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Los Angeles River Watershed Bacteria TMDL
Technical Report Section 7: Dry Weather Implementation Plan

Prepared for:

CLEANER RIVERS THROUGH EFFECTIVE STAKEHOLDER-LED TMDLS (CREST)

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7.1 Preface

This document was created by the Cleaner Rivers through Effective Stakeholder-led TMDL (CREST) stakeholder group, based on feedback provided during many meetings, workshops, and deliverable comments. The goal of this document is to serve as the basis for the Los Angeles Region – Regional Water Quality Control Board's (Regional Board) development of the LA River Bacteria TMDL Implementation Plan section of the TMDL Staff Report.

7.2 Introduction

California Water Code section 13242 requires that the Basin Plan include an Implementation Plan to describe the nature of actions to be taken to achieve water quality objectives and a time schedule for action. However, California Water Code section 13360 precludes the Regional Board from specifying the method of compliance with waste discharge requirements. The following section describes implementation procedures that will be used to provide reasonable assurances that water quality standards will be met through the implementation of dry weather bacteria waste load allocations (WLA) and load allocations (LA) developed for the Los Angeles River (LA River) and tributaries. This section presents the following dry weather Implementation Plan elements:

- Dry Weather Load Allocation Implementation
- Dry Weather Waste Load Allocation Implementation and Compliance
- Reconsideration of TMDL Targets, Load Allocations, and Wasteload Allocations
- Prioritization of MS4 Permittee Implementation Actions
- MS4 Permittee Implementation Approaches for an Individual LA River Segment or Tributary
- MS4 Implementation Strategies for the Entire Watershed with Estimated Costs and Timelines
- Comparison of the LA River Bacteria TMDL Effort to other TMDLs
- Dry Weather TMDL Implementation Schedule

As detailed in **Section 6** (TMDL and Allocations), WLAs in units of MPN per day were developed for five segments along the mainstem LA River from its headwaters to near its mouth and corresponding tributaries (**Figure 1**):

- **Segment E**: Reach 6 – LA River headwaters to Balboa Boulevard
- **Segment D**: Reach 5 to middle Reach 4 – Balboa Boulevard to Tujunga Avenue
- **Segment C**: lower Reach 4 and Reach 3 – Tujunga Avenue to Figueroa Street
- **Segment B**: upper and middle Reach 2 – Figueroa Street to Rosecrans Avenue
- **Segment A**: lower Reach 2 and Reach 1 – Rosecrans Avenue to Willow Street

Note that the five LA River segments do not correspond directly to the reaches utilized in previous TMDLs. Instead, these segments correspond with locations for which flow rate data are available, including permanent flow gage stations, as described in **Section 6**.

The agencies identified in **Table 1** are jointly responsible for meeting the TMDL WLAs for LA River segments and tributaries assigned to their agency. Therefore, they may jointly or separately decide how to achieve the WLAs for each reach and/or tributary identified by employing the implementation strategies discussed below or any other viable and legal strategy.

Table 1. Entities Responsible for Meeting Dry Weather Waste Load Allocations Assigned in the LA River Bacteria TMDL

Responsible Entity	LA River Segment					LA River Tributary										
	A	B	C	D	E	Aliso Canyon Wash	Arroyo Seco	Bell Creek	Bull Creek	Burbank Western Channel	Compton Creek	Dry Canyon Creek	McCoy Canyon Creek	Rio Hondo	Tujunga Wash	Verdugo Wash
Alhambra		√												√		
Arcadia														√		
Bell		√														
Bell Gardens		√												√		
Bradbury														√		
Burbank		√	√							√						
Bureau of Land Management					√											
Calabasas					√							√	√			
CA Dept. of Parks and Recreation				√	√											
Caltrans	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Carson	√										√					
Commerce		√												√		
Compton	√	√									√					
Cudahy		√														
Downey		√												√		
Duarte														√		
El Monte														√		
Glendale		√	√				√			√					√	√
Hidden Hills								√					√			
Huntington Park		√									√					
Inglewood											√					
Irwindale														√		
La Cañada Flintridge			√				√									√
Lakewood	√															

Responsible Entity	LA River Segment					LA River Tributary										
	A	B	C	D	E	Aliso Canyon Wash	Arroyo Seco	Bell Creek	Bull Creek	Burbank Western Channel	Compton Creek	Dry Canyon Creek	McCoy Canyon Creek	Rio Hondo	Tujunga Wash	Verdugo Wash
Long Beach	√										√					
Los Angeles		√	√	√	√	√	√	√	√	√	√	√	√		√	√
Los Angeles County	√	√	√		√	√	√	√	√		√	√	√	√	√	√
Lynwood	√	√									√					
Maywood		√														
Monrovia														√		
Montebello		√												√		
Monterey Park		√												√		
National Park Service				√	√											
Paramount	√	√														
Pasadena		√	√				√							√		√
Pico Rivera														√		
Rosemead														√		
San Fernando															√	
San Gabriel														√		
San Marino														√		
Santa Clarita									√							
Sierra Madre														√		
Signal Hill	√															
South El Monte														√		
South Gate		√									√			√		
South Pasadena		√					√							√		
State Land Commission					√											
Temple City														√		
U.S. Forest Service							√		√					√	√	√
Vernon		√									√					

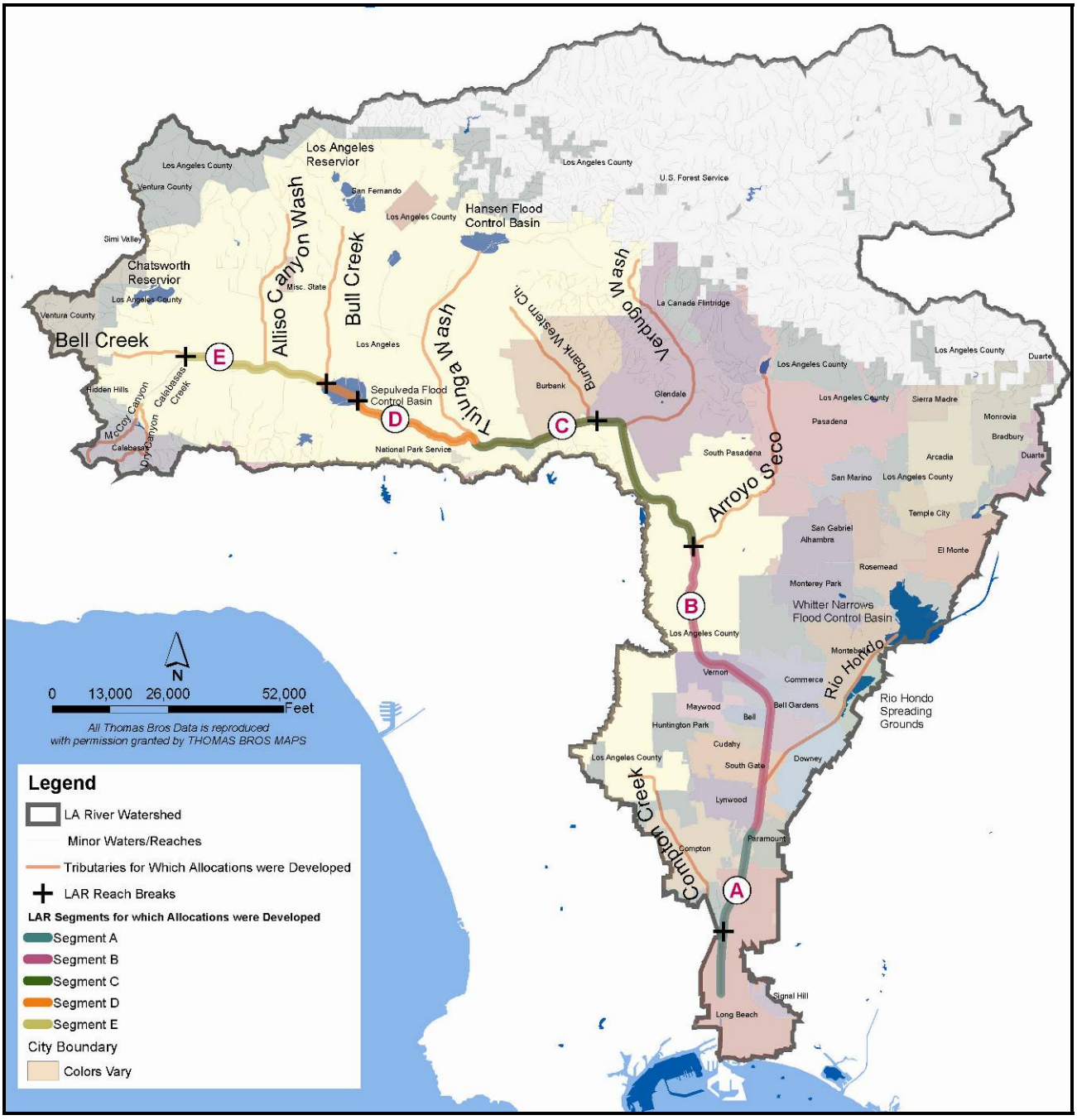

Figure 1. LA River Segments and Tributaries for which Allocations were Developed for the Los Angeles River Watershed Dry Weather Bacteria TMDL

7.3 Dry Weather Load Allocation Implementation for Non-point Sources

As described in the **Section 6** (TMDL and Allocations), the non-point sources in the Watershed include onsite wastewater treatment systems (OWTS), in-channel sources, and runoff from the headwaters. For this TMDL, bacteria discharges from OWTS are assigned a Load Allocation (LA) of zero *E. coli*. Many cities in the Watershed have signed Memorandums of Understanding (MOUs) with the Regional Board regarding OWTS programs. No additional implementation actions are expected to be necessary to meet the TMDL load allocations for OWTS.

Discharges from the headwaters and in-channel sources are accounted for with the Exceedance Day Approach. It is not the intent of this TMDL to require treatment of natural sources of bacteria from undeveloped areas. Specifically, there is an allowable frequency that the SSM WQO can be exceeded, which has not been accounted for during the allocation calculations. Thus the discharges of *E. coli* from these natural/non-point sources are "allocated" as LAs using allowable exceedance days. Load allocations are expressed as the number of daily or weekly sample days that may exceed the targets identified in **Section 3** (Numeric Targets) at ambient (in-stream) monitoring location. No implementation actions are expected to be necessary to reduce loading from natural, non-point sources.

7.4 Dry Weather Waste Load Allocation Implementation for Point Sources and Compliance Determination

This section describes the implementation requirements related to the final WLAs for dischargers regulated as point sources:

- Municipal Separate Storm Sewer System (MS4)
- Water reclamation plants (WRPs)
- General and individual industrial stormwater
- General and individual industrial wastewater
- Other non-MS4 discharges.

Final WLAs will be included in NPDES permits in accordance with the approach contained herein and with the compliance schedule provided in **Section 7.9** (Dry Weather Implementation Schedule), subject to the following condition:

> After TMDL adoption, WLAs may be revised within the TMDL through a legally-adopted Basin Plan Amendment adopted by the Regional Board. Any revisions to these WLAs are to be based on the collection of additional information as described in **Section 8** (Special Studies and Monitoring Plan).

TMDL reopeners are an integral part of the implementation process and this TMDL will be reopened periodically to consider relevant information, including revised regulations and

information generated through special studies and monitoring. The Implementation Schedule is described in **Section 7.9.** Special studies and monitoring to evaluate attainment of WLAs and evaluation of in-stream conditions are discussed in **Section 8**.

Implementation of this TMDL is based on two primary considerations:

1. **Waterbody attainment of water quality standards** – the TMDL components and implementation requirements are designed to result in attainment of water quality standards (i.e., attainment of in-stream TMDL targets) at the completion of the TMDL implementation schedule. The TMDL includes a Basin Plan Amendment that incorporates the TMDL components including implementation schedule into State law. In general, attainment of water quality standards will be determined based on results of ambient (in-stream) monitoring during TMDL implementation.
2. **NPDES Permit compliance** – the NPDES permits detail the responsibilities for Permittees based on consideration of the TMDL WLAs. Permittee compliance is based on meeting the requirements of the NPDES permits, which can include but is not limited to implementation of BMPs, monitoring, and submittal of implementation planning documents. As supported by recently adopted Phase I MS4 Permits in southern California (e.g., San Bernardino County, Orange County, and Riverside County), it is appropriate and legal to implement WLAs as an iterative BMP process as opposed to numeric effluent limits or results of receiving water monitoring. The BMP process incorporated into the MS4 Permits must have reasonable assurance of attaining the MS4 WLAs. The determination of MS4 compliance for the TMDL is then based on following the BMP implementation and maintenance processes in a timely manner including submittal of required documentation and monitoring results.

7.4.1 MS4 Permittees

For each LA River segment and tributary addressed under this TMDL (**Figure 1**), a group WLA has been developed for the MS4 Permittees in the watershed including Caltrans (**Section 6**). USEPA regulation allows allocations for NPDES-regulated stormwater discharges from multiple point sources to be expressed as a single categorical WLA when the data and information are insufficient to assign each source or outfall individual WLAs (40 CFR 130). The group allocation for each LA River segment or tributary will apply to all NPDES-regulated MS4 Permittees that discharge to that segment or tributary (see **Table 1**; MS4 Permittees in the Watershed are LA County and co-MS4 Permittees that discharge to the Watershed, City of Long Beach, and Caltrans). The recommended implementation approaches presented herein, called "Load Reduction Strategies", are based on a coordinated effort by all MS4 Permittees within a segment or tributary. However, if *individual* MS4 Permittees or *subgroups* of MS4 Permittees choose to develop and implement a Load Reduction Strategy (LRS) or alternative implementation strategy, then the group-based WLAs are distributed based on proportional drainage area. In this case, the implementation approaches herein can still be followed, based on the proportional WLAs.

This dry weather Implementation Plan as described in the following sections establishes a stepwise and iterative process to address the challenges of implementing the TMDL in an efficient and effective manner. Each municipality and MS4 Permittee will be required to meet the WLAs through a phased implementation of BMPs. The WLAs will be incorporated into the

applicable NPDES permits as the BMPs identified through the procedures outlined in this Implementation Plan. The Permit fact sheets and administrative record will utilize the information developed through the process identified in **Section 7.7**, or an alternative process, to provide reasonable assurance that the selected BMPs will be sufficient to attain the WLAs. This iterative approach is consistent with recent Phase I MS4 Permits in southern California (e.g., San Bernardino County, Orange County, and Riverside County),

This Implementation Plan does not specify the specific BMPs for achieving compliance with the allocations, and MS4 Permittees may choose to comply with this TMDL through any viable and lawful means. However, MS4 Permittees are encouraged to achieve compliance with WLAs through implementation of a Regional Board Executive Officer (EO) approved Load Reduction Strategy as outlined in this Implementation Plan. A Load Reduction Strategy (LRS) is both [1] a suite of actions performed by MS4 Permittees along an LA River segment or tributary and [2] a document submitted to the Regional Board EO for approval. The LRS document describes the suite of actions that will be performed and demonstrates reasonable assurance of WLA attainment.

The MS4 NPDES permit will provide the opportunity to follow one or a combination of the three following options for type of LRS (**Section 7.7** and **Appendix 1**):

1. Outfall-based
2. Downstream-based

For MS4 Permittees who choose to comply with the TMDL through a Regional Board EO-approved LRS, implementation of actions identified in the LRS as outlined in **Section 7.7** in accordance with the schedule in **Section 7.9** constitutes compliance with the TMDL. In other words, MS4 Permittee compliance is based on timely, iterative implementation of specific actions detailed in the Regional Board EO-approved LRS, as opposed to compliance being based strictly on attainment of the numeric WLAs. Additionally, if an MS4 Permittee demonstrates zero discharges during dry weather, then that MS4 Permittee is considered to be in compliance with the dry weather components of this TMDL. If an MS4 Permittee chooses to employ an LRS approach, but then does not submit the LRS components in compliance with the schedule in **Section 7.9,** or does not fully implement the actions identified in an approved LRS, then the MS4 Permittee is considered out of compliance with the TMDL. All MS4 Permittees that drain to the LA River segments and tributaries addressed under this TMDL (**Table 1**) are responsible for meeting WLAs, even if they do not have outfalls that discharge directly into a mainstem LA River segment or tributary (i.e., their jurisdiction is in the "interior" of the watershed, and thus their discharges drain through another municipality/jurisdiction).

For MS4 Permittees who utilize another lawful implementation approach that is not based on Load Reduction Strategies – herein referred to as the "Traditional" approach – then compliance is based on timely attainment of numeric WLAs, as opposed to performing specific implementation/BMP actions. In such cases, when MS4 Permittees do not meet the WLAs in accordance with the schedule in **Section 7.9**, then the MS4 Permittee is considered out of compliance with the TMDL. The timeframe allowed for final WLA attainment via the Traditional approach is shorter than for LRS approaches, because (in contrast to LRS

approaches) iterative actions under the Traditional approach are not explicitly accounted for in the TMDL schedule.

It is important to note that the Downstream-based LRS approach has not been fully vetted with the Regional Board, and thus this approach may in fact not be approvable by the Regional Board EO. Thus, for MS4 Permittees who desire to use a Downstream-based LRS approach, they are encouraged to consult the Regional Board staff and EO prior to directing significant resources toward submitting a Load Reduction Strategy for EO approval.

WLAs will be incorporated into the LA County MS4 NPDES Permit, City of Long Beach MS4 NPDES Permit, and the Caltrans NPDES Permit consistent with the assumptions and requirements of the WLAs (**Section 6**) and the TMDL Implementation Plan contained herein. The following is permit language for inclusion in MS4 NPDES permits to implement the WLAs of this TMDL:

> Each MS4 Permittee shall attain the dry weather Waste Load Allocations by implementing BMPs in accordance with the TMDL Technical Report, Implementation Plan, or as identified as a result of TMDL special studies specified in the Basin Plan Amendment.
>
> The MS4 Permittees shall comply with the dry weather Waste Load Allocations, consistent with the assumptions and requirements of the Waste Load Allocations documented in the Implementation Plans, including compliance schedules, associated with the State adoption and approval of the TMDL at compliance monitoring points established in the TMDL Monitoring Program (40 CFR 122.44(d)(1)(vii)(B)).

Example MS4 Permit Provisions are provided in **Appendix 2**.

