants from marina activities (under County of Los Angeles jurisdiction, which are not included in this Implementation Plan) include: "Elevated metal concentrations occur in the middle and back basins of Marina del Rey Harbor. The numerous boats that utilize the Marina are a likely contributor to the metals impairment in this area. Boats have metal components and engines that constantly corrode from salt water and air. Anti-fouling paints contain heavy metals such as copper that are designed to constantly ablate or leach out (passive leaching) to effectively reduce fouling organisms. Lead and zinc concentrations were also found in high amounts in the back harbor sediments. These metals might have originated from the historical industrial land uses of the Marina or have been derived from boating activity, including copper and lead in the boat paints, and zinc in the anodes of boat engines."

Table 2-3
Precipitation Summary (inches) based on Daily Precipitation Records in the Santa Monica Area, November 1998 to May 2008, Los Angeles County Gauge 634C

Year		Statistic	Month												Year Total
From	To		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
1998	1999	Monthly Total		1.09	0.64	1.00	0.82	1.99	1.74		0.37				7.65
		Mean		*0.36*	*0.21*	*0.25*	*0.21*	*0.33*	*0.44*		*0.12*				
		Max Day		*0.86*	*0.45*	*0.38*	*0.58*	*1.15*	*0.82*		*0.28*				
		Min Day		*0.06*	*0.05*	*0.12*	*0.04*	*0.02*	*0.13*		*0.02*				
		# Rain Days		*3*	*3*	*4*	*4*	*6*	*4*		*3*				*27*
1999	2000	Monthly Total				1.41	5.48	2.13	1.47	0.05				0.02	10.56
		Mean				*0.20*	*0.55*	*0.36*	*0.74*	*0.05*				*0.02*	
		Max Day				*0.69*	*1.65*	*1.27*	*1.02*	*0.05*				*0.02*	
		Min Day				*0.02*	*0.10*	*0.01*	*0.45*	*0.05*				*0.02*	
		# Rain Days				*7*	*10*	*6*	*2*	*1*				*1*	*27*
2000	2001	Monthly Total	0.01		0.02	6.05	7.29	1.66	0.73						15.76
		Mean	*0.01*		*0.02*	*0.76*	*0.52*	*0.55*	*0.37*						
		Max Day	*0.01*		*0.02*	*3.25*	*2.03*	*0.80*	*0.40*						
		Min Day	*0.01*		*0.02*	*0.01*	*0.02*	*0.10*	*0.33*						
		# Rain Days	*1*		*1*	*8*	*14*	*3*	*2*						*29*
2001	2002	Monthly Total	0.09	2.00	0.95	0.40	0.30	0.32	0.05						4.11
		Mean	*0.05*	*0.40*	*0.16*	*0.13*	*0.30*	*0.08*	*0.05*						
		Max Day	*0.07*	*0.91*	*0.30*	*0.25*	*0.30*	*0.17*	*0.05*						
		Min Day	*0.02*	*0.03*	*0.02*	*0.03*	*0.30*	*0.01*	*0.05*						
		# Rain Days	*2*	*5*	*6*	*3*	*1*	*4*	*1*						*22*

Table 2-3
Precipitation Summary (inches) based on Daily Precipitation Records in the Santa Monica Area, November 1998 to May 2008, Los Angeles County Gauge 634C

Year		Statistic	Month												Year Total
From	To		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
2002	2003	Monthly Total		2.04	2.44		4.49	2.52	1.31	1.54	0.04	0.06			14.44
		Mean		0.41	0.35		0.75	0.84	0.17	0.39	0.02	0.03			
		Max Day		1.53	1.00		3.08	2.00	0.46	1.15	0.03	0.05			
		Min Day		0.01	0.03		0.05	0.07	0.01	0.03	0.01	0.01			
		# Rain Days		5	7		6	3	5	4	2	2			34
2003	2004	Monthly Total	0.04	1.29	0.91	1.04	4.20	0.84	0.01					0.01	8.34
		Mean	0.02	0.26	0.13	0.09	0.47	0.21	0.01					0.01	
		Max Day	0.03	0.95	0.57	0.42	2.50	0.79	0.01					0.01	
		Min Day	0.01	0.02	0.01	0.01	0.01	0.01	0.01					0.01	
		# Rain Days	2	5	7	5	9	4	1					1	34
2004	2005	Monthly Total	3.13	0.50	6.03	8.50	11.68	1.56	0.87	0.15				0.20	32.62
		Mean	0.52	0.13	0.67	0.85	1.06	0.20	0.44	0.05				0.20	
		Max Day	1.26	0.30	2.25	1.87	3.88	1.10	0.85	0.09				0.20	
		Min Day	0.05	0.01	0.01	0.01	0.01	0.01	0.02	0.01				0.20	
		# Rain Days	6	4	9	10	11	8	2	3				1	54
2005	2006	Monthly Total	1.16	0.38	1.50	2.40	1.30	2.54	2.05	0.68	0.01				12.02
		Mean	0.39	0.19	0.38	0.60	0.33	0.32	0.26	0.68	0.01				
		Max Day	0.57	0.32	1.18	1.38	0.67	0.92	1.10	0.68	0.01				
		Min Day	0.03	0.06	0.01	0.12	0.10	0.01	0.01	0.68	0.01				
		# Rain Days	3	2	4	4	4	8	8	1	1				35

Table 2-3
Precipitation Summary (inches) based on Daily Precipitation Records in the Santa Monica Area, November 1998 to May 2008, Los Angeles County Gauge 634C

Year		Statistic	Month												Year Total
From	To		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
2006	2007	Monthly Total	0.01	0.13	0.51	0.53	0.67	0.02	0.44			0.01		0.95	3.27
		Mean	0.01	0.13	0.17	0.08	0.13	0.01	0.22			0.01		0.95	
		Max Day	0.01	0.13	0.30	0.36	0.23	0.01	0.36			0.01		0.95	
		Min Day	0.01	0.13	0.09	0.01	0.04	0.01	0.08			0.01		0.01	
		# Rain Days	1	1	3	7	5	2	2			1		1	23
2007	2008	Monthly Total	1.12	0.61	1.98	4.39	1.58		0.05	0.06					9.79
		Mean	0.56	0.31	0.28	0.40	0.40		0.05	0.06					
		Max Day	1.11	0.60	1.08	1.03	0.77		0.05	0.06					
		Min Day	0.01	0.01	0.01	0.02	0.01		0.05	0.06					
2007	2008	Monthly Total	1.12	0.61	1.98	4.39	1.58		0.05	0.06					9.79
		# Rain Days	2	2	7	11	4		1	1					28
Average by month of each parameter for the total period from Nov 1998 to May 2008 (based on daily precipitation):															
Average Monthly Total			0.62	0.80	1.50	2.57	3.78	1.36	0.87	0.28	0.05	0.01	0	0.13	11.96
Average of each Mean			0.17	0.22	0.24	0.34	0.47	0.29	0.27	0.14	0.02	0.00	0	0.13	
Average Max Day			0.34	0.56	0.72	0.96	1.57	0.82	0.51	0.23	0.04	0.01	0	0.13	
Average Min Day			0.02	0.03	0.03	0.04	0.07	0.03	0.11	0.09	0.00	0.00	0	0.03	
Average # rain of days			1.9	2.7	4.7	5.9	6.8	4.4	2.8	1.1	0.7	0.3	0	0.4	31.7