The estimated costs for two implementation approaches to the dry weather component of the TMDL are presented in **Section 7.7.5.1** and **7.7.6.1**, but it is important to note that a variety of implementation LRSs or other viable and legal strategies could be used to comply with this TMDL, including strategies that differ from those for which costs were estimated.

The implementation of this TMDL should be coordinated with activities and BMPs that are implemented through other TMDLs that have already been adopted in the Watershed (particularly the Metals TMDL) and other activities including the Integrated Regional Water Management Plan and LA River Revitalization Plan. Because WLAs can be achieved through the reduction of discharges as well as control of sources, the implementation actions for other TMDLs may significantly contribute to the implementation efforts for this TMDL. Therefore, overall coordination of implementation actions with multiple TMDLs developed in this Watershed is important.

7.4.2 Water Reclamation Plants

Dry weather WLAs established for the three WRPs in this TMDL (D.C. Tillman, City of LA-Glendale, and Burbank) will be implemented through NPDES permits as end of pipe permit

limits. The current coliform limits[1] for these WRPs are sufficient, and no revisions to the WRP NPDES permits are necessary based on this TMDL. No additional actions are expected to be necessary for WRPs to be in compliance with the TMDL allocations.

Sanitary sewer collection systems are often managed by multiple agencies under various Waste Discharge Requirements. Discharges of untreated wastewater are illegal (i.e., sanitary sewer overflows). Sanitary sewer system agencies covered under the Statewide General Waste Discharge Requirements for sanitary sewer overflows (SSOs) (WQO No. 2006-0003-DWA), referred to as Enrollees, are required to report all SSOs for which their agency has responsibility to the State Water Resources Control Board's (SWRCB) SSO database. Because SSOs are addressed through other regulations/prohibitions that provide protection for receiving waters they are not assigned allocations in this TMDL.

7.4.3 General and Individual Industrial Stormwater NPDES Dischargers

A dry weather WLA that specifies the concentration of *E. coli* in discharges shall be less than 235 most probable number (MPN) per 100mL[2] is assigned to all general and individual industrial stormwater permits. Order No. 97-03 DWQ (general industrial) already prohibits non-storm water discharges with few exceptions. Under Order No. 97-03-DWQ, non-storm water discharges are authorized only when they do not contain significant quantities of pollutants, where Best Management Practices (BMPs) are in place to minimize contact with significant materials and reduce flow, and when they are in compliance with Regional Board and local agency requirements.

The WLA could be attained through the implementation of BMPs required in the general permit or as implemented to comply with the Metals TMDL (BMPs for the Metals TMDL that eliminate runoff will eliminate bacteria loading from these dischargers). Given the existing prohibitions and Metals TMDL requirements, no additional implementation actions are expected to be necessary to meet the TMDL allocations.

Compliance schedules may be established in individual or general NPDES permits, allowing the length of a permit cycle (typically five years) to achieve compliance. A discharger that can not comply immediately with effluent limitations specified to implement WLAs may be required to apply for an individual permit and/or demonstrate the need for a compliance schedule.

If a Permittee demonstrates that advanced treatment (necessitating long design and construction timeframes) will be required to meet final WLAs, the Regional Board will consider extending the implementation schedule to allow additional time from the effective date of the TMDL to achieve compliance with the final WLAs.

[1] Effluent limits in the NPDES Permits for the three WRPs in the Watershed currently require (1) the median number of total coliform organisms in effluent not to exceed 2.2 per 100 milliliters and (2) the number of total coliform organisms cannot exceed 23 per 100 milliliters in more than one sample within any 30-day period.

[2] For the purposes of this TMDL, the unit of most probable number MPN per 100mL is considered equivalent to colony forming units (cfu) per 100mL.

7.4.4 Individual Industrial Wastewater NPDES Dischargers

A dry weather WLA that specifies the concentration of *E. coli* in discharges shall be less than 235 MPN per 100mL is assigned to industrial wastewater NPDES dischargers. Compliance schedules may be established in individual NPDES permits, allowing the length of the permit cycle (typically 5 years) to achieve compliance.

Compliance with the dry weather *E. coli* WLAs will be determined through monitoring of final effluent discharge as defined in the NPDES permits and wastewater treatment improvements, as necessary.

If an industrial wastewater Permittee demonstrates that advanced treatment (necessitating long design and construction timeframes) will be required to meet final WLAs, the Regional Board will consider extending the implementation schedule to allow additional time from the effective date of the TMDL to achieve compliance with the final WLAs.

7.4.5 Construction Stormwater NPDES Dischargers

A dry weather WLA that specifies the concentration of *E. coli* in discharges shall be less than 235 MPN per 100mL is assigned to all NPDES-regulated construction stormwater dischargers. WLAs established for construction stormwater NPDES permitted dischargers in this TMDL will be implemented through Order No. 99-08 DWQ[3] (Construction General Permit), which already prohibits non-storm water discharges with few exceptions. Under Order No. 99-08-DWQ, discharges of non-storm water are authorized only where they do not cause or contribute to a violation of any water quality standard and are controlled through implementation of appropriate BMPs for elimination/reduction of pollutants.

The WLA could be attained through the implementation of BMPs required in the general permit or implemented to comply with the Metals TMDL (BMPs for the Metals TMDL that eliminate runoff will eliminate bacteria loading from these dischargers). Given the existing prohibitions and Metals TMDL requirements, no additional implementation actions are expected to be necessary for construction dischargers to meet the TMDL allocations.

7.4.6 Other Non-MS4 NPDES Dischargers

A dry weather WLA that specifies the concentration of *E. coli* in discharges shall be less than 235 MPN per 100mL is assigned to all other non-MS4 NPDES dischargers, including minor non-stormwater Permittees and general non-stormwater Permittees. The WLAs established for other non-MS4 NPDES-permitted dischargers in this TMDL will be implemented through NPDES permit limits. In general, these non-MS4 NPDES discharges of non-storm water are authorized only where they do not cause or contribute to a violation of any water quality standard and are controlled through implementation of appropriate BMPs for elimination/reduction of pollutants.

[3] This order was recently revised and a new order adopted by the State Water Resources Control Board. The new order (2009-0009-DWQ), which becomes effective July 1, 2010 may be viewed at: http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml

The WLA could be attained through the implementation of BMPs required in the general permit or implemented to comply with the Metals TMDL (BMPs for the Metals TMDL that eliminate runoff will eliminate bacteria loading from these dischargers). Given the existing prohibitions and Metals TMDL requirements, no additional implementation actions are expected to be necessary for other, non-MS4 dischargers to meet the TMDL allocations.

Compliance schedules may be established in individual or general NPDES permits, allowing the length of the permit cycle (typically five years) to achieve compliance. A discharger that can not comply immediately with effluent limitations specified to implement WLAs may be required to apply for an individual permit and/or demonstrate the need for a compliance schedule.

If a non-MS4 Permittee demonstrates that advanced treatment (necessitating long design and construction timeframes) will be required to meet final WLAs, the Regional Board can consider extending the implementation schedule to allow additional time from the effective date of the TMDL to achieve compliance with the final WLAs.

7.5 Reconsideration of TMDL Targets, Load Allocations, and Wasteload Allocations

The Implementation Plan includes provisions for reconsidering the TMDL to consider the results of special studies and potential new water quality objectives/criteria developed by the State and/or USEPA, as appropriate. The TMDL reopeners are included in the schedule in **Section 7.9**, but note that TMDL revisions could take place at any time during the implementation process.

The federal BEACH Act (40 CFR 32.1) requires USEPA to conduct a *Criteria Development Plan* (R/7-097-432). Under the ongoing *Plan*, the USEPA is conducting additional epidemiological studies and quantitative microbial risk assessments (QMRAs) for fresh- and marine waters impacted by point- and non-point sources (Boehm et al., 2009). The assays being utilized by USEPA include *Enterococcus*, *E. coli*, and *Bacteroidales*. Under a legal settlement, USEPA is committed to issuing new and/or revised criteria by October 15, 2012. The State will likely have at least two years to implement these new/revised criteria before promulgation by USEPA. During TMDL reopeners, the state of the science will be used to evaluate the most appropriate indicator(s) to protect existing recreational uses, and the Targets for this TMDL may be revised by the Regional Board through a legally-adopted Basin Plan Amendment, if appropriate.

The dry weather WLAs developed in **Section 6** and used as a basis for TMDL implementation were calculated based on current conditions including dry weather flow rates in the LA River and tributaries. If these or other watershed conditions significantly change over the course of TMDL implementation, then the WLAs may be recalculated and revised by the Regional Board through a legally-adopted Basin Plan Amendment.

As discussed in **Section 7.9**, the schedules for attaining final WLAs (e.g., implementing Load Reduction Strategies) could be revised through a legally-adopted Basin Plan Amendment based

on an assessment of *actual* action/BMP levels required for dry weather TMDL compliance compared to the action levels that are *estimated* herein (**Section 7.6**).

On April 1, 2010 the Regional Board adopted a resolution setting basin planning priorities for the 2008-2010 Triennial Review period. The outcome of the following two priorities could have a significant impact on the implementation of the Los Angeles River Bacteria TMDL:

1) Determine how bacteria water quality objectives should be applied in compliance determination based on more recent monitoring results.
2) Reconsider the application of REC-1 and REC-2 beneficial uses in specific instances, where appropriate.

As described in **Section 7.9**, stakeholders are encouraged to form a LA River Water Quality Standards Work Group (LARWQSWG). If appropriate, the information generated by the LARWQSWG could support the Regional Board in legally adopting a Basin Plan amendment(s) that could affect the Targets, WLAs, and LAs for this TMDL.

7.6 Prioritization of MS4 Permittee Implementation Actions

This section describes the overarching process for prioritizing MS4 implementation actions through an iterative process on five specific mainstem LA River segments and 11 tributaries. The concept of prioritizing TMDL implementation actions was evaluated during a September 2009 CREST stakeholder workshop, and by the Water Body Use Survey (CREST, 2007). As a result, four primary locations[4] where water contact activities are known or likely to occur were categorized as highest priority:

- **Long Beach beaches:** the beaches of Long Beach, which are adjacent to the mouth of the LA River, are subject to water contact by thousands of individuals each year.
- **Segment A and B of the LA River:** much of this portion of the LA River has a path on the bank of the LA River[5], and while entering the channel is illegal, water contact has been observed to occur here. The most common type of water contact along this portion of the LA River appears to be bathing/cleaning by homeless persons.
- **Glendale Narrows:** the Narrows is a stretch of soft-bottom channel at the downstream end of Segment C. Horse riding and sunbathing are common in this portion of the LA River, and there are few access points where individuals can get near or into the channel.
- **Sepulveda Basin:** the Sepulveda Basin is another soft-bottom portion of the LA River, and adjacent to the Basin are recreational areas (Balboa Lake Park) and trails that provide access to the River.

Table 2 presents the corresponding timeline of prioritization of TMDL implementation for the mainstem LA River segments and tributaries assigned WLAs. The order in which the LA River segments of the LA River were prioritized over time was based on (1) the relative level of risk to recreation users given perceived differences in frequency of recreational activities[6] and (2) the extent of currently available water quality information which could expedite implementation actions to meet WLAs.

An important consideration for the timeline is the order of implementation actions in LA River segments versus tributaries. To allow for attainment of TMDL targets in the mainstem LA River earlier during the TMDL implementation timeline, implementation activities on tributaries are scheduled to follow completion of initial work on the corresponding mainstem LA River segments. In other words, all LA River segments could have been addressed prior to any tributaries, but the loading from tributaries might have prevented attainment of TMDL targets in

[4] It is likely that other areas in the Watershed are subject to water contact. However, these four locations were highlighted as the primary recreational areas-of-concern in the Watershed during stakeholder discussions.

[5] The LA River is a trapezoidal channel along Segment A and B (from Figueroa Street [upstream] to the mouth [downstream]). The walking/bike path is adjacent to the LA River, several hundred feet from the low flow channel. Unlike other portions of the LA River, there is no fence between the path and the water along Segment A and B.

[6] The relative magnitude of recreational activities was based on discussions with stakeholders including non-governmental organizations. It was presumed that the lower reaches of the LA River (Reach 1 and Reach 2) are subject to the most frequent activity, predominantly due to presence of homeless persons. Glendale Narrows and Sepulveda Basin are likely subject to the most water contact use that is recreational in a traditional sense. It is noted that some user access to the LAR is prohibited by LA County DPW. http://ladpw.org/services/water/nowayout.pdf

the mainstem LA River until later in the schedule. Thus, the order for the implementation timeline is, for example, segment-tributary-segment-tributary instead of segment-segment-tributary-tributary.

While the prioritization process shows a stepwise progression of BMP implementation through the various LA River segments and tributaries, MS4 Permittees are encouraged to implement system-wide source control BMPs during all phases of implementation. In this manner, loading to some LA River segments or tributaries could be reduced prior to being addressed by structural BMPs, and in fact, system-wide source control efforts should ultimately reduce the effort for structural implementation actions. Note that **Table 2** includes "follow-up actions" that are a component of the iterative LRS approaches, as described in **Section 7.7**.

The prioritization approach does not account for the feasibility of implementation actions, such as installation of infiltration or low-flow diversions. Should further study show that specific implementation efforts are not practicable (e.g., without a major sewer or treatment plant upgrade) under the implementation schedule (**Section 7.9**), priorities may need to be revised. Responsible Parties can submit a written request to the Regional Board EO, who may then revise the prioritization prior to implementation of actions and corresponding schedules, if deemed appropriate by the EO.

The following describes the reasoning for prioritizing the segments, and corresponding tributaries, as presented in **Table 2** (see **Figure 1** for the extent and location of LA River segments and tributaries):

- **Priority 1:** Segment B: upper and middle Reach 2 – Figueroa Street to Rosecrans Avenue. Tributaries to Segment B include Rio Hondo and Arroyo Seco. Segment B was selected as the first priority for implementation efforts for three reasons: 1) the availability of data to support a relatively rapid initiation of implementation actions 2) elevated recreational use compared to other LA River segments and 3) proximity to the downstream estuary and bay beaches. By reducing bacterial loads to Segment B, not only would recreational users within the LA River be protected but it would also reduce loadings of indicator bacteria to the bay and beaches (into which the LA River empties). Additionally, there is a large data set on the bacteria and virus loading from the storm drain outfalls collected by the recently completed Los Angeles River Bacteria Source Identification (BSI) Study (CREST 2008). This dataset will also allow the MS4 Permittees to move forward with implementation efforts to reduce bacterial loads from priority storm drain outfalls to the main channel (monitoring will be needed on other LA River segments to identify high priority discharges). In addition, early reduction of MS4 bacteria discharges to Reach 2 will provide a better starting point for concurrently conducting an optional special studies to evaluate uncharacterized sources (as described in the Source Assessment Section 4).

- **Priority 2:** Segment A: lower Reach 2 and Reach 1 – Rosecrans Avenue to Willow Street. Compton Creek is the only tributary to Segment A. Segment A, which is downstream of Segment B, was considered to be the next highest priority reach for implementation efforts due to its close proximity to the downstream estuary and bay beaches. By reducing bacterial loads to Segment A, not only would recreational users within the LA River be protected but

it would also reduce loadings of indicator bacteria to the bay and beaches (into which the LA River empties).

- **Priority 3:** Segment E: Reach 6 – LA River headwaters to Balboa Boulevard. Tributaries to Segment E include McCoy Canyon, Dry Canyon, Bell Creek, and Aliso Canyon Wash. Segment E was chosen as the next priority because it is directly upstream of the Sepulveda Basin (Reach 5), which is a recreational area with potential water contact activities. Bacterial load reductions in Segment E are expected to result in improved water quality at the downstream Sepulveda Basin recreational area.

- **Priority 4:** Segment C: lower Reach 4 and Reach 3 – Tujunga Avenue to Figueroa Street. Tributaries to Segment C include Tujunga Wash, Burbank Western Channel, and Verdugo Wash. Segment C was selected as the next priority because of the potential for recreational use in the lower portion of the segment (Reach 3) due to its soft bottom and ease of accessibility to the public. Glendale Narrows is a popular recreational area, though water contact is likely infrequent.

- **Priority 5:** Segment D: Reach 5 and upper Reach 4 – Balboa Boulevard to Tujunga Avenue. Bull Creek is the only tributary to Segment D. Segment D was placed as the final priority for implementation efforts because much of this the segment is the least accessible (due to the fenced, vertical concrete channel). While Reach 5 is contained in Segment D and provides recreational use opportunities, it was not prioritized earlier for implementation efforts because (1) it is anticipated that reductions in loadings that occur as a result of addressing Segment E (Reach 6) will also result in supporting attainment of in-stream targets in Reach 5 and (2) there are relatively few MS4 discharges to Reach 5.

Table 2. Los Angeles River Bacteria TMDL Prioritized and Iterative Implementation Process for MS4 Permittees[1]

Timeline	Immediate Ongoing Actions	Implementation of Targeted Structural BMPs		Additional Implementation Actions (as necessary) [2]	
	Watershed-Wide Actions	LA River Mainstem	Tributaries	LA River Mainstem	Tributaries
Adoption of TMDL	LA River Watershed	Segment B			
		Segment A	Segment B	Segment B	
		Segment E	Segment A	Segments B, A	Segment B
		Segment C	Segment E	Segments B, A, E	Segment B, A
		Segment D	Segment C	Segments B, A, E, C	Segment B, A, E
			Segment D	Segments B, A, E, C, D	Segment B, A, E, C
Completion of TMDL				Segments B, A, E, C, D	Segment B, A, E, C, D

1 – See Figure 1 for the extent and locations of LA River segments and tributaries.
2 – Implementation of additional BMPs as necessary to achieve WLA for each individual segment and/or tributary. If WLA achieved, then no additional actions required for that segment or tributary.

7.7 MS4 Permittee Implementation Approaches for an Individual LA River Segment or Tributary

Implementation actions must result in attainment of the TMDL WLAs and Targets, thereby protecting recreational beneficial uses in the LA River. MS4 Permittees can achieve WLAs by employing any viable and legal implementation strategy. This section describes options for approaches that MS4 Permittees could take to conduct dry weather TMDL implementation, including a "Traditional Approach" and three options for "Load Reduction Strategies" by which determination of MS4 compliance is based on following one of these three well-defined strategies. The three types of Load Reduction Strategies[7] are named as follows:

1. Outfall-based
2. Downstream-based (Functional Equivalent)

Each LRS approach allows for adaptive and iterative TMDL implementation, while relying on quantitative approaches that demonstrate reasonable assurance of WLA attainment. Note that an LRS applies to an *individual* LA River segment or tributary, and one type of LRS could be employed by an MS4 Permittee to one LA River segment while another LRS type was used for a different segment. The combination of LRS types used across the entire Watershed to address *all* LA River segments and tributaries constitutes a "Watershed-wide Strategy". Examples of Watershed-wide Strategies are described in **Section 7.7.4** and used to develop TMDL cost estimates (**Section 7.7.5.1** and **7.7.6.1**) and the TMDL Implementation Schedule (**Section 7.9**).

Due to the highly variable nature of bacteria in the Watershed, each LRS follows a stepwise process and may include multiple "iterations" during TMDL implementation prior to the final compliance date for WLAs. If an LRS is developed per the processes outlined herein, the BMPs proposed will have been identified in a manner consistent with the assumptions of the WLAs.

For MS4 Permittees that choose to *not* follow one or more of these Load Reduction Strategies, a "Traditional" implementation option is included under which determination of compliance is based on timely attainment of mass-based WLAs as opposed to performance of specific actions. The timeframe allowed for final WLA attainment is shorter than for LRS approaches, as iterations are not explicitly accounted for in the schedule.

A summary of the MS4 dry weather implementation approaches is provided in **Table 3**. Overall, MS4 Permittees who follow an LRS approach accept a tradeoff that provides a longer timeframe for compliance with final WLAs but requires a more rigorous process by which implementation activities are performed and documented. The following sub-sections provide overviews of these approaches, while **Appendix 1** provides extensive details regarding the LRS methodologies, scenarios, and considerations.

[7] A Load Reduction Strategy is both [1] a suite of actions performed by MS4s along an LA River segment or tributary and [2] a document submitted to the Regional Board EO for approval. The document describes the suite of actions that will be performed by MS4s and demonstrates reasonable assurance of WLA attainment.

Table 3. Summary of Options for MS4 Dry Weather Implementation Approaches along an LA River Segment or Tributary Addressed by the LA River Bacteria TMDL

Type of Implementation Approach for Dry Weather LA River Bacteria TMDL	MS4 Permit Compliance based on Actions?	Requires Documentation of Implementation Activities?	End-of-Pipe Approach to Storm Drain Discharges	In-channel Approach to Bacteria Removal	Role of Non-structural MS4 Actions	Types of Required Monitoring[1]
Traditional (non-LRS)	No, based on WLA attainment	Yes, but not as rigorous as other approaches	As-needed	As-needed	As-needed	Outfall monitoring to determine WLA attainment. Receiving water monitoring.
Outfall-based LRS	Yes	Yes, detailed Load Reduction Strategy	Structural controls at Priority Outfalls to meet *E. coli* WLA with option of using a Weight of Evidence Approach	None (optional)	Must be quantified to explicitly incorporate into LRS.	Outfall Monitoring of *E. coli* loading to Plan and Assess. Receiving water monitoring.
Downstream-based LRS (Functional Equivalent)	Yes	Yes, detailed Load Reduction Strategy	None (optional)	Downstream Solution to achieve TMDL Target/WQO	None (optional)	Monitoring *E. coli* downstream of Solution to verify effectiveness. Receiving water monitoring.

1 – In the case that TMDL Targets are demonstrated to be met at an in-stream ambient TMDL monitoring location, then the MS4 WLAs for the segment or tributary that corresponds to that in-stream monitoring location are assumed to be met, and the TMDL monitoring of outfalls is no longer required.

The Downstream-based LRS approaches is categorized as a "Functional Equivalent" because it was developed as an alternative to the Outfall-based LRS approach, which relies heavily on structural controls (e.g., low flow diversions or other subwatershed projections such as infiltration, reuse or treat and discharge projects) at storm drain outfalls (inland) within priority subwatersheds along LA River segments and tributaries. The Downstream-based LRS approach uses a type of (single) structural control called "Downstream Solutions" to directly reduce bacteria concentrations in receiving waters (e.g., constructing a treatment control at the mouth of a tributary just upstream of its confluence with the LA River), as opposed to constructing multiple controls at storm drain outfalls along the segment or tributary. However, the Downstream-based LRS approach presents unique challenges that would need to be addressed over the course of TMDL implementation to evaluate whether it is a desirable, viable, and feasible implementation strategy, as described in the corresponding sub-sections below.

Under both the Outfall- and Downstream-based LRS, a well-defined process must be followed, but the specific types of structural actions are unspecified. MS4 Permittees can employ any types of BMPs, as long as a quantitative analysis is used to provide reasonable assurance that the WLAs are expected to be attained at completion of the LRS. Under the Traditional (non-LRS) approach, there is no specific process to be followed and there are no required types of BMP actions, but the compliance schedule for final WLA attainment is shorter.

For both the Outfall- and Downstream-based LRS approaches, the LRS must be submitted in accordance with the TMDL schedule, approved by the Regional Board EO prior to undertaking, and the proposed implementation actions must be completed according to the TMDL schedule. In general, the regulatory process during TMDL implementation would be as follows:

- **MS4 Permit:** The Permit would incorporate the WLAs and require the development of a TMDL Implementation Plan for LA River Segments and/or Tributaries to be addressed with the Permit term and briefly describe the four options for dry weather TMDL implementation. In addition, it specifies the schedule for required submittal of implementation documents (either LRS or Traditional implementation plans) and completion of implementation actions (e.g., submittal of monitoring data after completion of an LRS that evaluates WLA attainment and determines whether an additional LRS iteration is necessary). In addition, dates on which Coordinated Monitoring Plans and special studies must be submitted are also included. For Permit cycles that include dates on which final WLAs must be attained, these dates are specified (note: these dates vary based on selection of a Traditional Approach or one of the three LRS options implementation approach). The Permit does not need to be opened for approval of Load Reduction Strategies. Example MS4 Permit Provisions are provided in **Appendix 2**.
- **Executive Officer Approval**: Load Reduction Strategies are reviewed and approved by the Regional Board EO. The EO will only approve LRSs that follow the protocols specified herein, which are designed to provide reasonable assurance of WLA attainment.
- **Basin Plan Amendments/TMDL reopeners**: Over the course of TMDL implementation, TMDL reopeners will be performed to consider information that may affect the TMDL approach, Permittee compliance, or water quality standards. For example, adoption of new WQOs developed by the State Board or USEPA, recently completed TMDL special studies, or information that suggests that WLAs should be

revised. The TMDL does not need to be re-opened for approval of Load Reduction Strategies. However, the data generated during an LRS could be used to support revisions to WLAs or water quality standards, which could require a TMDL reopener and Basin Plan Amendment by the Regional Board.

7.7.1 Traditional Approach

Under the Traditional implementation approach, MS4 Permittees are not required to follow specific implementation processes, allowing for the most flexibility with regards to implementation actions. Similar to many other TMDLs, the Traditional Approach as described in this TMDL requires a general Implementation Plan be submitted by MS4 Permittees to the Regional Board EO after the effective date of the TMDL, and a strict compliance date is scheduled for WLA attainment. The process for and types of implementation actions are unspecified.

However, because the implementation process that would be presented in a Traditional Approach is typically not as well-documented compared to the LRS approaches contained herein, and thus may not be able to provide reasonable assurance that WLAs will be attained using the selected BMPs, an explicitly iterative BMP implementation schedule within the MS4 permit would not be included. The required dates for attainment of final WLAs are sooner than those for LRS approaches.

The Implementation Schedule section (**Section 7.9**) provides detail on the timing of actions and incorporation of Implementation Plan development requirements and final WLAs into NPDES permits.

7.7.2 Outfall-based Load Reduction Strategy

The Outfall-based approach emphasizes reducing loading from outfalls that discharge either directly to the mainstem LA River segment or tributary or to the MS4 system that ultimately discharges to receiving waters[8]. As shown in **Figure 2**, the Outfall-based approach is a stepwise process that includes monitoring of bacteria discharges from outfalls, implementation of actions to reduce MS4 discharges below the MS4 WLA, and follow-up assessment of additional actions needed both regulatory actions and structural actions, if necessary. Due to the highly-variable nature of bacteria, **Figure 2** demonstrates an iterative process to BMP implementation (i.e., another LRS is developed if the implementation actions performed during the previous LRS were insufficient to meet the WLA).

The seven steps that are envisioned for an Outfall-based approach during implementation are outlined in **Figure 2**. After outfall monitoring (Step 1) and comparison of existing *E. coli* loading to the WLA (Step 2), a LRS for attaining the WLA is developed (Step 3). The LRS is a detailed document that specifies the proposed number, types and locations of actions that will be implemented to attain the MS4 WLA for a mainstem LA River segment or tributary. Within the Outfall-based LRS, there is much flexibility regarding the number, types, and locations of

[8] The discharges from these outfalls are predominantly from MS4s, but the Outfall-based approach could also identify problematic discharges from industrial stormwater and other source types, which would be reported to the Regional Board by MS4s.

actions. MS4 Permittees may use any combination of actions as long as it is sufficiently demonstrated that the proposed suite of actions are expected to result in WLA attainment.

The Outfall-based LRS approach may incorporate, or even emphasize, system-wide non-structural programs. These programs might focus on the reduction of the *volume* of dry weather runoff discharged from MS4 outfalls. In this manner, non-structural approaches to reduce *E. coli* loading might be "flow-based," reducing drain flow rates as the driving factor to reduce loading rates[9]. Examples of non-structural system-wide strategies include:

- Implement water conservation strategies such as public education, irrigation controller programs, rate increases, monitoring programs and other strategies to reduce dry weather runoff. Increase enforcement action for water wasters.
- Implement Low Impact Development (LID) programs to require retention and/or treatment of runoff from new and re-development.

In general, these efforts would require MS4s to engage in multi-agency participation and coordination. If effective for reducing bacteria loading, these types of non-structural actions would be useful for reducing discharges of other TMDL pollutants (e.g., metals).

The three components of the LRS and the process for Regional Board EO approval are briefly described below (and in detail in **Appendix 1**):

- **Part 1: Prioritization of storm drain outfalls for implementation actions** – process for identifying outfalls that would potentially be included in the LRS. The prioritization process is based on conducting Monte Carlo simulations [or equivalent] to (1) evaluate both the individual and cumulative *E. coli* loading rates from outfalls along a segment or tributary and (2) prioritize implementation actions based on these *E. coli* loading rates and, if desired, data for other indicators including source identification data (e.g., human *Bacteroidales*, human-specific viruses, etc.). Two categories of outfalls are identified during Part 1:
    - ***Priority Outfalls:*** these are outfalls with relatively consistent, problematic discharges that both drive storm drain loading rates above the WLA and are considered to likely pose the highest risk to human health. As such, Priority Outfalls are the highest priority for source investigation and targeted implementation actions (i.e., structural controls).
    - ***Outlier Outfalls:*** these are outfalls that exhibit episodically-high loading rates of *E. coli*. Outlier Outfalls are initially subject to follow-up investigations to identify the sources that could be leading the elevated loading rates.

  The detailed process for identifying Priority Outfalls and Outlier Outfalls is presented in **Appendix 1**, using as an example data collected from Segment B during the BSI Study (CREST, 2008).

[9] It is noted that the BSI Study (CREST, 2008) identified outfalls with exceptionally low flow rates ("trickles") that were important sources of *E. coli*. However, when analyzing all storm drain data from the BSI Study (363 samples) *E. coli* loading rates were correlated with flow rates (Pearson correlation coefficient of $\rho = 0.63$, $p<0.0001$; see Section 7.1.2.2 of the BSI Study Final Report). Thus, system-wide reduction of volumes of water discharged from MS4 outfalls would be expected to reduce *E. coli* loading to the LA River and its tributaries. In addition, the targeted Outlier Outfall investigations described in **Appendix 1** would address storm drain "trickles" that are potentially important sources of *E. coli* loading.

- **Part 2: Field assessment of feasibility of potential implementation actions and investigation of potential sources to Priority Outfalls** – The primary purpose of conducting a field assessment is to evaluate the feasibility of potential actions to provide assurance that actions proposed in the LRS are implementable. Potential site constraints could include, but are not limited to, availability of land to construct a project, access to utilities, and/or proximity to wastewater infrastructure with available capacity. The secondary purpose of a field assessment would be to conduct more detailed investigation of potential sources to determine if source elimination (e.g., from a sanitary sewer connection), rather than a structural BMP to divert or manage the runoff, would be an available option. Details regarding the actions that could be performed during the field assessment are provided in **Appendix 1**.

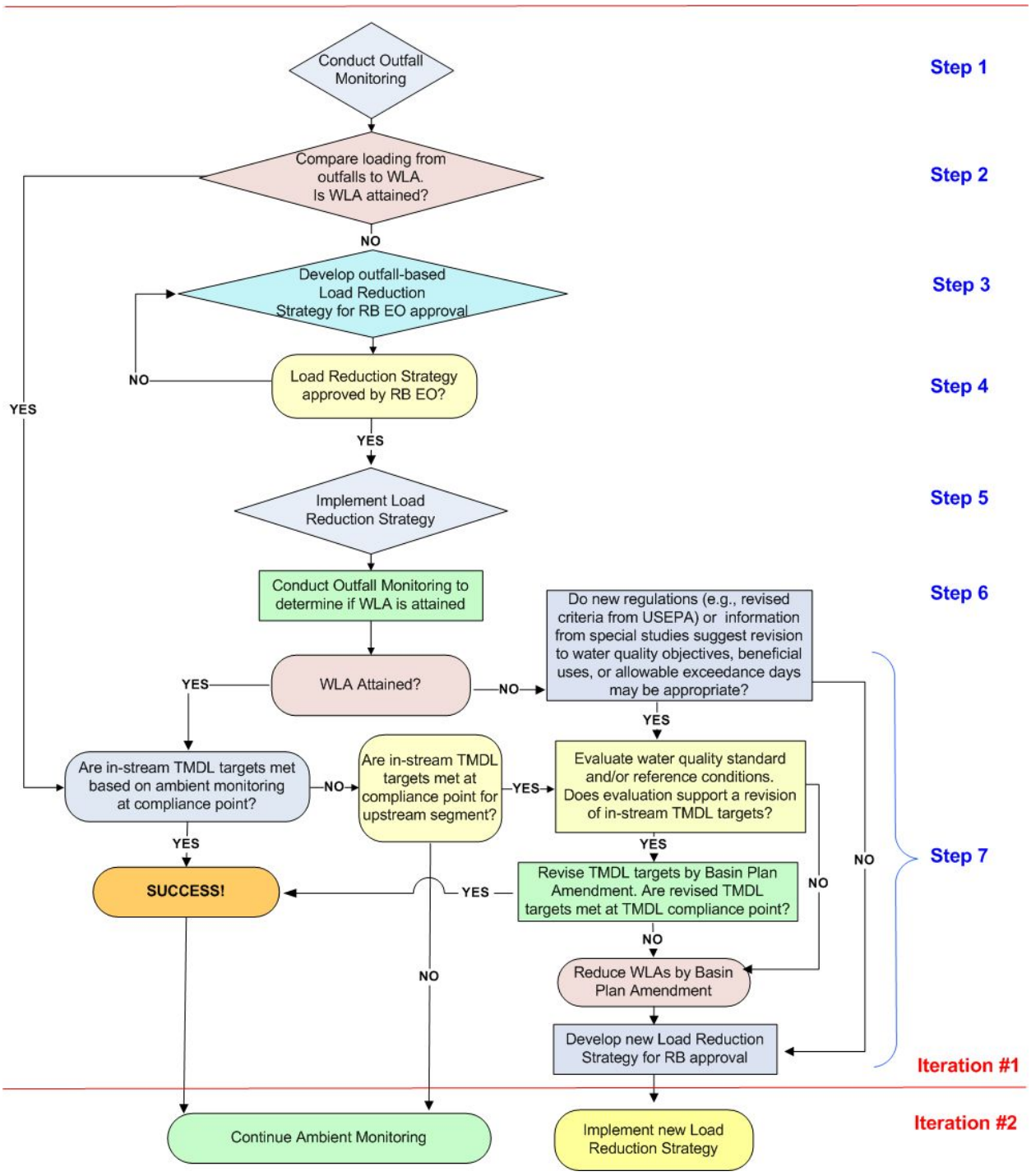

Figure 2. LA River Bacteria TMDL Outfall-based LRS Approach Flow Diagram

WLA = Wasteload Allocation RB EO = Regional Board Executive Officer

- **Part 3: Summarize field assessment and identify load reduction actions to be implemented –** this part of the LRS identifies proposed actions at Priority Outfalls and Outlier Outfalls and provides reasonable assurance that WLAs will be attained after the LRS is completed as follows:
    - ***Summarize results of field assessment at the Priority Outfalls:*** If a bacteria source was identified and abated, and therefore expected to reduce the loading of *E. coli* from a Priority Outfall (and the corresponding need for structural controls), then supporting field data shall be provided. Also, it is possible that the field assessment determines that one or more Priority Outfalls are privately-owned (e.g., industrial). In this case, the problematic discharge shall be documented by the MS4 in the LRS field assessment summary, and the Regional Board will follow-up with the private owner to reduce or eliminate *E. coli* loading in accordance with their WLA.
    - ***Identify proposed actions for Priority Outfalls:*** Permittees may choose whichever implementation actions are preferred to reduce or eliminate the *E. coli* loading from Priority Outfalls. The range of actions could include but are not limited to source control BMPs, low flow diversions, infiltration BMPs, and treatment BMPs as described in **Appendix 1**. Proposed non-structural controls would also be identified, though only those actions whose effectiveness could be reliably quantified would be explicitly incorporated into the LRS, as described below.
    - ***Demonstrate that implementation of actions will result in attainment of WLA:*** this component of the LRS provides reasonable assurance to the Regional Board EO that proposed implementation actions at the Priority Outfalls will result in attainment of the WLAs. Monte Carlo simulations similar to those utilized to identify Priority Outfalls could be used to demonstrate that implementation actions proposed for the Priority Outfalls will result in attainment of the WLAs. The expected performance (i.e., expected concentration and associated load from effluent) after a proposed BMP is installed could be input into the already-constructed Monte Carlo model. For proposed BMPs that do not completely eliminate the discharge, reliable data must be used to estimate expected BMP performance. In the case of non-structural controls, historically it has been a challenge to quantify their effectiveness for pollutant reduction. Within the LA River watershed, because there are ordinances and non-structural controls that have recently been implemented, opportunities exist for pilot studies to assess the effectiveness of these measures. As such, a proposed Outfall-based LRS might include quantification of expected effectiveness of non-structural controls. This effort to reliably quantify non-structural TMDL implementation actions (effectiveness monitoring) is a significant challenge associated with relying on non-structural controls with an LRS approach, but the collected effectiveness data would be beneficial to wide range of TMDL implementation plans. Shown in **Table 4** is a hypothetical example of an Outfall-based LRS approach to Priority Outfalls for Segment B, based on data collected during the BSI Study (CREST, 2008). **Appendix 1** provides additional details and hypothetical LRSs.
    - ***Establish timeline for implementation of actions at Priority Outfalls:*** a timeline for implementing the specific actions at Priority Outfalls must be provided in the LRS, including milestones during the course of LRS implementation. The proposed timeline for an LRS must be in accordance with the Implementation Schedule in **Section 7.9**.