Notes:
"Monthly Total" is the sum of all rainfall that month
"Mean" is the average of each daily rain event by month, for days that it rained
"Max Day" is the maximum rainfall observed for the days that had rain that month
"Min Day" is the minimum rainfall observed for the days that had rain that month
"# of Rain Days" is a count of the total number of days that it rained that month
"Average by month of each parameter for the total period from Nov 1998 to May 2008 (based on daily precipitation)" is the average by month over the entire period based on daily rainfall. The averages include zeros for months that had no rainfall
Source: Los Angeles County Gauge 634C, Santa Monica area

Table 2-4
TMDL Numeric Limits Compared to Average Concentration Measured during the Ballona Creek Watershed TIE Study

Constituent	Unit	TMDL Numeric Target	Average TIE Study Results[1,2]
Copper	mg/kg	34	35.58
Lead	mg/kg	46.7	26.96
Zinc	mg/kg	150	147.67
Chlordane	ug/kg	0.5	2.53
PCBs	ug/kg	22.7	1.96

Source: 2007-2009 TIE results. See Appendix B.
Note:
[1] Samples were taken at six sampling locations in September and October 2007, June 2008, and August 2009.
[2]For each constituent, the values presented are the average of all of the six sampling locations over all of the sampling events.

Section 3
Implementation Plan

This Implementation Plan emphasizes the use of watershed-based strategies that combine structural and institutional BMPs. These BMPs decrease pollutant loading through implementation of localized source control activities and reductions in the amount of dry and wet weather anthropogenic/urban runoff. The following sections describe the planned and existing institutional and structural BMPs, quantify the expected load reduction from quantifiable BMPs, compare the resulting pollutant loads to the TMDL WLAs, and provide a schedule for implementation. The approach to developing this Implementation Plan is based on an Integrated Water Resources Approach and similar to the approach followed by the City of Los Angeles for development of the Ballona Creek TMDL Implementation Plans.

3.1 Institutional BMPs

Institutional BMPs reduce pollutant loads by either reducing the source of a pollutant or capturing built-up pollutants before they can be washed off by stormwater. Information about the institutional BMPs described here was obtained from existing BMP implementation in the Marina del Rey Watershed, BMP implementation in the Ballona Creek Watershed, and programs implemented elsewhere in the United States. For those BMPs already undergoing implementation in the watershed, the evaluation considered how BMPs could be enhanced to provide additional water quality benefits for the Toxics TMDL.

Quantifying toxic pollutant sources in urban watersheds is difficult because sources and activities that mobilize these pollutants are numerous and diverse. In addition, some BMPs do not lend themselves well to quantifying the water quality benefits, e.g., public education and outreach. Accordingly, while all BMPs reduce pollutant loads to some degree, this Implementation Plan estimates benefits only for those BMPs that can be reasonably quantified: improved street sweeping program and vehicle brake pad product replacement (reduction in copper found in brake pads). Water quality monitoring will demonstrate how the non-quantified BMPs provide additional benefits.

Estimating pollutant load reductions achieved through the implementation of product replacement and enhanced street-sweeping BMPs involves two key computations:

- Pollutant buildup – describes how a pollutant from a targeted source builds up on the land surface within a watershed.
- Pollutant wash-off – describes the transport of a pollutant from the watershed land surfaces to downstream waterbodies.

Numerous studies have found that pollutant buildup and wash-off are most appropriately estimated using non-linear relationships. Pollutant buildup occurs at the fastest rate in the initial days following a wash-off or rain event, but declines as buildup approaches the maximum carrying capacity (or Pmax) for the watershed over long dry periods (Sartor and Boyd, 1972; EPA NURP Study, 1983). Maximum possible mass build-up occurs after approximately 20 dry days within an urban watershed (Pitt and Shawlee, 1982). These studies also show that the greatest amount of pollutant wash-off occurs with the first ½ inch of runoff, with lower wash-off rates associated with each increment of additional runoff. Therefore, exponential functions were used to estimate pollutant buildup and wash-off associated with specific sources of metals in the watershed. These exponential functions, which are consistent with the TMDL model (SCCWRP, 2004) and other researchers (Chen and Adams, 2006), include:

$$P_t = P_{max} * [1 - e^{(-k_b * DD)}] + [P_{t-1} - W_{t-1}] * e^{-k_b * DD}$$
$$W_t = P_t * [1 - e^{(k_w * R)}]$$

Where: P_t is the pollutant buildup for the current storm (lbs)

P_{max} is the maximum possible mass build-up (lbs)

k_b is the build-up rate coefficient (hr^{-1})

P_{t-1} is the pollutant buildup of the previous storm (lbs)

W_{t-1} is the pollutant wash-off of the previous storm (lbs)

DD is the dry inter-event period (hr)

k_w is the wash-off rate coefficient (in^{-1})

R is the runoff depth (in)

For this Implementation Plan, pollutant buildup and wash-off analyses were completed for specific sources of metals including copper in brake pad dust and copper, lead and zinc in street sediment. A 59-year rainfall record was used to estimate the buildup of metals from controllable sources prior to a storm event (Pt), as a function of preceding dry days (DD). Using NetSTORM (computer program for precipitation data assessment and rapid long-term urban runoff simulation, CDM), watershed-wide hydrologic simulations were used to estimate runoff volumes for distinct storm events in the historical rainfall record. The produced time series of discrete runoff events were then used in a spreadsheet model to estimate the wash-off of pollutants from the watershed surface (W), as a function of runoff depth (R). The results of this analysis are included in the appropriate sections below.

The concentration of toxic pollutants in accumulated sediment will be reduced by implementing other non-quantifiable institutional BMPs. Therefore, in the future the wash-off of accumulated sediment is expected to result in additional reduced metals loading. These institutional BMPs will have similar effects on buildup rates of copper, lead, and zinc.

3.1.1 Vehicle Brake Pad Product Replacement

The purpose of this BMP is to reduce a significant source of metals and other toxic pollutants in the environment by developing safe alternative products. California Senate Bill (SB) 346 was signed by former Governor Arnold Schwarzenegger in 2010, thereby requiring that brake pads contain no more than 5 % copper by 2021 and no more than 0.5 % copper by 2025.

Copper from vehicle brake pad wear debris accounts for a significant portion of total copper loads in urban watersheds. In subwatersheds of the San Francisco Bay, brake pad wear debris accounted for 15-50 % of total copper loads, depending upon the land use in each subwatershed (AquaTerra 2007). The Santa Clara Valley Urban Runoff Program estimated that brake pads are responsible for 42 % of copper loading to the San Francisco Bay (SCVURP 1997). To develop this Implementation Plan, a similar analysis for the Marina del Rey Watershed estimated the fraction of total copper loading manageable through direct source control activities related to copper content in brake pads. The mass of copper released to the watershed per vehicular kilometers traveled (VKmT) provides a basis to quantify baseline loads of total copper from brake pad wear debris. Copper loading rates per VKmT were estimated in several targeted studies conducted by the Brake Pad Partnership (Rosselot 2006). Rosselot (2006) identified a brake pad wear rate of approximately 0.5 milligrams per vehicle kilometer traveled (mg per VKmT) (6.5 % of 7.0 mg per VKmT). Rosselot (2006) also evaluated the copper content in different types of vehicles within the San Francisco Bay area.