- ***Identify proposed follow-up/investigation efforts at Outlier Outfalls:*** Outlier Outfalls and their corresponding drainage areas and storm drain networks shall be investigated to determine potential sources of *E. coli*, particularly human fecal sources that could have led to the episodic elevated bacteria loading rates. The proposed timeline for Outlier Outfalls investigations in the LRS must be in accordance with the Implementation Schedule in **Section 7.9**. A list of Outlier Outfalls along Segment B based on BSI Study data are presented in **Appendix 1**.

Following development, the Outfall-based LRS shall be submitted for Regional Board EO approval (Step 4 in **Figure 2**). **Appendix 1** contains the specifications for what constitutes a Regional Board EO-approvable LRS.

Implementation of actions in the LRS (Step 5) will be initiated upon Regional Board EO approval of the LRS.

Upon completion of the implementation actions identified in the LRS, outfall monitoring (Step 6) must be conducted to evaluate whether the LRS resulted in attainment of the WLAs. The goal of the outfall monitoring is to characterize the *E. coli* loading from all flowing storm drain outfalls (Priority Outfalls, Outlier Outfalls, and all other outfalls) and determine if WLAs were attained after the LRS was implemented. The monitoring will be conducted in the same manner as under Step 1, as described in **Section 8**.

The next steps for TMDL implementation shall be based on an evaluation of attainment of the WLAs and in-stream targets (Step 7). The Outfall-based Approach Flow Diagram (**Figure 2**) presents three scenarios that represent the potential outcomes of implementing an Outfall-based Approach LRS, as follows:

- Scenario 1: MS4 WLA attained and in-stream target met
- Scenario 2: MS4 WLA attained but in-stream target is not met
- Scenario 3: MS4 WLA not attained and in-stream target is not met

Appendix 1 provides the details for next steps and expectations under each of these scenarios. Outcomes include implementing additional LRSs; revising WLAs and/or TMDL Targets; and concluding that the waterbody is no longer impaired (declaring "success" in **Figure 2**). Under all scenarios ambient monitoring continues. All TMDL reopeners will include an evaluation of whether new information is available to support revisions to the WQOs or beneficial uses via a Basin Plan Amendment.

Table 4 Hypothetical LRS Approach to Priority Outfalls for Segment B based on Incorporating Treatment BMPs [1] (see Appendix 1 for additional details)

Priority Outfall	Current Expected *E. coli* Loading Rate[2] (10^9 MPN/day)	Proposed LRS Action[1]	Expected *E. coli* Loading Rate after Proposed LRS Actions (10^9 MPN/day) (% Reduction)	Expected *E. coli* Loading Rate from all Segment B Outfalls after Cumulative Proposed LRS Actions[3] (10^9 MPN/day)
R2-A	140	Diversion	0 (100%)	883
R2-K	78	Diversion	0 (100%)	742
R2-02	31	Wetland [4]	15 (50%)	694
R2-06	29	Media filter [5]	10 (65%)	637
R2-J	20	Wetland [4]	9 (50%)	597
R2-G	15	Diversion	0 (100%)	508
R2-E	12	Diversion	0 (100%)	446

1 – These actions are completely hypothetical for demonstration purposes only and have not been assessed for feasibility or desirability. The Priority Outfalls were identified using monitoring data from 51 outfalls (see **Appendix 1**).
2 – Expected values are based on Monte Carlo simulation medians using data collected from the BSI Study.
3 – The expected *E. coli* loading from all outfalls *prior* to action is 1431 x 10^9 MPN per day. The expected post-action loading rates are cumulative based on employed BMPs, starting with an LFD at R2-A and ending with an LFD at R2-E. The MS4 WLA for Segment B is 472 x 10^9 MPN per day, and thus the proposed actions at these seven outfalls is expected to result in WLA attainment.
4 – Median of 4 values reported by Clary et al. (2008) from the International Stormwater BMP Database (www.bmpdatabase.org). Reductions ranged from 0 to 98.5%. The average reduction was 38.4%.
5– Median of 12 values reported by Clary et al. (2008) from the International Stormwater BMP Database. Reductions ranged from 0 to 94.8%. The average reduction was 40.6%.

7.7.3 Downstream-based Load Reduction Strategy (Functional Equivalent #1)

An alternative approach to protecting recreational uses in a LA River segment or tributary is a "Downstream-based" approach. While the Outfall-based LRS approach systematically addresses discharges *to* an LA River segment or tributary, the Downstream-based approach protects recreational uses below the a given location by implementing actions *within or adjacent to* the segment/tributary. The general approach to developing a Downstream-based LRS is to identify implementation actions just upstream of a TMDL ambient (in-stream) monitoring location that would result in attainment of the TMDL target at that location. In other words, the goal of a Downstream-based approach is to attain TMDL WLAs for a segment/tributary by virtue of meeting the TMDL target at the TMDL ambient monitoring location for that segment/tributary.[10]

In coordination with the CREST stakeholder group, the Downstream-based LRS was developed because it has the potential to lead to more reliable, more protective, faster, and less-expensive solutions for protection of recreational users when compared to the Outfall-based approach. Downstream-based approaches may be less expensive may be able to be implemented in a shorter timeline because a *single* (though larger) solution can be installed within or adjacent to the segment/tributary as opposed to *multiple* projects at upstream outfalls. Downstream-based approaches may be more reliable and protective because they collect and treat *all* water (including MS4 runoff) at a single location upstream of potential recreational areas. In contrast, installing multiple projects at upstream outfalls leaves discharges from numerous other outfalls untreated while still attaining the WLA and meeting the in-stream TMDL target.

The Downstream-based LRS approach poses significant challenges, and may in fact not be feasible for any of the LA River segments or tributaries due to regulatory and/or engineering constraints, as described below. Nonetheless, in light of the potentially large gains in implementation effectiveness, the following describes an iterative LRS process based on Downstream Solutions (analogous to the Outfall-based approach) that could be considered as a Functional Equivalent by the MS4 Permittees and Regional Board EO during TMDL implementation.

A Downstream-based LRS approach for an LA River segment/tributary could include, but is not limited to, the following implementation actions (called "Downstream Solutions"):

- **In-stream project** – Create an in-stream project immediately upstream of ambient monitoring location that provides in-stream treatment for bacteria reduction and perhaps has multiple benefits (e.g., constructed wetland that provides habitat and is designed to maximize bacteria reduction).
- **Treatment and discharge/reuse** – Divert flow immediately upstream of TMDL ambient monitoring location (immediately prior to confluence with the LA River), treat and return to waterbody and/or reuse dry weather flow to supplement water supplies.

[10] The WLAs for a segment are assumed to be attained if the targets at the corresponding in-stream compliance point are met (Section 6.5). Thus a Downstream-based approach that led to TMDL target attainment at the ambient monitoring location for a segment would also result in WLA attainment for that segment.

- **Divert and infiltrate** – Divert flow immediately upstream of TMDL ambient monitoring location, and infiltrate diverted flow at a nearby site.
- **Diversion to WRP** – Divert all or a portion of a tributary or segment's surface runoff to a sanitary sewer for conveyance to and treatment at a WRP.

The six steps that are envisioned for an Outfall-based approach during implementation are outlined in **Figure 3**. Just as with the Outfall-based approach, there is much flexibility within a Downstream-based LRS regarding the number, types, and locations of actions. MS4 Permittees may use any combination of actions as long as it is demonstrated that the proposed actions are expected to result in WLA attainment. Further, implementation actions would continue as necessary during subsequent LRS iterations if the implemented Downstream Solutions were insufficient.

Under the Downstream-based LRS approach, the first step **(Figure 3)** is crucial, evaluating its feasibility and desirability. If a Downstream-based LRS approach were to be proposed for a segment or tributary, then an evaluation of the feasibility of the proposed approach shall be conducted and include the following components (described in detail in **Appendix 1**):

- Technical feasibility
- Economic feasibility
- Regulatory acceptability under federal and State laws
- Environmental impacts
- Public acceptability

A Downstream-based LRS approach could be considered "infeasible" according to any of the above criteria. The regulatory and public acceptability components are likely the biggest hurdles for MS4s who desire a Downstream-based approach. In particular, the Downstream-based approach may require the performance of a Use Attainability Analysis (UAA) to evaluate whether to re- or de-designate the recreational beneficial uses per 40CFR131.10(g). Otherwise, the portion of the segment or tributary that is just upstream of the Downstream Solution would not attain the TMDL target (and WQOs), potentially requiring additional actions in the future. MS4s are unlikely to consider undertaking a Downstream-based LRS approach if they could later be required to also utilize an Outfall-based LRS approach. There may be segments/tributaries for which a UAA would not support a re- or de-designation. UAAs may not be publicly acceptable, even if linked to implementation of Downstream Solutions.

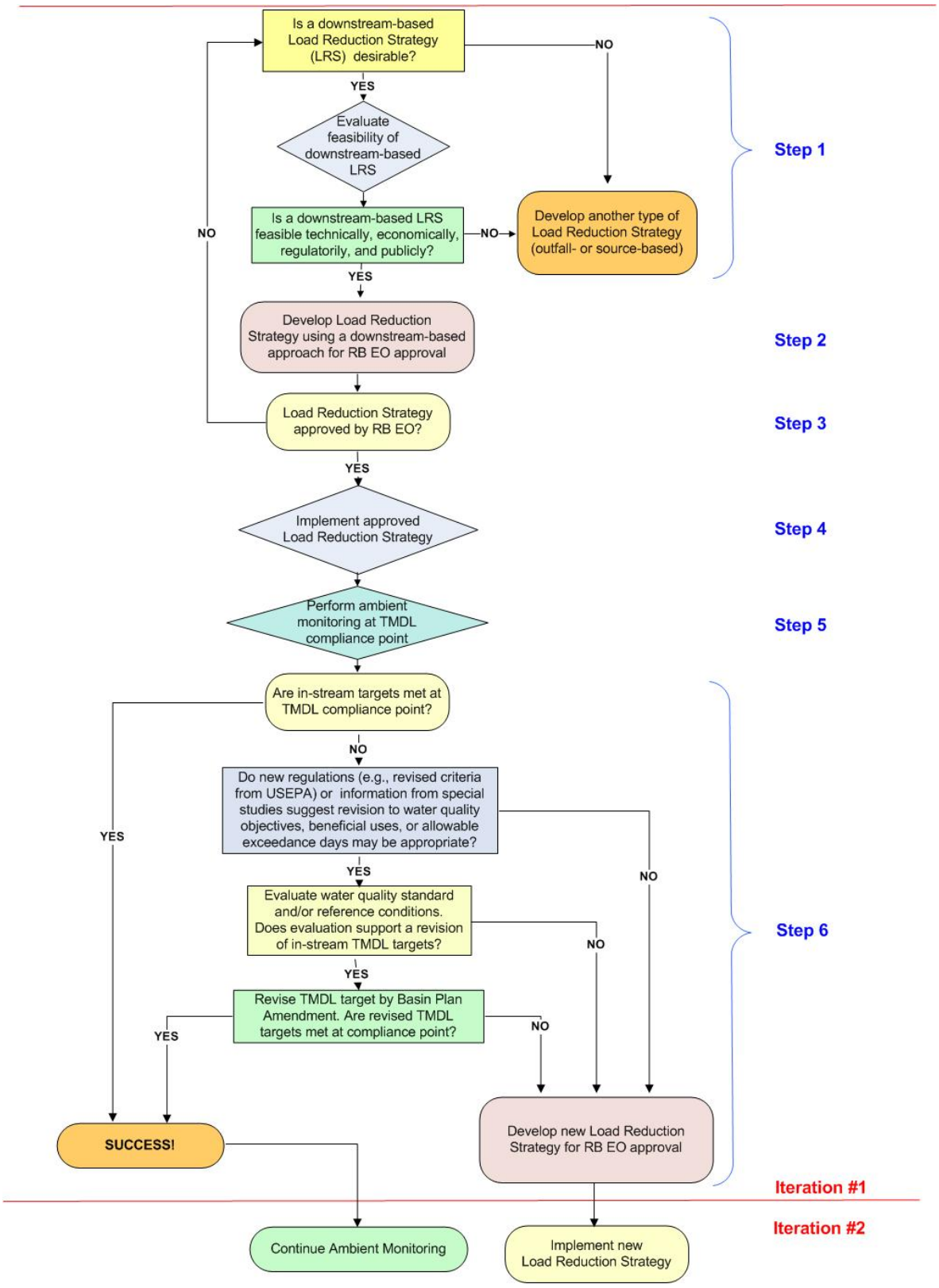

Figure 3. LA River Bacteria TMDL Downstream-based LRS Approach Flow Diagram

LRS = Load Reduction Strategy; RB EO = Regional Board Executive Officer

The LRS developed for the Downstream-based approach (Step 2) shall contain the following two components:

- **Part 1: Outline a Downstream-based Approach –** this component outlines a Downstream-based approach to implement actions in the mainstem LA River segment or tributary and/or associated subwatershed. The feasibility considerations of Step 1 shall be summarized.

- **Part 2: Provide sufficient information for approval of the LRS by the Regional Board EO** – this component of the LRS demonstrates that the proposed actions are expected to result in attainment of the TMDL target at the ambient monitoring location. This demonstration shall include a consideration of the bacteria concentrations and flow rates of the influent and effluent (if any) of the proposed Downstream Solution. A timeline for implementing actions identified in the Downstream-based LRS must also be provided and be in accordance with the TMDL schedule (**Section 7.9**).

Following development, the LRS shall be submitted for Regional Board EO approval (Step 3 in **Figure 3**). **Appendix 1** contains the specifications for what constitutes a Regional Board EO-approvable Downstream-based LRS.

Implementation of actions in the LRS (Step 4) will be initiated upon Regional Board EO approval.

Upon completion of the implementation actions identified in the LRS, MS4 Permittees must conduct monitoring of receiving water[11] just downstream of the Downstream Solution (Step 5) to evaluate whether the LRS resulted in attainment of the WLAs (by virtue of meeting the TMDL target).

The next steps for TMDL implementation shall be based on an evaluation of attainment of the TMDL targets (Step 6). **Figure 3** presents two scenarios that represent the potential outcomes of implementing a Downstream-based Approach LRS, as follows:

- Scenario 1: TMDL target met at ambient (in-stream) monitoring location
- Scenario 2: TMDL target is not met at ambient (in-stream) monitoring location

Appendix 1 provides the details for next steps and expectations under each of these scenarios. Outcomes include implementing additional LRSs; revising WLAs and/or TMDL Targets; and concluding that the waterbody is no longer impaired (declaring "success" in **Figure 3**). Under all scenarios ambient monitoring continues. All TMDL reopeners will include an evaluation of whether new information is available to support revisions to the targets/WQOs or beneficial uses via a Basin Plan Amendment.

[11] Note this differs from the Outfall-based LRS approach, for which WLA attainment is assessed by measuring *E. coli* loading from all storm drain outfalls along the segment/tributary.

7.7.4 MS4 Implementation Strategies for the Entire Watershed with Estimated Costs and Timelines

The LRS approaches outlined in **Section 7.7** are described in a manner applicable to *individual* LA River segments or tributaries. This section combines these approaches into overall "Watershed-wide" strategies for the entire LA River watershed (i.e., *all* impaired segments and tributaries). These strategies are examples of approaches by which the entire Watershed could be addressed. Any legal and viable strategy can be used for TMDL implementation, including combinations of LRS approaches not described herein. A primary goal of outlining the Watershed-wide strategies herein is to assist with development of cost estimates and an implementation schedule for this TMDL. Water Code Section 13000 requires the State and Regional Boards to regulate so as to achieve the highest water quality which is reasonable, based on consideration of economics and other public interest factors.

Three types of Watershed-wide strategies are described herein: Conventional, Alternative, and Integrated[12]. The types of Watershed-wide strategies in conjunction with corresponding cost estimates and prioritization (**Section 7.6**) lead to the development of the TMDL schedule in **Section 7.9**. In this manner, the TMDL implementation schedule accounts for the four options for MS4 implementation approaches (**Section 7.7**) and provides flexibility for MS4 Permittees to use any combination of those approaches across the Watershed.

To generate timelines and the sequences for LA River segments and tributaries, all three Watershed-wide strategies incorporate the prioritization approach in **Section 7.6.**

7.7.5 Conventional Watershed-wide Strategy (Outfall-based LRS Approach in all LA River Segments and Tributaries)

The Conventional Strategy to implementation of the LA River Bacteria TMDL involves performing Outfall-based Load Reduction Strategies (see **Section 7.7.2**) in all five LA River segments and all 11 tributaries addressed by this TMDL (**Figure 1**). Downstream-based LRS approaches are not included in the Conventional Strategy.

7.7.5.1 Cost Estimate for Conventional Strategy

The process for developing an implementation cost estimate included the following steps for a Conventional Strategy that uses an Outfall-based LRS approach for all LA River segments and tributaries (**see Section 7.7.2**). Each of these steps is further detailed in **Appendix 3**.

1. **Estimate the number of outfalls** – the total estimated number of outfalls in the Watershed is approximately 3700.
2. **Estimate the number of outfalls that flow during dry weather** – the estimated number of flowing outfalls is as follows:
    - Mainstem LA River – approximately 280 flowing outfalls during dry weather

[12] A Watershed-wide Strategy based on the Traditional Approach is not presented herein because there was no basis by which estimates of timeline and cost could be estimated. In other words, when compared to the LRS approaches the Traditional Approach is much less defined in terms of numbers and locations of implementation actions, which makes it difficult to generate a cost and timeline for the Traditional approach.

- Tributaries – approximately 330 flowing outfalls during dry weather

3. **Estimate the number of outfalls that may require *initial* actions/structural controls along the mainstem LA River –** using information generated during the BSI Study (CREST 2008) in combination with a Monte Carlo analysis for Segment B (**Appendix 1**), the number of outfalls along the mainstem LA River that would require elimination of flow and/or bacteria is estimated to be a minimum of 10%, or approximately 28 outfalls (**Table 5**). A similar approach was used for Outlier Outfalls, leading to an estimate of 28 Outlier Outfall investigations over the course of TMDL implementation.
4. **Estimate the number of outfalls that will require *follow-up* actions/structural controls along the mainstem LA River** – for estimating purposes, it was assumed that after the initial projects were completed in accordance with an LRS, an additional 100% more controls would be needed[13] for an ultimate total of 20% of outfalls (1 in 5) or approximately 28 additional (**Table 5**).
5. **Estimate the total number of outfalls that will require structural controls along tributaries** – A minimum of approximately 33 outfalls to the tributaries of the LA River are estimated to require initial projects, and an additional 100% for follow-up projects (**Table 5**) for a total of 66 projects[14].
6. **Establish representative storm drain outfall flow rate** – a representative flow rate for storm drain outfalls of 0.15 cfs for each of the Priority Outfalls was estimated.
7. **Establish representative water quality conditions** – Representative values for Total Suspended Solids (TSS) and Biological Oxygen Demand (BOD) in dry weather storm drain discharges were established at 10 mg/L as these are also used to estimate treatment plant capacity costs.
8. **Create "typical" LFD design** – a "typical" LFD facility design for was created based on prior projects planned and designed by the City of Los Angeles BOS/BOE.
9. **Estimate distances from outfalls to wastewater infrastructure** – an average distance between major outfalls to the river and wastewater infrastructure within **the vicinity of the river was estimated at an aver**age distance of 300 feet was used.
10. **Conveyance and treatment capacity** – a cost basis was developed for acquiring incremental interceptor capacity and incremental treatment plant capacity for the dry weather flows based on the following factors: conveyance, treatment flow, BOD, and TSS. Separate treatment cost factors were applied to LFDs that would connect to the County Sanitation Districts of Districts of Los Angeles (LACSD) facilities.
11. **Develop overall capital costs** –The unit capital costs for a single LFD project in current (2009) dollars was estimated to be $1.7M not including conveyance and treatment capacity allowances (these were categorized as operation and maintenance costs). Costs for Outlier Outfall investigations were estimated as $100,000 per Outlier Outfall.

[13] Note that this assumption of necessary additional structural controls does not necessarily reflect lack of confidence in ability of the Monte Carlo approach; the approach handles *existing* sources well. Instead, the assumption that additional projects are necessary accounts for potential *future* sources of bacteria that arise over the course of TMDL implementation.

[14] Similar to the mainstem LA River, this assumption of necessary additional projects along tributaries accounts for potential *future* sources of bacteria that arise over the course of TMDL implementation.

Table 5. Estimated Number of Required Structural Controls (LFDs or other BMPs) for Conventional Strategy (Outfall-based Approach)

Los Angeles River Segment or Tributary	Length (mi)	Estimated Number of Required Initial Structural Controls (Rounded)	Estimated Number of Required Follow-up Structural Controls (Rounded)	Estimated Total Number of Required Structural Controls (Rounded)
LA River Segment A (lower Reach 2 and Reach 1 – Rosecrans Avenue to Willow Street)	**7.1**	**3**	**3**	**6**
Compton Creek	**8.5**	**4**	**4**	**8**
LA River Segment B (upper and middle Reach 2 – Figueroa Street to Rosecrans Avenue)	13.7	5	5	10
Arroyo Seco Reach 1	5.2	3	3	6
Arroyo Seco Reach 2	4.4	1	1	2
Rio Hondo Reach 1	4.6	2	2	4
Rio Hondo Reach 2	9.3	2	2	4
LA River Segment C (lower Reach 4 and Reach 3 – Tujunga Avenue to Figueroa Street)	12.2	8	8	16
Burbank Western Channel	14.4	4	4	8
Verdugo Wash Reach 1	2.0	1	1	2
Verdugo Wash Reach 2	7.5	5	5	10
Tujunga Wash	9.7	4	4	8
LA River Segment D (Reach 5 to middle Reach 4 – Balboa Boulevard to Tujunga Avenue)	7.8	6	6	12
Bull Creek	6.6	1	1	2
LA River Segment E (Reach 6 – LA River headwaters to Balboa Boulevard)	6.5	6	6	12
Aliso Canyon Wash	10.1	1	1	2
Bell Creek	8.9	2	2	4
Dry Canyon Creek	3.9	2	2	4
McCoy Canyon Creek	4.0	1	1	2
Totals				
Mainstem LA River Segments	47.3	28	28	**56**
Tributaries	99.1	33	33	**66**
Mainstem LA River Segments and Tributaries	146.4	61	61	**122**

12. **Develop operation and maintenance costs** – once LFDs are on line, operation and maintenance costs (O&M) were assumed to begin, starting with the completion of each LFD and continue through the end of the overall TMDL implementation period.[15] Utilized factors included diversion flow rate, pumping and operation and maintenance costs, collection system maintenance costs, and treatment plant operation and maintenance costs.
13. **Compile costs** – the combination of capital cost and operation and maintenance costs were complied on an annual basis over the entire TMDL implementation time period based on the estimated timeline. Both zero and 3% cost escalation factors were applied.

As shown in **Table 6**, combining both the capital costs and O&M costs over the TMDL implementation period, the total costs of the TMDL under the Conventional Strategy, with and without escalation, are estimated to be $585,000,000 and $1,097,000,000, respectively.

To further illustrate TMDL costs, **Figure 4** and **Figure 5** present the total annual costs added together over the same period as well as cumulative costs over the TMDL implementation period with and without an allowance for escalation, respectively.

Table 6. Conventional Strategy – Estimated Total Costs (Capital and O&M, 2009 Dollars) for Treatment Facilities to Implement the Dry Weather Los Angeles River Bacteria TMDL assuming zero and 3% cost escalation

Type of Implementation Cost	Zero Escalation	Assuming 3% Escalation
Diversion Facilities and Outlier Outfall Investigations (Capital Cost)	$217,000,000	$363,000,000
Conveyance Facilities (Capital Cost)	$23,000,000	$40,700,000
Treatment Capacity Cost (Capital Cost)	$42,000,000	$65,300,000
Total Capital Costs	$283,000,000	$469,000,000
Operation & Maintenance [a]	$302,000,000	$628,000,000
Total TMDL Cost [a,b]	**$585,000,000**	**$1,097,000,000**

Type of Implementation Cost	Zero Escalation	Assuming 3% Escalation
Diversion Facilities and Outlier Outfall Investigations (Capital Cost)	$217,000,000	$363,000,000
Conveyance Facilities (Capital Cost)	$23,000,000	$40,700,000
Treatment Capacity Cost (Capital Cost)	$42,000,000	$65,300,000
Total Capital Costs	$283,000,000	$469,000,000
Operation & Maintenance [a]	$302,000,000	$628,000,000
Total TMDL Cost [a,b]	**$585,000,000**	**$1,097,000,000**

a – The estimated total O&M cost is for the TMDL implementation period only. Efforts for O&M costs will likely continue indefinitely, with estimated annual costs exceeding $21,700,000 per year without escalation and 56,400,000 per year with escalation after the TMDL implementation period.
b – This total cost does not include costs for monitoring efforts or special studies, as described in Section 8.
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[15] Costs would continue indefinitely, but for simplicity the estimated TMDL costs were constrained to the implementation period.

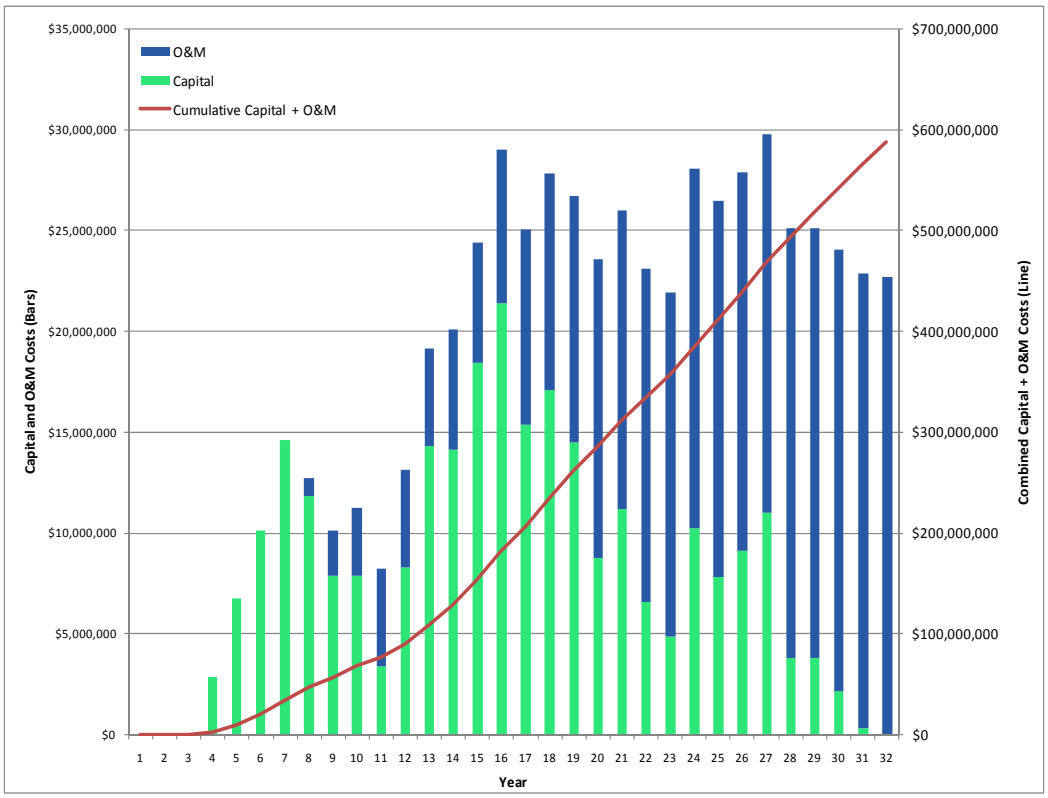

Figure 4. Outfall-Based Approach – Estimated Total Annual and Cumulative Capital Costs for Initial, and Follow-up Projects and Operational and Maintenance Costs Without Annual Escalation Factor

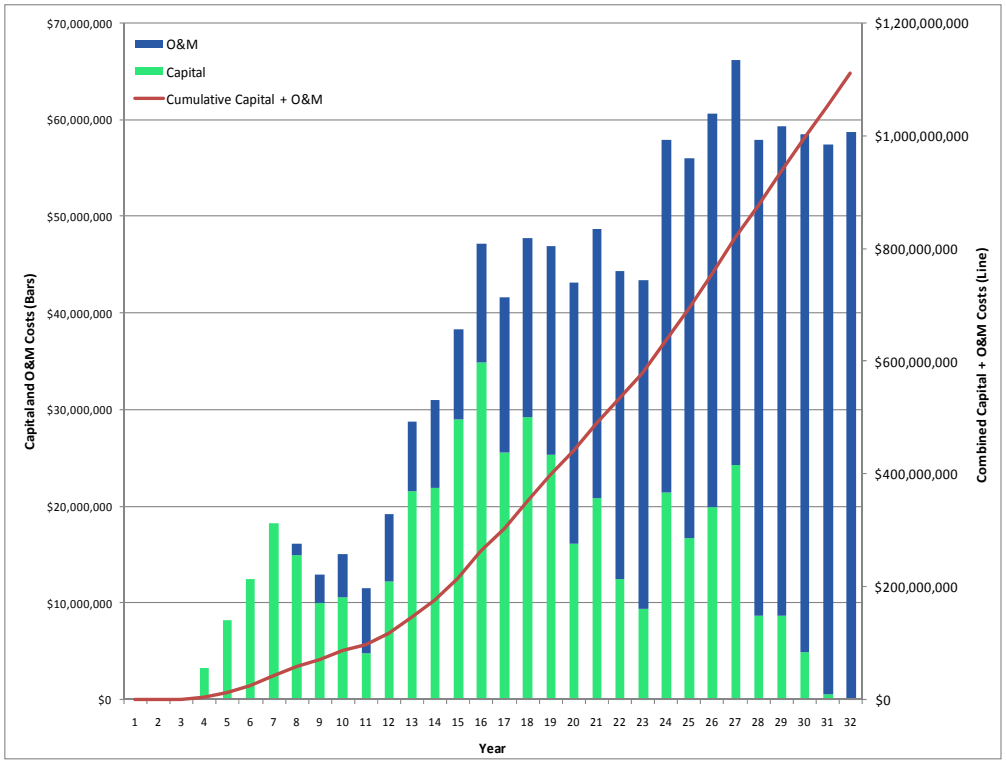

Figure 5. Outfall-Based Approach – Estimated Annual Capital and Cumulative Costs for Initial, and Follow-up Projects and Operational and Maintenance Costs With Annual Escalation Factor

7.7.5.2 Timeline for Conventional Strategy

The timeline for implementing the Conventional Strategy was designed to meet the regulatory goals of the Regional Board, ,prioritize actions based on various factors including the potential human health risk (as discussed in **Section 7.6**)**,** and allow for sufficient periods of time to implement WLAs through system-wide non-structural and structural BMPs. Time is also provided for coordination with special studies (**Section 8**) and TMDL reopeners.

As described below, the length of an implementation timeline is a function of the length of (1) the estimated time to complete a single project, (2) the estimated total number of projects (i.e., the number of LFDs, infiltration facilities, or other actions required to comply with WLAs), and (3) an evaluation of how many projects a single agency (or group of agencies acting together) could, on a sustained long-term basis, complete over a period of time.

7.7.5.2.1 Individual Project Timeline for Structural Actions at Outfalls

The Conventional Strategy timeline is a function of the length of time needed to complete individual projects/actions. The estimated timeline to complete an individual project is based on LFD of a dry weather storm drain discharge (as a "surrogate" structural BMP) because reliable examples of LFD projects conducted locally by MS4 Permittees are available. The use of LFD projects as the example implementation action is simply to provide a basis for developing the timeline and overall Implementation Schedule. It is reasonable to use an LFD as the surrogate BMP because (1) it provides reasonable assurance for adequately addressing bacteria discharges from Priority Outfalls, and (2) the cost and timeline for implementing an LFD project is assumed to represent a mid-range in terms of BMP complexity. Furthermore, while any of the non-LFD structural BMPs (infiltration or treatment) are potentially viable for a number of individual outfalls, they tend to be very location-specific. Thus it would be difficult to develop a replicable "unit" schedule and cost based on non-LFD BMPs

Additionally, implications of choosing alternative projects/actions (i.e., infiltration) are considered. In the case of infiltration actions, fewer projects were available to evaluate the timeline and steps associated with a "typical" project. Relative to LFDs, it is likely that infiltration projects would require a similar or longer timeline especially if additional land acquisition is required. All of the implementation steps noted below for LFDs would be required for an infiltration type project. In addition there may be other activities that could potentially add more time.

Based on review of local LFD projects by the City of Los Angeles Bureau of Sanitation[16], the following steps and timeline are considered typical for an LFD project in a highly urbanized setting (see **Appendix 3** for more details):

- **Preliminary Engineering Design** (9-12 months)
- **Design** (8 months)
- **Advertisement**, **bid and award** (6 months)
- **Construction** (8 months)

[16] The projects evaluated include LFDs along Santa Monica Bay, recent projects underway for the Los Angeles River near downtown Los Angeles, and projects developed as part of the City of Los Angeles Proposition O funding.

- **Post-construction, start-up and turnover** (3 months)

As presented above, a total project timeline to bring an identified LFD project from pre-planning to operations is estimated to be 37 months [17].

7.7.5.2.2 Overall Timeline for Conventional Strategy

In order to complete all projects along the LA River segments or tributaries under this TMDL within a reasonable period of time, MS4 Permittees would be actively involved with multiple projects at different stages, ranging from pre-design through completion and start-up. It is expected that the first several years of activity for a particular segment or tributary will focus primarily on the initial activities (termed "Plan" below) for multiple projects including outfall monitoring, strategizing, detailed planning, pre-design and design. Completion of construction and start-up for the same concurrent projects (termed "Execute" below) would likely occur several years later. Finally, follow-up monitoring and planning (termed "Assess" below) would evaluate whether actions were successful in attaining the WLAs, and if not the follow-up actions needed to meet the WLAs.

The steps used to develop the Conventional Strategy timeline include the following:

1. **Determine responsible jurisdictions and corresponding number of outfalls** – for each LA River segment and tributary, the jurisdictional agencies along with a coarse estimate for each agency's number of outfalls to the LA River segments and tributaries were determined.
2. **Establish a minimum timeline for implementing and assessing required structural BMPs –** the minimum timeline for implementing and assessing structural BMPs within an individual LA River segment or tributary was based on three components, as follows:
    - **Plan** – the schedule for each segment and tributary begins with an initial 3-year pre-planning, monitoring, prioritizing and implementation planning period for each Segment or tributary. This time period would also be used for inter- and intra-agency agreements. The schedule also assumes that pre-monitoring and planning for implementation of the next priority reach would be conducted in parallel with on-going implementation activities for the preceding segment/tributary so that there would essentially be continuous implementation activities occurring.
    - **Execute** – the schedule assumes that an average completion time for a single project would be four years from start to finish, based on the assumption that one or more of the projects undertaken during the period might be more complex and require up to five or six years to complete (compared to the surrogate BMP timeline of 37 months). The total time to implement structural BMPs for any given segment was estimated by taking the total estimated number of projects in the segment/tributary, initiating detailed actions on the first project immediately after the Plan phase, staggering the start of additional projects at six month intervals, and completing the final project within four years of the start of the project. In reality, this would require agencies or groups of agencies with multiple projects along a given

[17] Note that this timeline begins after it has been determined that an LFD is feasible and desirable at a given outfall. More complex projects will likely require a longer timeline (e.g., a reuse or infiltration project, in-stream BMPs and other projects with permitting challenges, etc).

segment/tributary to be working on as many as eight projects at any given time in various stages of planning through construction in order to get all projects completed by the end of the allowable time. The other factor that was taken into account was whether different agencies or groups of agencies discharge to the various segments/tributaries, in order to evaluate opportunities for separate agencies to take actions in parallel. An example of this in Segment A, which generally has different responsible agencies than Segment B, and thus Segment A actions are scheduled to begin prior to completion of actions in Segment B.