Studies have shown equilibrium pollutant carrying capacity occurs after approximately 20 dry days within an urban watershed (Pitt and Shawlee, 1982). Therefore, the maximum buildup of copper on impervious areas is estimated as the buildup over 20 dry days.

Based on the previously mentioned studies, an average copper content for vehicles in the Marina del Rey Watershed was assumed to be 6.5 %. Thus, 6.5 % of 7.0 mg per VKmT is the rate at which copper is released to the Marina del Rey Watershed for every VKmT. Daily VKmT was estimated by taking the number of vehicles in the watershed and a conservatively estimated average annual distance driven in the watershed of 5,000 km per year. Per the 2005 Census, there are approximately 1,600 people living in the watershed. To establish the number of vehicles driving in the watershed, this number was tripled to account for the high number of other vehicles passing through the watershed in addition to these residents. Marina del Rey Harbor is a destination point which requires travelers to drive through the upper watershed. Lincoln Blvd (State Route 1) also passes through the watershed and is a major thoroughfare for people traveling north and south along the coast including to and from the airport. Venice Blvd (State Route 187) and Washington Blvd are also well traveled roads for those accessing the beaches.

Based on the quantification methodology described above, in the Marina del Rey Watershed approximately 2.56 kg of copper is washed off roadways per year from this source based on the current content of copper in brake pads (6.5 %). Refer to Appendix C for tables showing model outputs. Brake pad dust was assumed to be uniformly distributed across the watershed but can only be washed off from impervious surfaces. The mass of accumulated sediment on a given day is an exponential function of the maximum carrying capacity, residual pollutant not washed off during the preceding runoff event, and dry days prior to the storm event.

Since State Bill 346 requires new brake pads in the State of California to contain less than 5 % copper by 2021, the mass of copper built up on the watershed, and available for wash-off, will be reduced. In order to account for the introduction of new brake pads into the market, this compliance analysis assumed average copper content could be reduced to 5 % content by the 2021 first compliance milestone.

Assuming copper content in brake pads will be reduced to 5 %, modeling results show that approximately 0.56 kg less copper per year would be washed off the roadways, resulting in a 0.56 kg/yr copper load reduction.

The Marina del Rey Watershed Agencies have supported the Brake Pad Partnership and the adoption process of SB 346 through monetary contributions, in-kind technical services, committee memberships, etc. Caltrans in conjunction with the State Board contributed close to $1,000,000 to research on impacts of brake pads to surface waters.

3.1.2 Enhanced Street Sweeping

Metals released to the urban environment during dry weather conditions are likely to adsorb on street sediments, which provide a transport mechanism for metals to reach downstream waterbodies. Street sweeping removes sediment, debris, and other pollutants from road and parking lot surfaces. Several studies conducted on the effectiveness of street sweeping for pollution reduction have shown variable results dependent on traffic volume, type of sweeper used, frequency of sweeping, land use, and pavement type (Herrera, 2006). Another study showed annual sediment removal for a residential street of 20 to 31 % for mechanical sweepers and 50 to 88 % for new vacuum sweepers, depending on sweeping frequency (Rosselet, 2007). A separate study found that the frequency of street sweeping necessary to maximize sediment removal is once every week (Brinkman and Graham, 2001). Given the number of variables involved, including sweeping frequency or sweeper efficiency, the effectiveness of this program can vary widely.

The City of Los Angeles Bureau of Street Services (BSS) currently operates a street sweeping program that includes over 130 mechanical broom sweepers with a staff of over 100 operators. Citywide, BSS conducts routine street sweeping for 7,600 curb-km of posted streets on a weekly basis, and an additional 13,000 curb-km of non-posted or arterial streets on a monthly basis. Approximately 100 curb-km (63 curb-mi) of these swept roads (some swept weekly and some swept monthly) are located within the City of Los Angeles' portion of the Marina del Rey Watershed.

Additionally, maintenance responsibility of Lincoln Boulevard (State Route 1) and Venice Boulevard (State Route 187) has been delegated to City of Los Angeles, by a Delegated Maintenance Agreement. Caltrans will be working closely with the City in achieving optimal maintenance performance that includes, among other things, sweeping, trash pickup and drainage cleanup.

Lastly, the City of Culver City currently has a street sweeping program in place that includes weekly sweeping of street in the Culver City portion of the watershed.

Several alternatives exist for enhance street sweeping programs to capture more sediment for roads within the upstream portion of the Marina del Rey Watershed, including increased frequency of sweeping on roads that are currently swept monthly (e.g., increase frequency to weekly) or replacement of aging mechanical broom sweepers within the current fleet with new more efficient types of street sweepers. The City of Dana Point doubled sediment removal by increasing street sweeping from biweekly to weekly (Dana Point 2005). Several studies comparing mechanical broom sweepers to newer high efficiency alternative equipment have shown increases in sediment removal of 35 % (Pitt 2002), 15 to 60 % (Minton 1998), and up to 140 % (Schwarze Industries).

This Implementation Plan uses a conservative target of increasing current sediment removal by 15 % with enhancements to street sweeping. Appendix C provides an analysis, using available data and estimates of the City of Los Angeles street sweeping program, of the number of additional curb-miles that would need to be swept to achieve this goal of increasing street sweeping by 15 %. As shown in Appendix C, approximately 9 curb-km (3.7 curb-mi), which is approximately 9 % relevant watershed area, would need to be converted from monthly to weekly sweeping frequency. Additional evaluations and potential pilot programs coordinated with BSS will be necessary to determine the most effective and suitable approach to achieve this target.

Findings from local studies on accumulation rate and metals composition in street sediment provide necessary information to quantify the sediment loading. Sartor and Gaboury (1984) estimated sediment accumulation for impervious surfaces to range from 12 to 21 kg/curb-km/day. In a more recent study to support the Brake Pad Partnership in California, Rosselot (2007) measured a street sediment accumulation rate of 14 kg/curb-km/day. Using this rate of accumulation for 20 days following a wash-off event, and the estimated 100 curb-km within the City of Los Angeles and Culver City's portion of the Marina del Rey Watershed, a maximum washoff amount of sediment on streets within the watershed is approximately 50,356 kg/year (without any street sweeping).

The mass of accumulated sediment on a given day is an exponential function of the maximum carrying capacity, residual pollutant not washed off during the preceding runoff event, and dry days prior to the event.

It was assumed that mechanical sweepers can remove 5 kg/curb-km (20 lbs/curb-mile) (Seattle, 2010) and that existing street sweeping practices could remove approximately 16,700 kg/yr of sediment. Based on an analysis of the current street sweeping program (Appendix C), the increase in street sweeping by 15 % would result in an additional 2,518 kg/yr of sediment removed from streets.

Accumulated street sediments contain a high concentration of metals of concern in the Marina del Rey Watershed, based on the findings of Lau and Stenstrom (2005) from several roadways (Table 3-1). These values facilitate quantification of reductions in pollutant buildup for specific metals associated with additional sediment removal from current street cleaning operations.

Based on the concentration of each metal in sediment shown in **Table 3-1**, the predicted average annual load reduction achieved by increasing street sediment removal by 15 % from current levels is approximately 0.25 kg per year (kg/yr) for copper, 0.33 kg/yr for lead, and 0.93 kg/yr for zinc (Table 3-1).

Table 3-1
Metals Concentrations in Street Sediments and Load Reduction from Increased Street Sweeping

Metal	Concentration (ppm)	Kg Removed by 15% Increase in Street Sweeping[1]
Sediment	NA	2,518
Copper	99	0.25
Lead	133	0.33
Zinc	371	0.93

[1]Based on a storm by storm buildup and wash-off analysis.

Concentrations of PCBs and chlordane in street sediment are unknown, so the absolute load reductions for these pollutants could not be determined. Irrespective, it is estimated that current street sweeping practices reduce the amount of sediment bound PCBs and chlordane by about 33%. Enhanced street sweeping would increase this removal efficiency to about 38%.

3.1.3 Education and Outreach

Education and outreach programs for residents and businesses about water quality impacts from controllable sources of metals include brochures, posters, websites, event attendance, utility bill inserts, and surveys. Education and outreach programs require a change in consumer behavior to be effective. In order to evaluate BMP performance, the City of Portland Bureau of Environmental Services assumed that eight % of the public would change their habits based on educational programs. This figure was derived from public relations outreach data developed by Clean Water Services (Herrera, 2006).

Education and outreach has been an ongoing activity for many years and it is implemented on a city-wide or watershed-wide basis. Education and outreach implementation opportunities related to the Marina del Rey Toxics TMDL Implementation Plan, either already in progress or for future consideration, could include:

- Urban Runoff Websites—The City of Los Angeles will continue to manage its stormwater Website (www.lastormwater.org) to provide information on urban runoff management practices, and specific information on Toxics TMDL implementation will be added.

- Regulatory and Policy Education—Agencies will develop and implement a process to educate and provide outreach to appropriate agency departments to support implementing newly developed policies, ordinances, and incentive programs.

- Rapid Transit Promotion—Agencies will continue to promote the use of rapid transit to minimize the number of vehicle miles driven in the watershed. In addition, the Agencies will evaluate opportunities to develop and implement incentives to further reduce miles driven.

- Education and Outreach Effectiveness Evaluation—Agencies will develop evaluation and monitoring methods to better understand the performance of education and outreach programs. Based on this information, prioritize educational campaigns on the basis of their effectiveness (e.g., information dissemination through brochures, public meetings, signage, school education, etc.).

- Watershed-wide Education—The purpose of this ongoing BMP is to improve the consistency and efficiency of urban runoff management education efforts watershed-wide. The Agencies will continue to collaborate with other jurisdictions and NGOs to develop appropriate watershed-wide educational programs.

- Education and Outreach Funding—Agencies will work with watershed partners to establish a long-term stable fund for supporting watershed-wide education activities that is cost-shared among jurisdictions and organizations including, but not limited to, the Agencies, Los Angeles County, and NGOs. Establishing this fund would include developing an agreement on the methods for governing fund expenditures.

- Environmental Learning Center—The City of Los Angeles will complete construction of the Environmental Learning Center, and establish a secure funding source so that the facility is regularly available to provide environmental education.

- Targeted Metals Education & Outreach—The City of Los Angeles currently implements a comprehensive education program to reduce potential mobilization of metals into storm drains from car washing (both at home and charity car washes, see below), hosing down driveways, improper disposal of used oil, and vehicle maintenance activities at home. The City of Los Angeles will evaluate its existing education and outreach program to determine the need to enhance this effort to improve the effectiveness of this BMP.

- Individual Car Washing – This BMP targets car owners that wash their own cars. Past surveys have indicated that 56 to 73 % of car owners wash their own cars and over 90 % of those let water drain to the pavement (CWP, 2008). This activity washes metals off of the car, increases dry weather urban runoff, and mobilizes metals present on impervious surfaces. In order to reduce metals loads and other toxic pollutants that are transported via urban runoff, educational outreach could be increased to encourage car owners to minimize washing activities that result in flow to storm drains. Educational materials could encourage car owners to use commercial car washes or wash cars on permeable surfaces.

  LADWP has a five phase Emergency Water Conservation Ordinance that includes restrictions on car washing. Two of these phases limit car washing activities. In the first phase, car washing is only permitted with a hose equipped with a shut-off device. In the third phase car washing is only permitted at commercial car wash facilities.

- Implementation of BMPs to address trash reduction is also expected to help reduce sediment loadings, which will assist in achieving compliance with the Toxics TMDL WLAs. Caltrans has been conducting Don't Trash California (DTC) public education program since 2005. Survey results have indicated reduction of trash from the public through behavior change.

3.1.4 Catch Basin Cleaning

Studies have shown that catch basins can be effective in removing 40 to 50 % of total suspended solids (Herrera, 2006). Catch basin performance declines as flow increases, catch basin turbulence increases, and retention time decreases. In addition, when over 50 % of the catch basin is full, previously captured sediments can be re-suspended (Herrera, 2006). Catch basin cleaning can maintain higher pollutant removal rates and reduce remobilization of pollutants entrained in the sediments including metals and organics. However, increasing the cleaning frequency to more than quarterly provides little additional benefit. For example, one study determined that semi-annual cleaning is optimal for the average catch basin (Herrera, 2006). Overall, catch basin cleaning is an important institutional BMP, but the benefits of increased frequency of catch basin cleaning should be evaluated. Also see the discussion on catch basin inserts under Section 3.2.

3.1.5 Downspout Retrofit

This BMP redirects runoff from roofs to pervious areas, resulting in reduced flow to storm drains. Implementation options include redirecting downspouts to lawns, gardens or swales, or installing a rain barrel or cistern to collect roof runoff for later use. The City of Portland has been implementing an effective downspout retrofit program since 1996. The program's Website indicates that over 56,000 property owners have disconnected downspouts. Downspout retrofit is an effective institutional BMP for commercial, industrial, and public buildings as well. This opportunity is especially important since buildings associated with these land use types tend to have roofing materials containing higher leachable metals content.

The City of Los Angeles currently has a pilot program in place for downspout retrofit of single family residential roofs. Pending the results of the pilot program, the City of Los Angeles may expand the program citywide. Additionally, downspout retrofit is an important component of other TMDL Implementation Plans, including the Los Angeles River (metals) and Ballona Creek (Metals, Bacteria and Toxics) Implementation Plans, therefore, there is a move for widespread implementation of this BMP.

3.2 Structural BMPs

The Implementation Plan includes structural BMPs designed to treat wet weather runoff, which in many cases will also treat dry weather runoff. Structural BMPs include regional projects serving multiple catchments as well as distributed BMPs that consist of small-scale decentralized, structural BMPs.

Structural BMPs include new and significant redevelopment projects subject to Standard Urban Stormwater Mitigation Plan (SUSMP), Trash TMDL implementation, and other BMPs installed in the watershed to address other water quality concerns.