- **Assess** – each LRS requires follow-up monitoring and reporting to assess the effectiveness of implemented actions, and determine whether additional load reduction (follow-up) actions are needed. It was assumed this effort would take 2 years, one year for monitoring and one year for reporting.

The resulting implementation timeline based on the above assumptions is shown in **Figure 6**. These assumptions result in a timeline to complete the first iteration on all mainstem LA River segments and tributaries within 25 years, and a total timeline of 31 years to complete a second iteration on the final segment addressed (Segment D). The first iteration of implementation actions on Priority Outfalls in Segments A and B would be completed within eight years of the effective date of the TMDL. The first iteration of implementation actions on Segment A and B tributaries would be completed within the following two years (10 years after the effective date of the TMDL).

For all of the LA River segments and tributaries, the timeline depicts the follow-up actions as an iterative process, as described in **Section 7.7.** These follow-up actions, if needed, would continue in parallel with work on subsequently-addressed LA River segments and/or tributaries (i.e., follow-up actions and initial actions are implemented concurrently). To minimize the effect of follow-up actions on the length of the Conventional timeline, the timeline does not account for more than one iteration in Segment D and its tributaries, which were prioritized for actions later in the schedule. If the number of required outfall actions along tributaries was dramatically higher than estimated in **Table 5**, the corresponding implementation timeline could increase by decades.

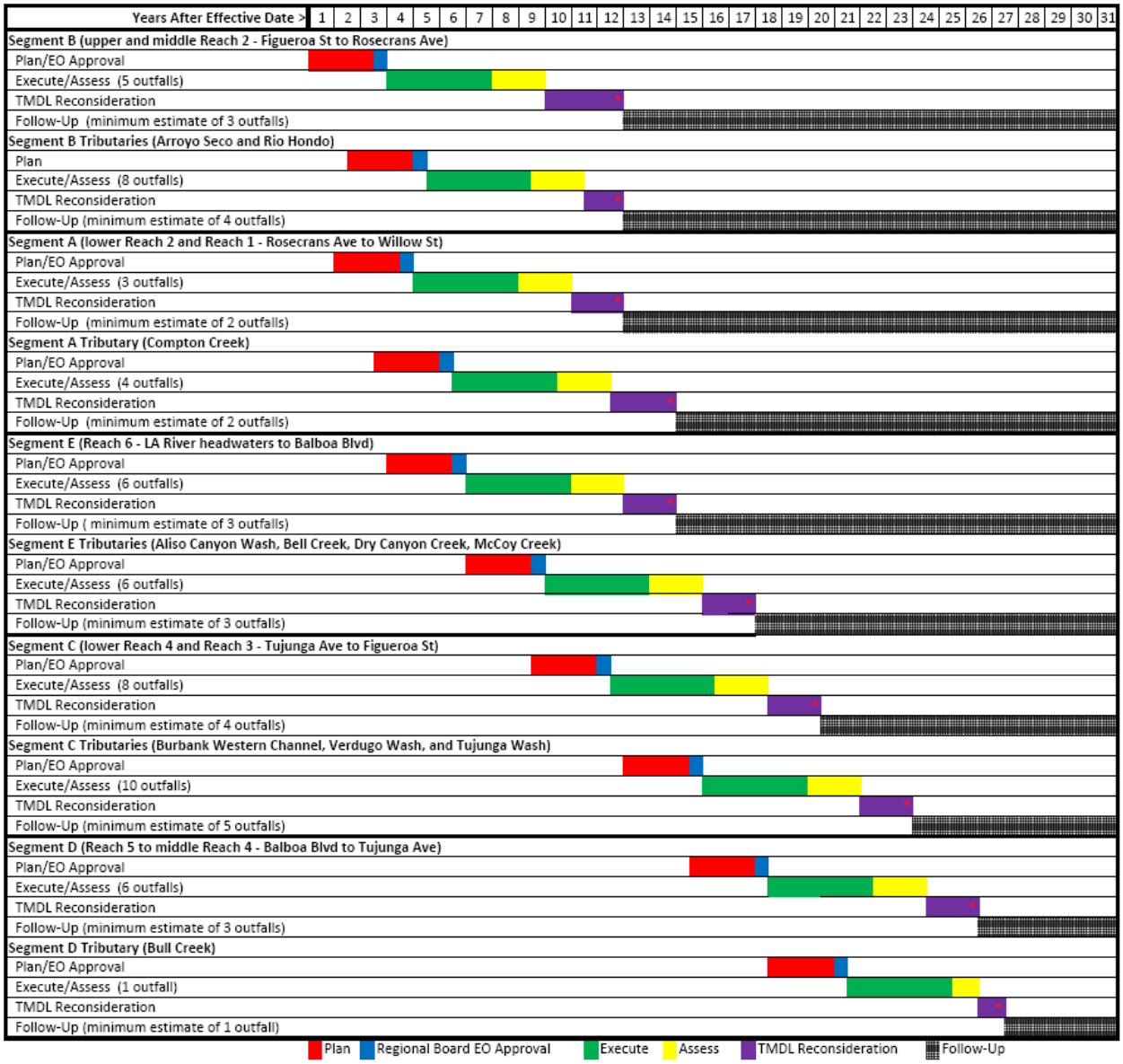

Figure 6. Estimated Timeline for the Los Angeles River Bacteria TMDL for Conventional Watershed-wide Strategy (Outfall-Based Load Reduction Strategies)

7.7.6 *Alternative Watershed-wide Strategy (Combination of Outfall- and Downstream-based LRS Approaches in LA River Segments and Tributaries)*

The Alternative Strategy utilizes both Outfall- and Downstream-based LRS approaches. The integration of Downstream-based approaches into a Watershed-wide strategy assumes it would be feasible to implement Downstream Solutions at strategic locations near the downstream end of tributaries and/or mainstem LA River segments. This assumption may be inaccurate due to the regulatory and public acceptability and other related issues (**Section 7.7.3**). Nonetheless, the Alternative Strategy evaluates a potential approach, cost, and timeline associated with utilizing a combination of Outfall- and Downstream-based approaches on a watershed scale.

Locations with the highest potential feasibility with regards to employing a Downstream-based approach are those that are both (1) downstream of areas that are unlikely to be suitable for recreational use (e.g., vertical walls, fenced channel, very shallow flows, etc.) and (2) just upstream of areas that have a high potential for recreational use. In this manner, resources can be directed at solutions that are able to most-effectively reduce human health risk. Evaluations of the existing and attainable beneficial uses would be used to rigorously determine the locations of recreational areas-of-concern in the Watershed (i.e., the highest priority locations to be protected) and thereby direct implementation of Downstream Solutions.

Two fundamental components of the Alternative Strategy are (1) evaluations of the existing and attainable beneficial uses and (2) potential revisions to the designated beneficial uses which would likely require UAAs. In order for a Downstream-based LRS to be feasible/desirable approach for MS4s, it would likely be necessary to re- or de-designate the portions of the segments/tributaries[18] that are upstream of the proposed solutions because the areas just upstream of the Downstream Solution would potentially not meet the current TMDL targets. Thus to avoid third party litigation, the MS4s may need for the segment/tributary upstream of the Downstream Solution to be de-listed to avoid having to later employ an Outfall-based LRS. Note that a re- or de-designation may only be appropriate in the lower portions of tributaries modified for flood control and not for areas that remain in a more natural state and/or are accessible.

The magnitude of the TMDL implementation effort for tributaries is a key factor that led to the development of a Downstream-based LRS approach. Tributaries assigned allocations represent almost twice as many miles of length compared to the mainstem LA River, and tributaries have little to no assimilative capacity for bacteria discharges from point and nonpoint sources. The relatively low flow rates in tributaries (generally less than 3 cfs) suggests that engineering solutions in or adjacent to the channel with a Downstream-based approach could be much more efficient when compared to implementing actions at numerous upstream outfalls (generally discharging less than 0.1 cfs) with an Outfall-based LRS approach. Many of the tributaries that received allocations have minimal access, either due to vertical channels/fencing or very shallow flow conditions, significantly reducing the potential for recreational activities. This is an

[18] De-designation could only apply to those portions where the use is not currently attained and cannot be attained based on the factors set forth in 40CFR131.10(g)

important consideration, because it may be necessary to de-designate upstream REC-1 uses for a Downstream-based approach to be a feasible and desirable alternative for MS4s.

While a Downstream-based approach may be more feasible in tributaries, recreational uses along the mainstem LA River could also be protected with Downstream Solutions. The most upstream segment of the LA River, Segment E, also exhibits "tributary-like" conditions (low dry weather flow rates [generally <10 cfs], limited access, etc.) and thus might also be suitable for a Downstream-based approach. For the Alternative Strategy, recreational uses in the Sepulveda Basin (upstream end of Segment D [Reach 5]) and at the Glendale Narrows (middle of Segment C [Reach 3]) were considered for protection with a Downstream-based approach.

- **Sepulveda Basin** – highlighted because (1) the flows from upstream (Segment E [Reach 6] are relatively low, approximately 10 cfs, suggesting that an engineering solution would be feasible, and (2) it is perceived that recreational uses in Segment E (Reach 6) are infrequent or non-existing. Implementation of a Downstream Solution just upstream of the Sepulveda Basin could be much more efficient and effective than eliminating dry weather discharges from a large number of upstream outfalls.
- **Glendale Narrows** – highlighted because the area is subject to recreational use, but is just downstream of miles of concrete-lined, vertical-walled, and fenced channel that likely have limited or no recreational use. Implementation of a Downstream-based approach just upstream of Glendale Narrows could be much more efficient and effective than eliminating dry weather discharges from a large number of upstream outfalls. However, as described below, a Downstream Solution upstream of the Glendale Narrows was not included in the Alternative Strategy due to challenges associated with dry weather flow rates between 60 and 90 cfs.

Based on a preliminary review of the Watershed and discussions with stakeholders, the locations listed below are considered potential sites for Downstream Solutions (see **Figure 7**):

- **All tributaries except Compton Creek –** up to 10 of the 11 tributaries addressed under this TMDL may have the potential for the use of a Downstream-based LRS approach. In general, tributaries in the LA River have low dry weather flow rates (< 5 cfs) and may have poor conditions for recreational activities to be existing and attainable uses (e.g., channelized, fenced, and shallow flows), which gives them high potential for being feasible for Downstream Solutions. The overall purpose of the Downstream Solutions in the tributaries (just upstream of the confluence with the LA River) would be to protect existing or attainable beneficial uses and support attainment of TMDL targets in the LA River (downstream of the tributary confluence). Compton Creek has areas with soft bottom and is subject to occasional fishing, which limits its suitability for Downstream-based approach. However, it may be determined that Compton Creek is in fact suitable for Downstream-based LRS approach or may be appropriate for certain portions of this tributary (e.g., just upstream of the soft-bottom sections).
- **LA River, downstream end of Segment E (Reach 6) –** the section of Segment E of the LA River between the confluence with Bell and Calabasas Creeks[19] and Sepulveda Basin has low dry weather flows (<10 cfs) and poor conditions for recreational activity (e.g.,

[19] Technically, the most upstream end of the LA River is the confluence with Bell Creek and Calabasas Creeks. Those tributaries form the LA River's headwaters.

channelized, significant portions are fenced, and shallow flows). In contrast, the Sepulveda Basin has a high potential for recreation uses due to available access, presence of soft-bottom channel, and relatively deep flow. This scenario suggests that an LA River location just upstream of Sepulveda Basin may have a high potential of being suitable for a Downstream-based LRS approach (i.e., recreational uses in the Sepulveda Basin would be protected by constructing a Downstream Solution at the end of Segment E). In addition, the D.C. Tillman WRP is near the proposed location, which could potentially provide treatment capacity as a component of the Downstream Solution. Because recreational uses may not exist and may not be attainable upstream of this location, the entire watershed area upstream of the Downstream Solution could be appropriate for consideration of a re- or de-designation. In this case, outfall based or Downstream Solutions may be not be necessary in Bell Creek, McCoy Canyon, Dry Canyon, and Aliso Canyon Wash (i.e., a single solution just upstream of Sepulveda Basin could be adequate to protect recreational uses).

The remaining segments (or portions of segments) of the LA River (not listed above) were assumed to be addressed using Outfall-based approaches (yellow-highlighted segments in **Figure 7**) for the following reasons:

- **Segment A and B –** likely to have existing water contact uses (e.g., water contact by homeless persons for bathing) that should be protected with implementation actions (and likely could not be re- or de-designated), even though some of this user access is prohibited/illegal. In addition, the dry weather flow rates in these segments are relatively high (>100 cfs), limiting the technical and economic feasibility of Downstream Solutions. Thus, the alternative strategy assumes Segment A and B would be addressed with an Outfall-based LRS approach.
- **Segment C and D –** the elevated dry weather flow rates (>60 cfs) and limited availability of land suggested that construction of a Downstream Solution just upstream of Glendale Narrows has a low probability of being technically or economically feasible. Thus, the alternative strategy assumes Segment C would be addressed with an Outfall-based LRS approach.

During TMDL implementation, these assumptions could be revisited to determine if a Downstream-based LRS approach was in fact feasible for these segments.

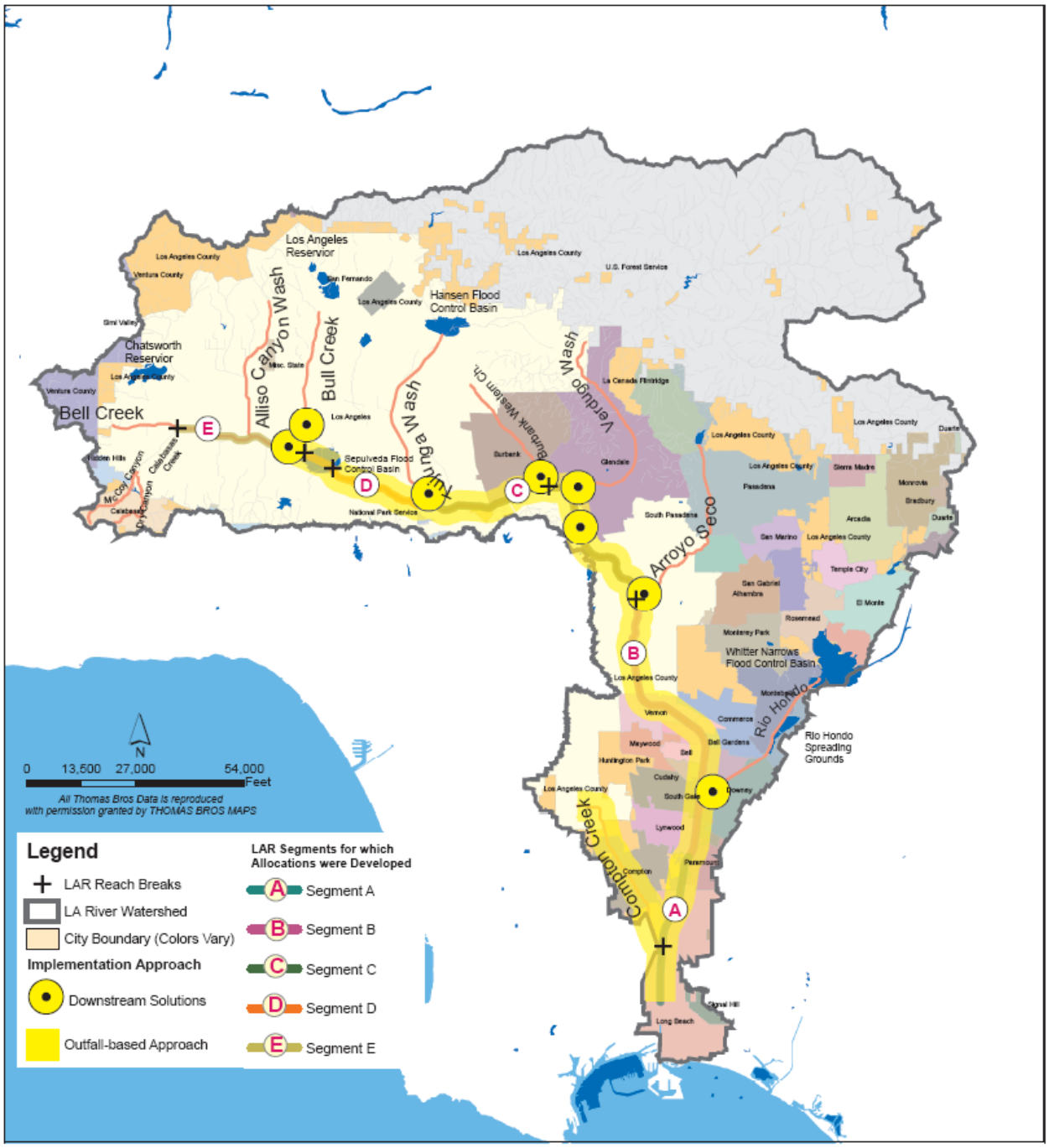

Figure 7. Representation of Alternative Watershed-Wide Strategy for TMDL Implementation

7.7.6.1 Costs for Alternative Strategy

This section presents a cost estimate for the Alternative Strategy which combines Outfall- and Downstream-based LRS approaches. For the purposes of developing the Alternative Strategy, the following assumptions were made (**Figure 7**):

- Outfall-based actions would be implemented for the following segments and tributaries:
  - Segments A, Segment B, Segment C[20], and Segment D.
  - Compton Creek
- Downstream solutions would be implemented near the downstream end of the following tributaries just prior to the confluence with the mainstem LA River:
  - Rio Hondo
  - Arroyo Seco
  - Verdugo Wash
  - Burbank-Western Channel (potentially implement upstream of from the Burbank WRP discharge)
  - Tujunga Wash
  - Bull Creek
- A Downstream Solution would also be implemented in Segment E of the mainstem LA River just upstream of the Sepulveda Basin, and no additional projects would be required on the tributaries to Segment E.