3.2.1 SUSMP Projects

The SUSMP requirements of the existing MS4 permit apply to new development and redevelopment projects. The MS4 in the Marina del Rey Watershed is permitted under a single permit issued to Los Angeles County and 84 incorporated cities (all except the City of Long Beach). An important part of the MS4 permit is the SUSMP requirements. In general, SUSMP applies to new developments and redevelopments of a certain minimum size. The BMPs installed on-site must be able to infiltrate, capture and reuse, or treat all of the runoff from an 85th percentile storm, which is approximately a 3/4-inch, 24-hour storm in the Marina del Rey Watershed. New guidelines approved on July 9, 2008 require developers to give top priority to BMPs that infiltrate stormwater and lowest priority to mechanical/hydrodynamic units. **Table 3-2** provides a summary of the number of projects required to meet SUSMP requirements in the City of Los Angeles in recent years. It is estimated that in future years, similar numbers of projects will be built resulting in additional treatment, Citywide, on these categories of properties.

Based on these values, since the City of Los Angeles portion of the Marina del Rey is 0.23% of the total area of the City of Los Angeles, it is assumed that within the Marina del Rey Watershed approximately eight SUSMP redevelopments will occur each year.

The City of Los Angeles also recently adopted a Low Impact Development (LID) Ordinance which requires that properties beyond those subject to SUSMP requirements implement stormwater control measures. Since the LID ordinance was adopted by City Council in December of 2010, statistics on the number of properties subject to these requirements have not been tabulated. However, it is anticipated that the ordinance will result in an increase in the number of properties that have stormwater control measures implemented on an annual basis, resulting in additional reductions in pollutant discharges.

Table 3-2
City of Los Angeles Projects Reviewed and Conditioned to meet SUSMP Requirements[1]

Year	Single Family	10+ Housing Dev.	Commercial/ Industrial	Auto-motive Services	Retail Gasoline	Restaurants	Parking Lots	Discharges to ESAs[2]	All Category Total
01-02	5	0	22	2	1	2	8	0	40
02-03	76	46	42	1	1	4	15	2	187
03-04	184	219	98	11	5	3	21	1	542
04-05	303	207	125	10	4	5	24	9	687
05-06	215	202	76	9	2	1	32	6	543
06-07	165	192	81	4	6	0	42	21	511
07-08	246	179	132	9	5	4	56	38	669
08-09	90	104	78	11	7	2	47	20	359
Total:	**1284**	**1149**	**654**	**57**	**31**	**21**	**245**	**97**	**3538**
Fraction in MDR	3	3	1	0	0	0	1	0	8

Notes:
[1] Los Angeles County MS4 Permit (City of Los Angeles Annual Report Summary)
[2] Permits issued to projects located in, directly adjacent to, or discharging directly to an environmentally sensitive area

Following are estimates of the beneficial impact that SUSMP program implementation will have on water quality in the upper Marina del Rey watershed, assuming that historic redevelopment rates continue to occur (see Table 3-2).

Land Use Category: Commercial

- The rate of commercial parcel redevelopment was estimated based on the City of Los Angeles redevelopment project records between 2003 and 2009.
- The average number of redevelopment projects in the Marina del Rey Watershed for automotive, retail gas, restaurants, and parking SUSMP classes [1 project] and commercial/industrial projects [1 project] was assumed to occur each year for 10 years.
- The average redevelopment project size is 0.25 acres for automotive, retail gas, restaurants, and parking lots and 1.5 acre for commercial/industrial projects.
- Using the above assumptions, approximately 1.75 acres of commercial land use will be redeveloped to SUSMP standards per year for 10 years [*17.5 acres treated by 2021*].

Land Use Category: Multifamily Residential (MFR)

- The rate of MFR redevelopment was estimated based on the City of Los Angeles redevelopment project records between 2003 and 2009. SFR projects subject to SUSMP (projects less than 10 residential units) as specified in the City of Los Angeles records were considered MFR in this analysis.
- An average of 3 "10+ Unit" projects were redeveloped annually in the Marina del Rey Watershed from 2003 to 2009. The average "10+" unit project size is approximately 2 acres.
- An average of 3 smaller MFR projects were redeveloped annually in the Marina del Rey Watershed from 2003 to 2009. The average project size for these smaller projects is approximately 0.25 acres.
- Approximately 6.75 acres of MFR land use would be redeveloped to SUSMP standards per year for 10 years [*67.5 acres total area treated by 2021*].

Conclusion

Based on the estimates of new development and redevelopment projects that will be subject to SUSMP, an additional 85 acres within the watershed may have BMPs installed to treat or capture stormwater runoff, thereby reducing the amount of pollutants discharged to the Marina del Rey Back Basins.

3.2.2 Trash TMDL Implementation

The LARWQCB has adopted several TMDLs within the Los Angeles area (Los Angeles River, Ballona Creek, Dominguez Channel), which established limits on the amount of trash allowed into these waterbodies. The TMDLs required Southern California cities to reduce their trash contribution to these water bodies by 10% each year for a period of 10 years with the goal of zero trash to waterbodies. The City of Los Angeles has achieved every yearly milestone, solely through the implementation of structural measures without having to take credit for implemented institutional measures that are also resulting in a reduction of trash.

Implementation of BMPs to address the Trash TMDLs is also expected to help reduce sediment loadings, which will assist in achieving compliance with the Toxics TMDL WLAs. The Bureau of Sanitation's Watershed Protection Division (WPD) is the lead office in charge of city-wide Trash TMDL implementation in the City of Los Angeles. As part of this effort, in the spring of 2002 WPD completed a study entitled *High Trash Generation Areas and Control Measures*, which identified the spatial distribution of trash in the City of Los Angeles for both the Los Angeles River and Ballona Creek Watersheds. The study examined the amount of trash accumulating in City-owned catch basins beginning in 1999 through the end of 2003. The ensuing analysis of the data resulted in the identification of three categories of trash generation potential (low, medium, and high) to describe areas within the City of Los Angeles. The high trash generation area was shown to contribute approximately 60% of the trash within the City of Los Angeles. It was concluded that implementing both institutional and structural control measures first in the high and medium trash generating areas would have the greatest impact in reducing trash discharges.

The City of Los Angeles' strategy for compliance is based on using the following two-pronged approach: 1) implementing institutional measures such as public outreach, street sweeping, catch basin cleaning, enforcement, etc., with a special focus on the high trash generation areas, and 2) installing structural trash control devices in the storm drain system, targeting first the high trash generating areas of the City of Los Angeles, followed by the medium and low trash generating areas.

As of September 2010, the City of Los Angeles has installed over 19,000 catch basins in the Los Angeles River Watershed and 16,200 catch basin opening screen covers in the Ballona Creek Watershed with either inserts and / or opening screen covers. In addition, 13 netting systems and three continuous deflection separators (CDS) units certified as full capture devices, have been strategically installed throughout the City of Los Angeles and continue to operate effectively in preventing trash from getting to the Los Angeles River and Ballona Creek. Thus far, the City of Los Angeles has committed over $80 million to fully meet compliance with the Trash TMDLs.

In the Marina del Rey Watershed, approximately 100 catch basin opening screen covers will be installed, with completion estimated to be June 30, 2011. While the benefits associated with implementation of this program to toxic load reductions have not been quantified, it is expected that continued removal of the associated sediment loads will result in additional reductions of toxic pollutants being discharged to Marina del Rey Back Basins.

3.2.3 Other Installed BMPs

The BMPs listed below have been installed in the watershed by the County of Los Angeles for the purpose of reducing bacteria loads, but which provide the additional benefit of removing other pollutants, including sediment bound toxic pollutants.

Three Low Flow Diversions (LFDs) (owned and operated by County):

- LFD Facility at Boone-Olive Pump Station (Project No. 3874 LFD); completed in 2007; operational during summer dry-weather periods; 104,720 gallons storage capacity; 45 gpm pump discharge rate, 64,800 gpd daily discharge volume.
- LFD Facility at Oxford Basin (Project No. 3872 LFD); completed in 2010.
- LFD Facility at Washington and Thatcher (Project No. 5243 LFD); completed in 2007; operational during summer dry-weather periods; 1,363 gallons storage capacity; 100 gpm pump discharge rate, 144,000 gpd daily discharge volume.

Five tree wells (owned and operated by County):

- Bio-Retention Filter-Garfield Avenue (two tree wells)
- Bio-Retention Filter-Abbot Kinney Blvd. (one tree well)
- Bio-Retention Filter-Coeur D'Alene (two tree wells)

The low flow diversion facilities divert dry weather flows to the sanitary sewer system, thereby preventing that flow and the associated pollutants from being discharged to the Marina del Rey Back Basins. The bio-retention filter tree wells treat wet and dry weather flows that pass through them, which also reduces pollutant discharges.

3.2.4 Additional Future BMPs

In additional to the BMPs identified herein, the Marina del Rey Watershed Agencies will continue identifying opportunities for green infrastructure projects that will further serve to reduce the discharge of multiple pollutants, including those listed in the Toxics and Bacteria TMDLs. Additionally, Oxford Basin (owned and operated by the County of Los Angeles) was identified in the Marina del Rey Bacteria TMDL Implementation Plan as an opportunity site for installation of a regional BMP, which could provide the opportunity to remove multiple pollutants from Areas 3 and 4 of the watershed.

3.3 Quantification of Water Quality Benefits

The Toxics TMDL limits the loading of sediment bound toxic pollutants discharged by stormwater into the Marina del Rey Back Basins. Following is a summary of the potential amount of sediment and pollutants removed from the baseline load by BMPs in this Implementation Plan described under Section 3.1.

3.3.1 Sediment Based Components of the TMDL

The Toxics TMDL limits the amount of sediment bound copper, lead, zinc, chlordane and PCBs. Ideally, to calculate the baseline loading of each constituent to the Marina del Rey Back Basins, sediment samples taken directly from runoff flowing to the Back Basins would have been analyzed to determine a concentration of each constituent in the inflowing sediment. This concentration would have been multiplied by the total annual sediment load to determine the total load of each constituent to the Back Basins. However, as previously discussed, these data are not available.

To address the lack of sediment data from urban runoff to the Back Basins, the pollutant concentration data from the Ballona Creek Estuary TIE study was used as a surrogate, but representative, dataset (see additional discussion in Section 2). Per this study, the estimated baseline load was calculated using the sediment loading of 64,166 kg/yr (Regional Board TMDL Staff Report). As shown in **Table 3-3**, the total baseline load for Areas 1A, 3 and 4 were scaled down to account for (1) the load that the MS4 permittees and Caltrans are responsible for; and (2) the portion of the load that the preparers of this Implementation Plan are responsible for (the City of Los Angeles, Culver City and Caltrans only). **Table 3-4** presents the analysis of institutional post-BMP implementation.

Table 3-3
Baseline Load

Constituent	Average of Measured Concentrations in BC Estuary[1]	Area 1A, 3 and 4 of MDR Watershed Baseline Load[2]	Baseline Load (MS4 Portion and Caltrans)[3]	Baseline Load City of LA, Culver City and Caltrans Only[4]
Metals	**(mg/kg)**	**(kg/yr)**	**(kg/yr)**	**(kg/yr)**
Copper	35.58	2.283	2.242	1.718
Lead	26.96	1.730	1.699	1.301
Zinc	147.67	9.475	9.305	7.128
Organics	**(µg/kg)**	**(g/yr)**	**(g/yr)**	**(g/yr)**
Chlordane	2.53	0.162	0.159	0.122
PCBs	1.96	0.126	0.124	0.095

Notes:

[1]The average measured concentrations of each constituent were based on the measured data reported in the 2007-2009 TIE Study performed by SCCWRP and the City of Los Angeles (see also Section 2 and Appendix B of this Implementation Plan). These data provided representative concentrations of these constituents in stormwater runoff.

[2]The baseline load is the concentration of each constituent (column 2) multiplied by the fine sediment load of 64,166 kg/yr (Regional Board, Toxics TMDL Staff Report).

[3]The load that the MS4 permittees and Caltrans are responsible for is based on the portion of the loading capacity that they are responsible for, as listed in the TMDL. The MS4 Permittees and Caltrans are responsible for 98.2% of the load; therefore the watershed-wide baseline load (column 3) was multiplied by 98.2%.

[4] Portion of Areas 1A, 3 and 4 that is under the jurisdiction of City of Los Angeles, City of Culver City and Caltrans (the preparers of this Implementation Plan), which is 76% (based on GIS analysis); therefore the MS4 and Caltrans portion (column 4) was multiplied by 76%.

Table 3-4
Load Reduction from Quantified BMPs

Constituent	Baseline Load[1]	Load Reduction from BMPs[2]		Estimated Post-BMP Load[3]	TDML Wasteload Allocation[4]	Estimated Post-BMP Load as % of WLA
		Vehicle Brake Pad Product Replacement	Enhanced Street Sweeping			
Metals	(kg/yr)					
Copper	1.72	0.56	0.25	0.908	1.557	58%
Lead	1.30	-	0.34	0.967	2.130	45%
Zinc	7.13	-	0.93	6.194	6.853	90%
Organics	(g/yr)					
Chlordane	0.12	-	-	0.122	0.023	535%
PCBs	0.09	-	-	0.095	1.029	9%

Notes:
1 – Baseline Load City of Los Angeles, City of Culver City and Caltrans only (Table 3-3, column 5)
2 – See Section 3.1 and Appendix C.
3 – Baseline load (column 1) less BMPs load reductions (columns 2 and 3).
4 – WLAs for stormwater (Table 1-1) multiplied by the percentage watershed area under the jurisdiction of City of Los Angeles, City of Culver City and Caltrans (76%).

As shown in Table 3-4, the baseline load will be reduced through the implementation of the vehicle brake pad product replacement program and through enhanced street sweeping. After implementation of these BMPs, compared to the WLA, all constituents with the exception of chlordane will be in compliance.

Chlordane was used as an insecticide until 1983 when it was banned for all uses except termite control. It was completely banned from any use in 1988. The soil half-life for chlordane is estimated at 350 days but can range from 37 days to 3,500 days (or approximately 10 years) (NPIC, 2001).

As described above, the method for establishing the baseline load used the measured constituent concentrations found in the adjacent Ballona Creek Estuary bottom sediments as determined as part of the Ballona Creek Estuary TIE study. Since this study represents sediments deposited over multiple years which were included in each sample, it is possible that sediments from previous years are erroneously showing high historical concentrations of some constituents. This consideration may apply to the exceedances shown for chlordane, since this pesticide is very persistent in the environment but was banned many years ago.