To develop an order-of-magnitude cost estimate for each Downstream Solution, a concept was used that assumes that some type of off-line diversion and treatment facility would be constructed in the general vicinity of the diversion location, potentially on publicly-owned land. A unit cost of these projects per MGD of flow capacity was developed for the Integrated Resources Plan (IRP)[21] for both capital and operation and maintenance costs. Additional details are provided in **Appendix 3**. Based on these assumptions, the assumed dry weather flows rates for each of the locations listed above, the estimated capital costs of each project, and the estimated operation and maintenance costs once the project was on-line are summarized in **Table 7**.

Total capital costs are based on the Downstream Solutions identified in **Table 7**, plus the number of projects along the segments/tributaries subject to an Outfall-based approach (**Table 5**), which includes 26 initial and 14 follow-up projects in Segments A, B, C, and D and Compton Creek (**Table 5**).

[20] A Downstream-based approach was considered in the concrete-lined portion of Segment C above the Glendale Narrows, but substantial technical challenges exist due to the large flow rate (driven by POTW effluent) at this location. As such, for planning purposes, it is assumed that and Outfall-based approach would also be required for Segment D and the upper portion of Segment C above this point.

[21] Under the IRP it was assumed that all dry weather flow to the mainstem or tributaries would have to be intercepted from all outfalls and conveyed through separate parallel pipelines to each downstream treatment facility. Under the current assumption, flow would be allowed to be conveyed in the mainstem or tributary and intercepted at only one location near the URP, and therefore the diversion pipeline costs were not included.

Table 7. Locations, Sizes, and Costs for Downstream Solutions

Location of Project	Flow Rate/Capacity (MGD)	Estimated Capital Cost ($M 2009)	Estimated Annual Operation and Maintenance Costs ($/yr 2009)
Arroyo Seco	2.50	18.0	875,000
Rio Hondo	0.16	1.2	56,000
Verdugo Wash	5.2	37.5	1,820,000
Burbank Western Channel	2.6	18.7	910,000
Tujunga Wash	1.0	7.2	350,000
Bull Creek	2.40	17.3	840,000
LAR Segment E	5.80	41.8	2,030,000

The combination of capital cost and operation and maintenance costs were complied on an annual basis over the entire implementation timeline. As shown in **Table 8**, total capital costs are projected to be approximately $264,000,000 in current (2009) costs, and approximately $391,000,000 allowing for a 3% cost escalation over the assumed TMDL implementation period.

To further illustrate TMDL costs, **Figure 8** and **Figure 9** present the total annual costs added together over the same period as well as cumulative costs over the TMDL implementation period with and without an allowance for escalation, respectively.

These estimated total capital costs for the Alternative Strategy are slightly lower than those estimated for the Conventional Strategy. With zero cost escalation, the total capital cost for Alternative Strategy is estimated to be $20,000,000 (7%) less than the Conventional Strategy. With a 3% cost escalation, the total capital cost for the Alternative Strategy is estimated to be $78,000,000 (17%) less than the Conventional Strategy. While in terms of percentages these costs savings are not dramatic, there are other reasons that the Alternative Strategy could be preferred even at equivalent (or higher) costs:

1. The costs estimates for segments/tributaries addressed with the Outfall-based approach made assumptions that could result in an underestimation of the total number of Priority Outfalls that may ultimately need to be addressed to meet WLAs. In contrast, there is more certainty that Downstream Solutions would result in the attainment of in-stream TMDL targets thus reducing the likelihood that additional (follow-up) solutions and costs would be necessary.
2. It should be recognized that the Downstream-based approaches treat 100% of the flow that affects the downstream recreational areas, as opposed to a fraction of the flow treated with Outfall-based approaches. As such, the Downstream-based approach could be considered more “reliable” and more “protective” than the Outfall-based approach.

Table 8. Alternative Strategy – Estimated Total Costs (Capital and O&M, 2009 Dollars) for Treatment Facilities for Implementation of the Dry Weather LA River Bacteria TMDL assuming zero and 3% cost escalation

	Zero Escalation	**Assuming 3% Escalation**
Diversion Facilities and Outlier Outfall Investigations (Capital Cost)	$93,000,000	$139,000,000
Downstream Facilities (Capital Cost)	$141,000,000	$208,000,000
Conveyance Facilities (Capital Cost)	$9,000,000	$14,000,000
Treatment Capacity Cost (Capital Cost)	$20,000,000	$30,000,000
Total Capital Costs	$264,000,000	$391,000,000
Operation & Maintenance [a]	$326,000,000	$633,000,000
Total TMDL Cost [a,b]	**$590,000,000**	**$1,024,000,000**

a – The estimated total O&M cost is for the TMDL implementation period only. Efforts for O&M costs will likely continue indefinitely, with estimated annual costs exceeding $22,800,000 per year without escalation and 54,400,000 per year with escalation after the TMDL implementation period.

b – This total cost does not include costs for monitoring efforts or special studies, as described in Section 8.

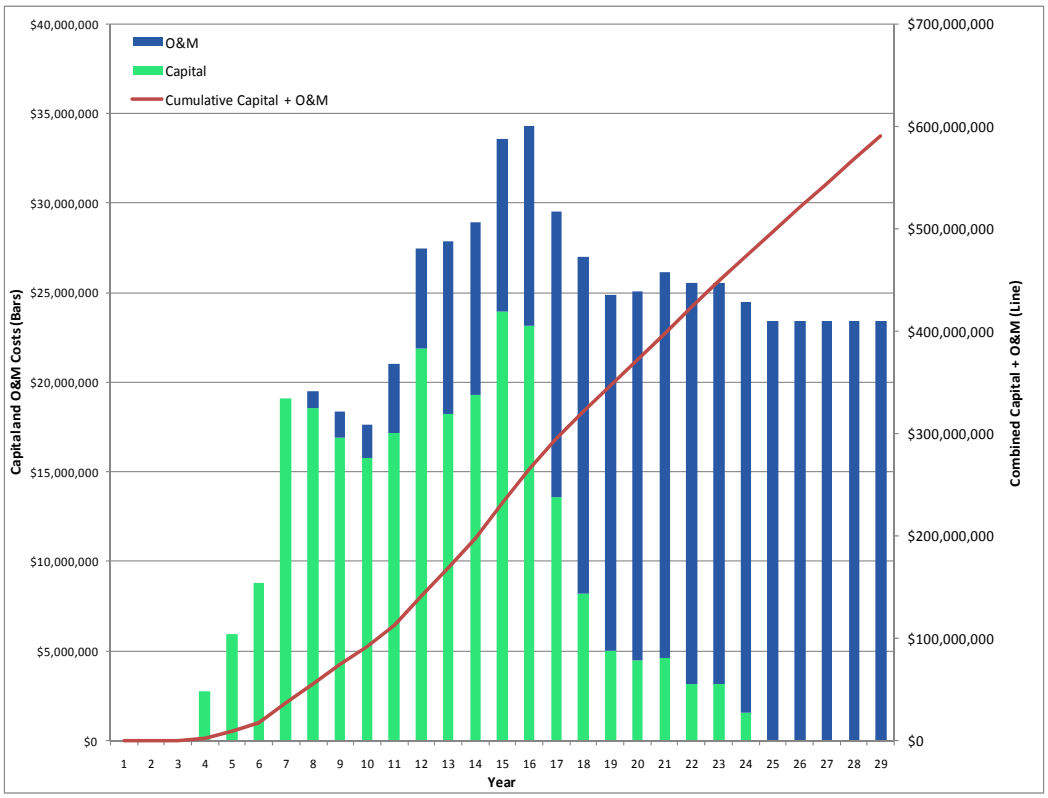

Figure 8. Alternative Strategy Approach – Estimated Total Annual Capital and Cumulative Costs for Initial, and Follow-up Projects and Operational and Maintenance Costs Without Annual Escalation Factor

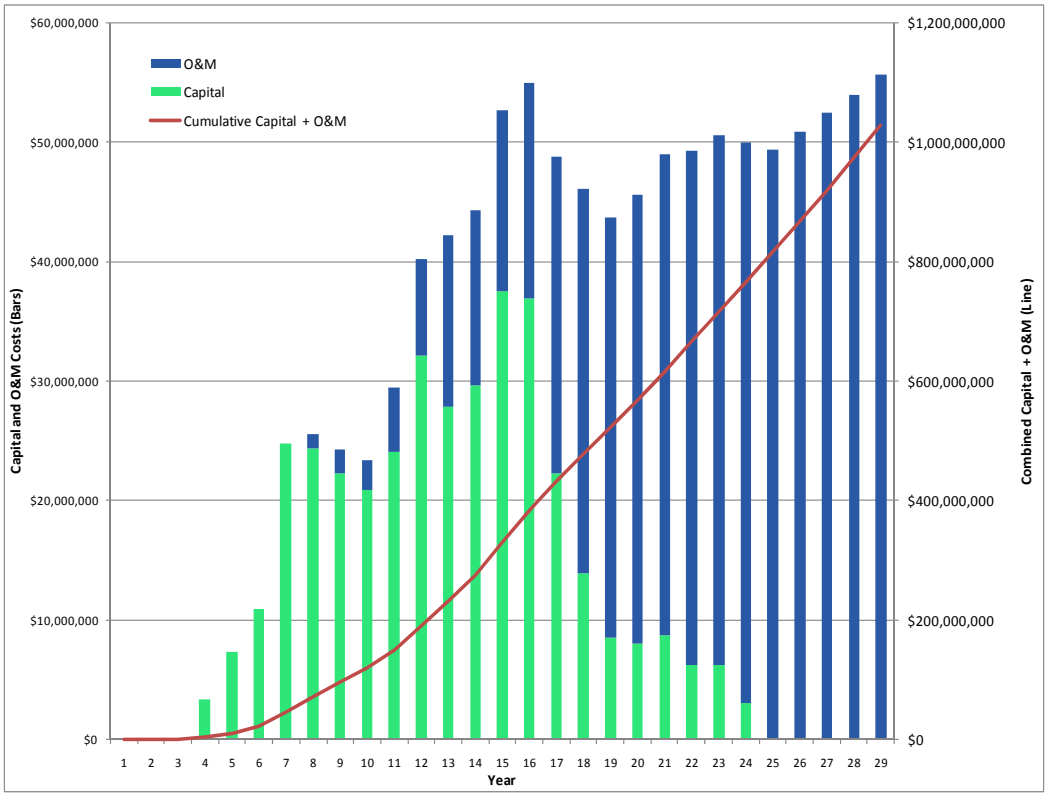

Figure 9. Alternative Strategy Approach – Estimated Annual Capital and Cumulative Costs for Initial, and Follow-up Projects and Operational and Maintenance Costs With Annual Escalation Factor

7.7.6.2 Timeline for Alternative Strategy

The general approach to developing a timeline for the Alternative Strategy is similar to that described under **Section 7.7.5.2**. The lengths of time for performing a Downstream-based LRS approach within an individual LA River segment/tributary were estimated as follows:

- **Plan –** 3 years, identical to the Outfall-based LRS approach
- **Assess –** 2 years, identical to the Outfall-based LRS approach
- **Execute –** the average length of time assumed to construct each Downstream Solution was assumed to be five years (compared to estimate of four years for a structural solution at an individual outfall). For the largest projects the timeline could potentially be even longer. Note that for all segments and tributaries that would be candidates for Downstream Solutions the total number of projects would be much fewer; however, longer time periods are assumed for individual projects as they would tend to be larger and more complex in terms of technical, permitting, environmental and regulatory issues.

The timeline based on the above assumptions is shown in **Figure 10**. These assumptions result in a timeline to complete the first iteration on all mainstem LA River segments and tributaries of approximately 20 years and a total timeline of 29 years to complete a second iteration on the final segment addressed (Segment D). Note if it were possible to develop a downstream project above the Glendale Narrows in the upper portion of segment D, there is the potential to shorten the schedule by another 3 to 5 years.

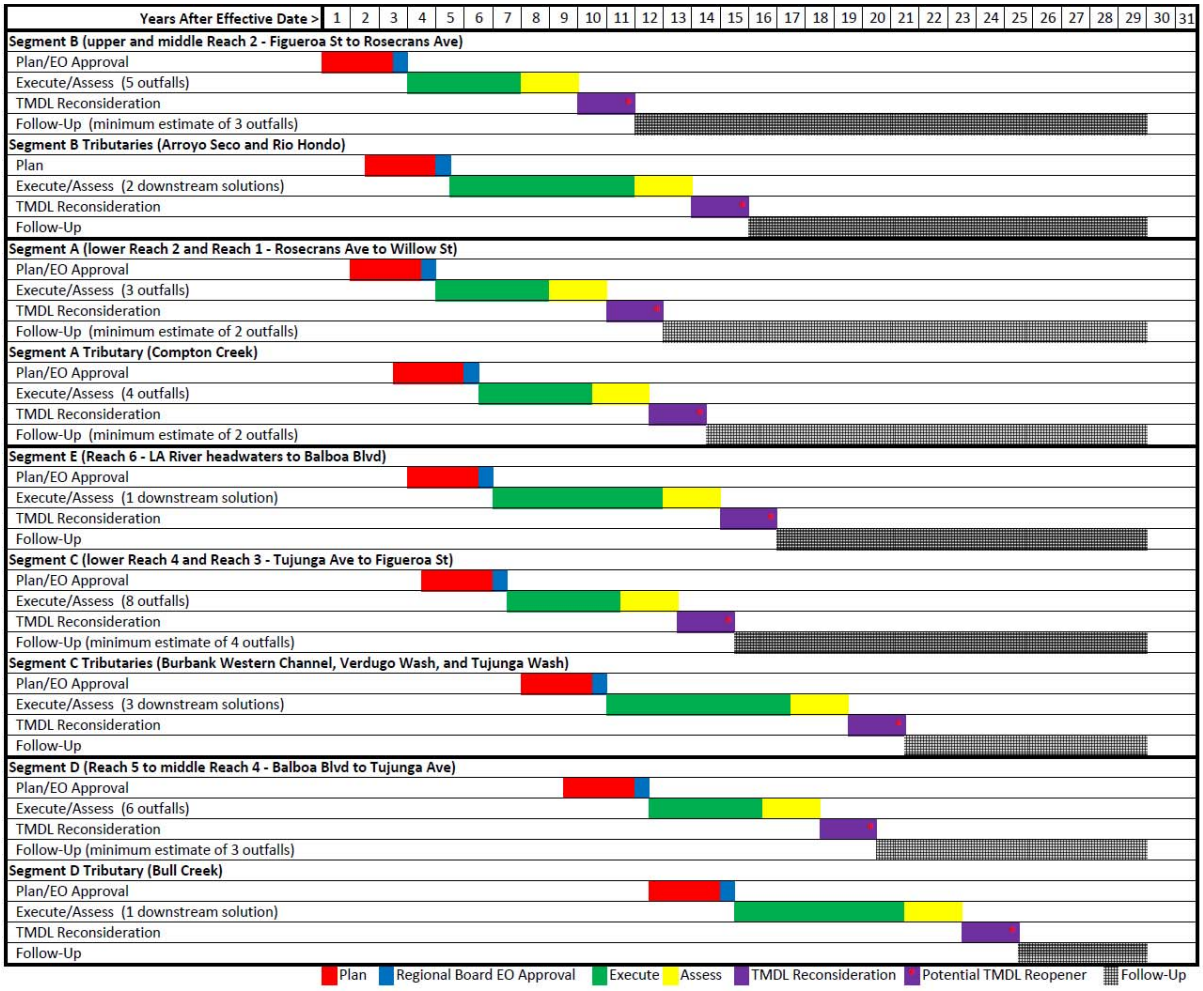

Figure 10. Estimated Timeline for the LA River Bacteria TMDL Alternative Watershed-wide Strategy (Outfall- and Downstream-based Load Reduction Strategies)

7.8 Comparison of the LA River Bacteria TMDL Effort to other TMDLs

The LA River is a large, complex watershed and thus it is important to compare of the effort proposed for this TMDL to previously-developed TMDLs. In particular, an important consideration with respect to the ability of agencies to undertake the anticipated activities within the allocated time frame is the capacity of the agencies to expend both agency staff resources and actual dollars to implement this bacteria TMDL relative to all of the other water quality compliance activities and other water investments at the local agency level.

As discussed in **Section 7.7.5.1** and **7.7.6.1**, the estimated overall annual costs for TMDL dry weather implementation using structural approaches (Conventional Strategy and Alternative Strategy) include capital cost investments of over $16,000,000/yr during maximum implementation periods and averaging just under $7,000,000/yr over the entire period. If escalation is taken into account, the long term average annual investment would be approximately $11,000,000/yr with the maximum period up to $25,000,000/yr. In addition, the total annual cost will increase steadily over time as more projects come on-line and operation and maintenance costs increase. By the mid-point in the proposed schedule, total annual costs for the combination of capital and operation and maintenance costs would range from $18-24,000,000/yr and continue close to $20,000,000/yr without considering escalation, and over $40,000,000/yr by the end of the period when escalation is included. If the schedule were shortened further, the cost/yr would increase proportionately.

To put these estimates into perspective, the proposed costs are shown as additive to the estimated costs of compliance of all other active TMDL implementation activities in **Table 9**. The total capital cost of compliance with all TMDLs in the Los Angeles River, Ballona Creek, Dominguez Channel and Santa Monica Bay Watersheds is now estimated to be in the range of $3.7B in capital costs and ultimately close to $90M/yr in annual operation and maintenance costs, in current dollars only, not accounting for cost escalation. This is in addition to current estimated costs of approximately $100 M/yr for annual implementation of other stormwater program NPDES compliance activities reported in annual reporting by the MS4 cities within these same four watersheds (and not counting the San Gabriel River watershed). There are major challenges facing all cities and Los Angeles County to fully implement all these requirements in the coming years, particularly considering the costs of all other (non-stormwater) municipal services and the recent economic downturn which has decreased tax revenues.