3.3.2 Water Column and Fish Tissue Components of the TMDL

The Toxics TMDL contains targets for PCBs in the water column and PCBs in fish tissue. The LARWQCB Staff Report recognizes that PCBs are a legacy pollutant similar to chlordane. The presence of this constituent is expected to be reduced overtime as it is no longer used. The interim and final targets are shown in **Table 3-5**.

Table 3-5
Water Column and Fish Tissue

Condition	Numeric Limit	Concentration in Samples
Interim Target for Total PCBs in Water Column	0.03 μg/L	Non-Detect
Final Target for Total PCBs in Water Column	0.00017 μg/L	Non-Detect
PCBs in Fish Tissue	5.3 μg/kg	No data available

Note:
Results are from the first quarterly report prepared as part of the Marina del Rey Toxics CMP. Concentrations of PCBs were not detected in the samples. However, the detection limit, 0.1 μg/L, is above the interim and final targets. Therefore it is not conclusive whether any exceedances of the numeric targets exist.

As shown in Table 3-5, CMP results (Appendix B), show that concentrations of PCBs were not detected in water column samples. However, the detection limit of 0.1 μg/L is above the interim and final targets. Therefore, it is not conclusive whether any exceedances of numeric targets exist. However, since PCBs are a legacy pollutant, it is anticipated that water column concentrations would not be exceeded in runoff from the upper watershed. Concentrations in fish tissue were not available during the preparation of this Implementation Plan.

3.3.3 Compliance Analysis Conclusion

As shown in Table 3-4, lead and PCBs are already in compliance with the sediment WLAs based on the available sampling data. Those that are not in compliance currently include copper, zinc and chlordane. The institutional BMPs are anticipated to reduce the concentrations of copper and zinc to below the WLAs. Further, as described above, chlordane is likely showing exceedance due to the historic use and persistence in the environment.

The water column PCBs are not detected in existing samples coming from the watershed. However, the detection limits are higher than the numeric targets. As lower detection limits become available compliance with the numeric targets will be reassessed.

It should also be noted that the other BMPs listed in Section 3.1 and 3.2 will further serve to reduce the concentration of each constituent in runoff entering the Back Basins. These BMPs include:

- Education and outreach;
- Catch basin cleaning;
- Downspout disconnection;
- SUSMP implementation (e.g., 85 additional acres within the watershed will have BMPs installed to treat or capture stormwater runoff by 2021);
- Trash TMDL implementation (100 opening screen covers will be installed, with completion estimated to be June 30, 2011); and

- Other installed BMPs (three low flow diversions and five bio-retention tree wells).

As such, the estimates presented in Table 3-4 are conservative as they only account for the load reduction expected from two institutional BMPs (e.g., vehicle brake pad product replacement and enhanced street sweeping).

3.3.4 Uncertainty and Limitations of the Quantification Approach

There are several unavoidable sources of uncertainty in the pollutant load reduction estimates for BMPs due to data limitations, unknown future conditions, simplifying assumptions, and site-specific factors.

<u>Uncertainty #1</u>: Institutional BMP Performance Quantification

- Available data on the performance of institutional BMPs is scarce and highly uncertain. Two approaches for quantifying the downstream benefits of institutional BMPs includes reference watersheds or before/after studies. Both of these approaches typically require many years of monitoring to detect statistically significant differences due to natural variability in hydrology and water quality, unknown changes in land uses or activities in the control or target watersheds, and episodic or illicit discharges of pollutants. Due to the lack of statistically conclusive studies, the quantification of potential sediment load reductions from sources controls was based on a combination of data-supported assumptions and best professional judgment.

- The effectiveness of enhanced street sweeping was based on an estimate of the amount of street sediment and the expected performance of the sweepers. Sediment volumes would be expected to be highly variable and site specific. In addition, all of the studies base sweeper performance on the quantity of collected sediment rather than changes in downstream water quality. Finally, the proportion of collected sediment that would have reached the receiving water is unknown.

<u>Uncertainty #2</u>: Existing Sediment Data

- In order to perform the compliance analysis, the expected concentration of each constituent in the sediment in the Marina del Rey Watershed was required. Ideally, measured data would have been used from samples of sediment in runoff water in the Marina del Rey Watershed which included the concentration of each constituent in this runoff water. This would have represented the concentration of each constituent in the actual sediment coming from the watershed. However, the only available data was constituent concentrations in the sediment on the bottom of the Ballona Creek Estuary. The uncertainty associated with these data is that it is not possible to know the time frame with which these collected sediments were deposited, and while it is for an adjacent, similar watershed, it is not Marina del Rey Watershed specifically. Confirmation of sediment bound loading will need to be made as the CMP is implemented, which will result in the appropriate data being collected.

3.4 Monitoring and Special Studies

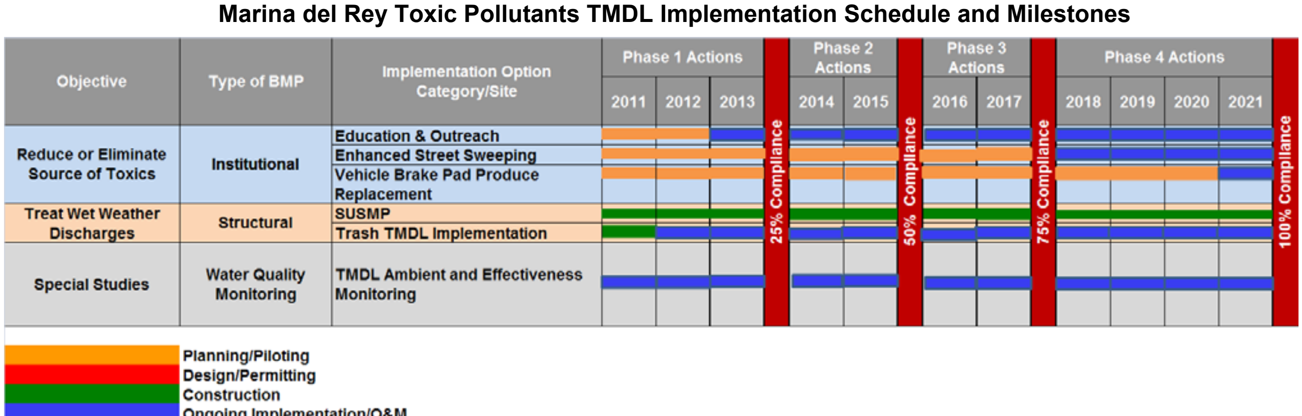
As discussed in Section 1, the Toxics TMDL requires ongoing baseline and performance monitoring, which is described in the CMP. These data will provide estimates of current and future metals and organics loadings relative to the TMDL loading targets. Upstream monitoring for these constituents can be used to identify "hot spots" or those areas showing consistent patterns of high concentrations where additional controls may be necessary. Additionally, the Toxics TMDL agencies will conduct two special studies that are required by the TMDL:

1. Evaluation of partitioning coefficients between water column and sediment;
2. Evaluation of low detection level techniques.