Table 9. Estimated Costs for Los Angeles area TMDL Compliance for LA River Dry Weather Bacteria TMDL

Watershed	TMDL	Year	Capital Cost $M	Annual O&M $M/yr	Comments
Santa Monica Bay	Bacteria (wet)	2002	379	3.7	RWQCB Staff estimate for *interim* strategy with stormwater diversion at 12 locations; long-term integrated resource strategy is estimated to cost more. (see RWQCB Staff report of 11-7-2002 for wet weather and see RWQCB Staff report of 1-14-2002 for dry weather).
	Bacteria (dry)	2002	46	1.5	
LA River	Trash	2004	554		Based on Draft RWQCB Report estimate: {estimated cost of $14/household} x {12 years} x {3.3 million households}. (see RWQCB Staff reports of 1/6/2004).
	Metals	2005	1,039-1,426	135	RWQCB estimate based on "phased implementation approach", implementation of IRP goals (not included in cost estimate), street sweeping and incorporation of structural BMPs. (see RWQCB Staff report of 6-2-2005.)
	Bacteria (dry)	2010	206	8.9	Based on cost estimate developed in Section 7.7.4 of this Technical Report.
	Bacteria (wet)	TBD	TBD	TBD	
Ballona Creek	Metals	2009	Included in bacteria estimate	$2 incremental above bacteria	Costs based on TMDL Implementation Plan scheduled to be submitted to RWQCB in April 2010. Capital costs based on same BMPs bacteria TMDL. O&M costs based on bacteria TMDL costs plus additional non-structural BMP costs. O&M costs shown are suggested for the Ballona Creek
	Toxic pollutants (Estuary)	2005	245-335	37	Toxic TMDLs, consisting of a combination of implementation of IRP goals (not included in estimate), street sweeping and incorporation of structural BMPs. Costs may be shared with bacteria and metals TMDL costs. (see RWQCB Staff report of 7-7-2005 (BC-toxics).
	Bacteria (dry)	2006	38	5.7	Based on Table 7-9 in RWQCB TMDL Staff Report, the sum of dry weather diversions and non-structural source controls. For comparison, using a coarse wet/dry cost split (96%/4%) of the Implementation Plan submitted to the RWQCB in November 2009 leads to an estimate of $50M for dry weather capital costs.
	Bacteria (wet)	2009	1,200	34	Cost based on Bacteria TMDL Implementation Plan submitted to RWQCB in November 2009.
Marina del Rey Harbor	Toxic Pollutants	2005	5.5-7.6	0.8	Cost for structural BMPs that would result in compliance of 70% of the urbanized portion of the watershed.
Marina del Rey Harbor (Mother's Beach/ Back Basins)	Bacteria	2003	1) 36.6 2) 3.1 3) unknown	1) 0.07 2) 0.03 3) unknown	For compliance with dry and wet weather includes (1) diversion/ treatment strategy, (2) improved circulation and (3) structural and non-structural BMPs.

7.9 Dry Weather TMDL Implementation Schedule

This section presents the TMDL implementation schedule including a regulatory timeline for meeting the dry weather TMDL allocations throughout the entire Watershed. This TMDL schedule was based on a review and integration of the timelines for the Watershed-wide Strategies (**Section 7.7.5.2** and **Section 7.7.6.2**).

While any EO-approved LRS or Traditional approach (or any other legal and viable strategy) can be used during implementation, the Conventional Strategy is used as the basis of the dry weather TMDL Implementation Schedule. The Conventional Watershed-wide Strategy was used as the schedule basis because this strategy is based on an approach that likely does not require beneficial use changes to be feasible for MS4s [in contrast to the Alternative Strategy]. In addition, the timeline for the Conventional Strategy is considered sufficiently long to allow MS4 Permittees to use Traditional (non-LRS), Outfall-based LRS, and/or Downstream-based LRS approaches within the specified schedule.

It is important to note that the Downstream-based LRS approach has not been fully vetted with the Regional Board, and thus this approach may in fact not be approvable by the Regional Board EO. Thus, for MS4 Permittees who desire to use a Downstream-based LRS approach, they are encouraged to consult the Regional Board staff and EO prior to directing significant resources toward submitting a Load Reduction Strategy for EO approval.

The overall dry weather Implementation Schedule for the LA River Bacteria TMDL is presented in **Figure 11** and **Table 10.**

For MS4 Permittees that choose the follow an LRS approach, the schedule depicts the BMP iterative process as follow-up actions on each LA River segment and tributary as described in **Section 7.7** (and detailed in **Appendix 1**). These follow-up actions, if needed, would continue in parallel with work on subsequently-addressed LA River segments and/or tributaries[22] (i.e., follow-up actions and initial actions are implemented concurrently). Given the highly variable nature of bacteria discharges, and the sophisticated approaches to reasonable assurance quantification described herein, the follow-up iterations are appropriate and in accordance with recent Phase I MS4 Permits in southern California (e.g., Orange County, San Bernardino County, and Riverside County). For MS4 Permittees that choose the Traditional (non-LRS), follow-up actions/iterations are not explicitly accounted for in the schedule and thus the date for final WLA compliance is sooner.

The dry weather schedule for the LA River Watershed Bacteria TMDL leads to completion of the first LRS iteration on all mainstem LA River segments and tributaries within 25 years, and a total timeline of 31 years to complete a second iteration on the final segment addressed (Segment D). Significantly improved water quality is expected at Long Beach beaches well before the complete implementation of the TMDL. Execution of implementation actions under the first LRS iteration for Segments A and B, which were identified as the highest priority because of the

[22] To minimize the effect of follow-up actions on the overall schedule, the schedule does not account for more than one iteration in Segment D and its tributaries, which were prioritized for actions later in the schedule.

potential influence of the LA River on the beaches located in Long Beach, would be completed within eight years of the effective date of the TMDL. Execution of implementation actions under the first LRS iteration for the corresponding tributaries would be completed within the following two years (10 years after the effective date of the TMDL).

On April 1, 2010 the Regional Board adopted a resolution setting basin planning priorities for the 2008-2010 Triennial Review period. The outcome of the following two priorities could have a significant impact on the implementation of the Los Angeles River Bacteria TMDL:

1) Determine how bacteria water quality objectives should be applied in compliance determination based on more recent monitoring results.
2) Reconsider the application of REC-1 and REC-2 beneficial uses in specific instances, where appropriate.

Because of the significance of the potential outcomes of these two Triennial Review priorities, stakeholders are encouraged to form a LA River Water Quality Standards Work Group (LARWQSWG). If stakeholders form a LARWQSWG, then the Regional Board shall coordinate with stakeholders and participate in the process. The LARWQSWG will be a stakeholder process that is tasked with [1] identifying approaches to implementing the Triennial Review priorities, [2] developing science based information to support evaluating changes to the Basin Plan, and, if appropriate, [3] supporting Regional Board staff to develop Basin Plan amendments for the Regional Board's consideration. The Regional Board shall review the information generated by the LARWQSWG, and as appropriate consider Basin Plan amendments based on the LARWQSWG findings within five years of the effective date of the TMDL.

The TMDL implementation schedule includes enforceable milestones to ensure that progress towards achieving the WLAs is occurring. Any revisions to these WLAs are to be based on the collection of additional information during the iterative processes described in **Section 7.7** including data (or other relevant information) collected during the TMDL Monitoring Plan and Special Studies as described in Section 8. Furthermore, if the assumptions contained herein with regards to required action levels for TMDL implementation (i.e., number of required structural controls [see **Table 5**]) are demonstrated to be inaccurate, leading to significantly low estimates of the required levels of action, then the TMDL schedule could be revised during a TMDL reopener.

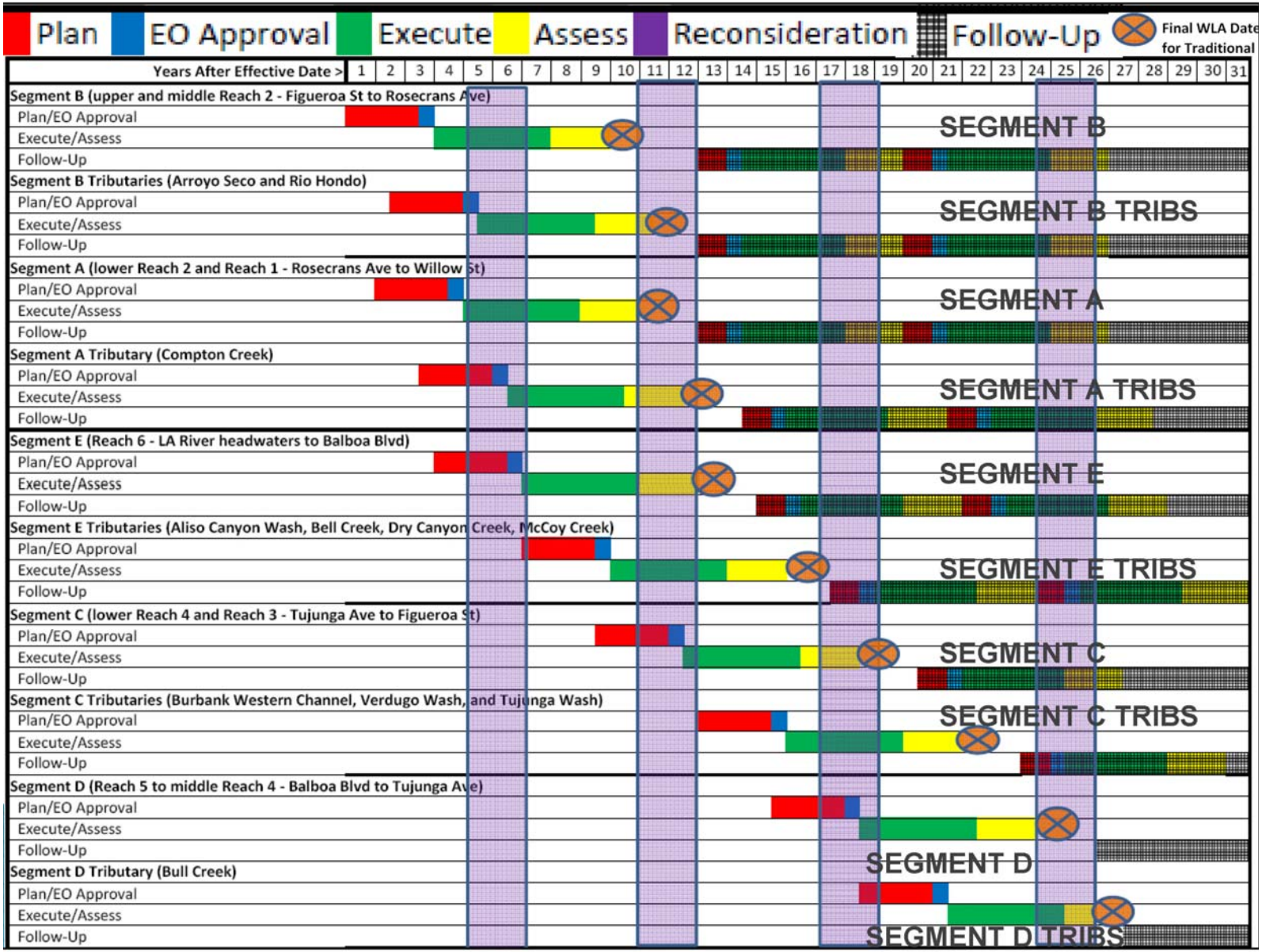

Figure 11. Schedule for Dry Weather Implementation of the LA River Bacteria TMDL

Table 10. Dry Weather Implementation Schedule for Los Angeles River Bacteria TMDL

Implementation Action	Date
Monitoring, Special Studies, and Reopeners	
Responsible agencies shall submit compliance monitoring plan to the Regional Board Executive Officer (EO) for approval.	1.5 years after the effective date of the TMDL
Responsible agencies shall begin monitoring as outlined in the approved monitoring plan.	Within 6 months of approval of the monitoring plan.
Responsible agencies shall submit work plans for optional special studies.	All special studies are optional; as such work plans may be submitted as necessary.
Responsible agencies shall submit annual reports summarizing progress on implementation actions as part of the annual MS4 reporting requirements.	Annually as part of the MS4 annual reports beginning one year after the effective date of the TMDL.
If requested by stakeholders within 6 months of the effective date of the TMDL, Regional Board staff shall coordinate with stakeholders and participate in an LA River Water Quality Standards Work Group to implement the provisions of the 2010 Triennial Review priorities related to recreational beneficial uses and bacteria water quality objectives.	Within 1 year of the effective date of the TMDL
Regional Board shall consider Basin Plan amendments to incorporate the findings of the LA River Water Quality Standards Work Group if information developed by the Work Group supports a change to the Basin Plan.	Within 5 years of the effective date of the TMDL.
Responsible agencies shall submit results of special studies or other pertinent information to support re-evaluation of this TMDL.	Within 5, 11, 17, and 24 years after the effective date of the TMDL
Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.	Within 6, 12, 18, and 25 years after the effective date of the TMDL
General and Individual Industrial Stormwater Permits	
Compliance schedules may be established in individual or general NPDES permits, allowing the length of a permit cycle (typically five years) to achieve compliance. A discharger that can not comply immediately with effluent limitations specified to implement WLAs may be required to apply for an individual permit and/or demonstrate the need for a compliance schedule. If a Permittee demonstrates that advanced treatment (necessitating long design and construction timeframes) will be required to meet final WLAs, the Regional Board will consider extending the implementation schedule to allow additional time from the effective date of the TMDL to achieve compliance with the final WLAs.	Within 5 years after first permit reissuance after the effective date of the TMDL
Industrial Wastewater NPDES Dischargers	
Compliance schedules may be established in individual NPDES permits, allowing up to 5 years within a permit cycle to achieve compliance. Compliance schedules may not be established in general NPDES permits. A discharger that can not comply immediately with effluent limitations specified to implement WLAs will be required to apply for an individual permit in order to demonstrate the need for a compliance schedule. If a Permittee demonstrates that advanced treatment (necessitating long design and construction timeframes) will be required to meet final WLAs, the Regional Board will consider extending the implementation schedule to allow additional time from the effective date of the TMDL to achieve compliance with the final WLAs.	Within 5 years after first permit reissuance after the effective date of the TMDL

Implementation Action	Date
Other Non-MS4 NPDES Dischargers	
Compliance schedules may be established in individual or general NPDES permits, allowing the length of the permit cycle (typically five years) to achieve compliance. A discharger that can not comply immediately with effluent limitations specified to implement WLAs may be required to apply for an individual permit and/or demonstrate the need for a compliance schedule. If a Permittee demonstrates that advanced treatment (necessitating long design and construction timeframes) will be required to meet final WLAs, the Regional Board will consider extending the implementation schedule to allow additional time from the effective date of the TMDL to achieve compliance with the final WLAs.	Within 5 years after first permit reissuance after the effective date of the TMDL

MS4 and Caltrans NPDES Permits	
Implementation Action	**Date**
SEGMENT B (upper and middle Reach 2 – Figueroa Street to Rosecrans Avenue)	
Actions conducted in first iteration – Segment B	
Responsible agencies shall submit a Load Reduction Strategy (LRS) or a Traditional Implementation Plan	30 months after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS.	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	10 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary.	3 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS.	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	31 years after effective date of the TMDL

IMPLEMENTATION ACTION	DATE
SEGMENT B TRIBUTARIES (Rio Hondo and Arroyo Seco)	
Actions conducted in first iteration – Segment B Tributaries (Rio Hondo and Arroyo Seco)	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	4 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible jurisdictions shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	11.5 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary.	2 years after submitting monitoring information in previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS.	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	31 years after effective date of the TMDL
SEGMENT A (lower Reach 2 and Reach 1 – Rosecrans Avenue to Willow Street)	
Actions conducted in first iteration – Segment A	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	4.5 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible jurisdictions shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	12 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL

IMPLEMENTATION ACTION	DATE
SEGMENT A TRIBUTARY (Compton Creek)	
Actions conducted in first iteration – Segment A Tributary	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	6 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	13.5 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL
SEGMENT E (Reach 6 – LA River headwaters [confluence with Bell Creek and Calabasas Creek] to Balboa Boulevard)	
Actions conducted in first iteration – Segment E	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	5.5 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	13 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL

IMPLEMENTATION ACTION	DATE
SEGMENT E TRIBUTARIES (Dry Canyon Creek, McCoy Creek, Bell Creek, and Aliso Canyon Wash)	
Actions conducted in first iteration – Segment E Tributaries	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	9.5 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	17 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL

SEGMENT C (lower Reach 4 and Reach 3 – Tujunga Avenue to Figueroa Street)	
Actions conducted in first iteration – Segment C	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	11 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	18.5 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary.	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan.	31 years after effective date of the TMDL

IMPLEMENTATION ACTION	DATE
SEGMENT C TRIBUTARIES (Tujunga Wash, Burbank Western Channel, and Verdugo Wash)	
Actions conducted in first iteration – Segment C Tributaries	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	15.5 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	23 years after effective date of the TMDL
Actions conducted in remaining iterations for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	2 years after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL

SEGMENT D (Reach 5 and upper Reach 4 – Balboa Boulevard to Tujunga Avenue)	
Actions conducted in first iteration – Segment D	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	17 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	24.5 years after effective date of the TMDL
Actions conducted in remaining iteration for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	2 years after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	3 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	1 year after completion of new LRS
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL

IMPLEMENTATION ACTION	DATE
SEGMENT D TRIBUTARY (Bull Creek)	
Actions conducted in first iteration – Segment D Tributary	
Responsible agencies shall submit a LRS or a Traditional Implementation Plan	20 years after effective date of the TMDL
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	4 years after EO approval of LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	7 years after EO approval of LRS or submittal of Traditional Implementation Plan
The MS4 Permittees who have not chosen to implement the TMDL through an approved LRS shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	26.5 years after effective date of the TMDL
Actions conducted in remaining iteration for MS4 Permittees following LRS approach	
Responsible agencies shall submit a new LRS, if necessary	Within 6 months after submitting monitoring information from previous iteration.
Regional Board EO review and approval of LRS	6 months after submittal of a new LRS
Responsible agencies shall complete implementation of LRS	3 years after EO approval of new LRS
Responsible agencies shall submit LRS monitoring information and evaluate WLA attainment	6 months after completion of new LRS
ALL LA RIVER SEGMENTS AND TRIBUTARIES ADDRESSED UNDER THIS TMDL	
The MS4 Permittees shall achieve WLAs based on the compliance procedure outlined in the Implementation Plan	31 years after effective date of the TMDL
TMDL targets will be achieved at the base of the segments and tributaries (compliance monitoring points) designated in the TMDL	31 years after effective date of the TMDL