3.5 Implementation Plan Schedule and Milestones

Table 3-6 summarizes the preliminary schedules and milestones for institutional BMPs and structural BMPs for achieving compliance with relevant TMDL targets in the Marina del Rey Watershed. For each BMP, Table 3-6 shows the proposed initiation and duration of: (1) planning/piloting activities, (2) design and permitting, (3) construction, and (4) ongoing implementation/operation & maintenance (O&M). It is assumed that the Marina del Rey Watershed Agencies will continue to act collaboratively and coordinate on scheduling the implementation activities. Caltrans, however reserves the right to proceed independently to address the TMDL goals depending on the specific costs and implementation measures identified during the implementation process.

Table 3-6
Marina del Rey Toxic Pollutants TMDL Implementation Schedule and Milestones



In Section 3.3, sediment load reductions from each of the quantifiable elements of the Implementation Plan scheduled for implementation prior to 2021 were subtracted from the baseline load to demonstrate compliance with the TMDL. The compliance milestones, as discussed in Section 1, include the following:

- March 22, 2013: 25% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.

- March 22, 2015: 50% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
- March 22, 2017: 75% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
- March 22, 2021: 100% of the total drainage area served by the MS4 system is effectively meeting waste load allocations for sediment.

As discussed in Section 3.3, copper and zinc are the constituents listed in the TMDL that are not currently in compliance and have not been historically banned from use. As such, the interim compliance analysis will serve to illustrate how the copper and zinc load will be reduced to meet the interim compliance requirements.

As shown in **Table 3-7**, the copper and zinc load would be reduced sufficiently to meet the TMDL WLA through the enhanced street sweeping program alone.

Table 3-7
Load Reduction and Post BMP Load

Constituent	Baseline Load[1]	Load Reduction from Enhanced Street Sweeping BMP	Estimated Post-BMP Load	Waste Load Allocation from TMDL	Estimated Post-BMP Load as % of WLA
Copper	1.72	0.25	1.47	1.557	91%
Zinc	7.13	0.93	6.194	6.853	90%

This plan proposes to enhance street sweeping by 15%. As shown in Appendix C, this can be achieved by converting a portion of the streets that are swept monthly to a weekly sweeping frequency. Analysis shows that to increase street sweeping by 15%, 8.5 curb-km would need to be swept weekly versus monthly (Appendix C). Since there are 100 curb-km within Areas 3 and 4 of the Marina del Rey watershed, this indicates that 8.5 % of the watershed area requires this BMP be implemented to bring this area into compliance. The remaining 91.5% of the watershed is assumed to already be in compliance. As such, since the TMDL requires that 75% of the watershed area be in compliance by 2017, it can be assumed that this (and previous) interim compliance requirements have already been met. The remaining 8.5% of the watershed will be in compliance by the final milestone of 100% of the watershed area in compliance by 2021 through the implementation of the enhanced street sweeping program.

Further, implementation of the additional BMPs listed in Section ES-8 will also reduce the load of these constituents as they are implemented, though their load reduction benefits have not been quantified. The schedule shown in Table ES-6 illustrates the proposed implementation of these BMPs.

3.6 Integrated Water Resources Benefits

One of the goals of the Implementation Plan is to develop an integrated plan. The Implementation Plan will also address other pollutants of concern in the Marina del Rey Watershed since the BMPs included in the Implementation

Plan are predicted to reduce loads of other pollutants including bacteria, trash and toxics, as discussed below.

- Enhanced Street Sweeping – Removal of the additional street sediments thought the enhanced program will not only remove the pollutants listed in the Toxics TMDL but also additional metals, bacteria and organics.

- Public Education – The public education program, which will be designed to change the public's behavior, will have a wider impact beyond the pollutants listed in the Toxics TMDL.

- SUSMP and LID Ordinances Implementation – Through the implementation of the ongoing SUSMP and the new LID ordinance, property owners will be required to manage discharges of runoff from their property, predominantly by on-site infiltration of the runoff. This will reduce not only the discharge of the pollutants listed in the Toxics TMDL but also any additional pollutant that would have otherwise discharged from the properties and into the Back Basins.

- Green Infrastructure Implementation – The Marina del Rey Watershed Agencies will continue to evaluate opportunities for implementation of green infrastructure BMPs on public right-of-way (e.g., green street retrofits) and parks and private properties (e.g., downspout disconnections).

- Trash TMDL Implementation – As discussed, the removal of trash from the waterbodies not only results in the removal of trash, but also the removal of pollutants attached to the trash, including the pollutants listed in the Toxics TMDL as well as other pollutants such as other metals, organics and bacteria.

Section 4
Program Cost and Budget

4.1 Introduction

Planning-level (order-of-magnitude) budget and staff resources estimates were developed based on the preliminary project and program concepts presented in Section 3. Given the iterative and adaptive nature of the implementation plan, the budget forecasts should be considered relatively speculative. The cost estimate is for this Implementation Plan as a whole: the allocation of costs to specific jurisdictional agencies is not addressed.

4.2 Cost Estimate for Individual BMPs

The assumptions discussed in Section 3 provide the basis for the cost estimate for implementation of the two key institutional BMPs: enhanced street sweeping and vehicle brake pad product replacement.

Enhanced Street Sweeping

The Marina del Rey Watershed Agencies already have an aggressive sweeping program which includes both weekly and monthly sweeping of most of the streets in the watershed. The additional planned 15% load reduction may be achieved by expanding the sweeping program incrementally to increase total annual number of curb-miles swept within the applicable areas of the Marina del Rey Watershed, e.g., by increasing the frequency of sweeping on streets currently swept monthly. Based on the analysis presented in Appendix C, using Los Angeles City data, it is estimated that the 15% load reduction can be achieved by additional street sweeping of 274 curb-miles per year. At an average cost of $43 per curb-mile, this translates to a cost for enhanced street sweeping of $12,000 per year.

Vehicle Brake Pad Product Replacement

As discussed in Section 3, there is a statewide initiative which requires that manufacturers of brake pads reduce the amount of copper allowed in brake pads to 5% or less by 2021 and 0.5% or less by 2025. There are no further costs associated with this BMP as SB 346 was signed into law in 2010 and the manufacturers will incur the cost to modify the brake pad content.

Education and Outreach

Education and outreach in the Marina del Rey watershed is part of broader and ongoing outreach programs by the Marina del Rey Watershed Agencies in the Los Angeles area. Therefore, a substantial cost increase for additional outreach in the Marina del Rey watershed is not expected.

SUSMP Retrofit for New and Redevelopments and Downspout Retrofit Programs

The costs associated with the stormwater BMPs required under SUSMP and the upcoming LID ordinance are to be implemented by the property owner, therefore it is assumed that no net increase in cost will be seen by the responsible parties.

Similarly, if the downspout retrofit program is expanded to the Marina del Rey watershed, it is assumed that these costs will be incurred by the property owners as well.

Catch Basin Cleaning and Installation of Opening Screen Covers

Costs associated with the catch basin cleaning and the installation of the opening screen covers are included in the costs developed for the City of Los Angeles implementation of the Trash TMDL Implementation Plan, therefore no net increase in cost is anticipated.

4.3 Implementation Plan Costs

As specified in Section 4.2, the estimated cost for implementation is $12,000 per year for enhanced street sweeping.

Implementation of this plan is subject to the availability of the necessary funding. Currently, none of the BMPs and projects identified in this plan are funded, except for some of the institutional measures. Responsible jurisdictions continue to pursue funding alternatives in partnership with each other.

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