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FINAL
Implementation Plan for the Cities of Burbank and Glendale for the Los Angeles River and Tributaries Total Maximum Daily Load for Metals

Prepared for:

CITIES OF BURBANK AND GLENDALE

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1.0 Introduction

The Los Angeles River and Tributaries Total Maximum Daily Load (TMDL) for Metals became effective on October 29, 2008. The TMDL Basin Plan Amendment (BPA) divides the Los Angeles River (LA River) watershed into six subwatersheds and places municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) Permittees into jurisdictional groups within the subwatersheds to which they discharge. The BPA requires each jurisdictional group to provide a draft written report to the Los Angeles Regional Water Quality Control Board (Regional Board) by January 11, 2010 outlining how the subwatersheds within the jurisdictional group will achieve compliance with the waste load allocations (WLAs) with a final report due to the Regional Board by July 11, 2010. Per the BPA, the report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring program.

The BPA also allows for the jurisdictional groups to be reorganized or subdivided upon approval by the Regional Board Executive Officer (EO). In a letter dated August 7, 2009, the cities of Burbank and Glendale (Cities) formally notified the Regional Board EO of their intent to submit the required written report (called an Implementation Plan) independent of a TMDL specified jurisdictional group resulting in the Cities forming their own two entity jurisdictional group. The Regional Board EO approved the request in a letter dated September 1, 2009. The decision by the Cities was made in light of Los Angeles County's formal notification letter to the Cities, dated January 5, 2009 and the City of Los Angeles's notification letter to the Regional Board, dated March 17, 2009, to each develop independent reports to meet the WLAs. The Cities' decision to develop a separate Implementation Plan is limited at this time to the LA River Metals TMDL. The Cities will continue to support the most cost-effective watershed-based implementations methods/actions on all TMDLs, whenever an agreement can be reached among stakeholders in the Watershed.

The Cities submitted a Draft Implementation Plan to the Regional Board on January 11, 2010. In a letter dated June 14, 2010 from the Regional Board Executive Officer to the Cities, the submittal deadline for the final version of the Implementation Plan was moved from July 11, 2010 to October 11, 2010. The following Final Implementation Plan outlines the process and implementation actions by which the cities of Burbank and Glendale will jointly achieve the dry weather WLAs for copper and lead and the wet weather WLAs for copper, lead, zinc, and cadmium within their jurisdictions. The Final Implementation Plan meets the requirements of the BPA to submit a final written report for the cities of Burbank and Glendale and includes:

- Assessment of Achieving TMDL Implementation Schedule Goals
- Potential Implementation Methods
- Implementation Approach
- Implementation Schedule and Milestones
- Monitoring Approach
- Annual Progress Reports

2.0 Assessment of Achieving TMDL Implementation Schedule Goals

For MS4 permittees, the BPA sets forth goals related to meeting WLAs based on the six subwatershed jurisdictional groups. As the Cities have formed their own jurisdictional group the goals apply jointly to the Cities per the following schedule outlined in the BPA:

January 11, 2012:	50% of the Cities' total drainage area served by the storm drain system is effectively meeting the dry weather WLAs.
	25% of the Cities' total drainage area served by the storm drain system is effectively meeting the wet weather WLAs.
January 11, 2020:	75% of the Cities' total drainage area served by the storm drain system is effectively meeting the dry weather WLAs.
January 11, 2024:	100% of the Cities' total drainage area served by the storm drain system is effectively meeting the dry weather WLAs.
	50% of the Cities' total drainage area served by the storm drain system is effectively meeting the wet weather WLAs.
January 11, 2028:	100% of the Cities' total drainage area served by the storm drain system is effectively meeting the dry weather and wet weather WLAs.

The Cities' assessed data collected through the TMDL Coordinated Monitoring Program (CMP) to evaluate their progress in meeting the land area-based implementation goals. The CMP sampling sites selected for the dry weather assessment are the first downstream effectiveness sampling sites in waterbodies to which the Cities discharge, consistent with the BPA (pg 16) and TMDL Technical Staff Report (TSR) (pg 79).

BPA (pg 16):

> *The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting dry-weather waste load allocations if the instream pollutant concentration or load at the first downstream monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation.… The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting wet-weather waste load allocations if the loading at the downstream monitoring location is equal to or less then the wet-weather waste load allocation.*

TMDL TSR (pg 79)

> *The storm water NPDES permittees will be found to be effectively meeting the dry-weather waste load allocations if the in-stream pollutant concentration or load at the first downstream effectiveness monitoring location is equal to or less than the corresponding concentration – or load-based waste load allocation.*

The storm water NPDES permittees will be found to be effectively meeting the wet-weather waste load allocations if the loading at the downstream monitoring location is equal to or less than the daily storm volume multiplied by the wet-weather numeric targets as defined in Table 6-12. For practical purposes, this is when the EMC is less than or equal to the numeric target.

Essentially, the BPA and TMDL TSR indicate that if concentrations measured in a LA River reach or tributary meet the corresponding numeric targets then permittees are effectively meeting the WLAs. Based on this, the assessment approach is as follows:

1. Determine the percent of the Cities upstream of the sub-drainage areas where TMDL targets are assessed at CMP sampling sites (Table 7-13.1 of the TMDL BPA contains the mainstem and tributary specific targets). 100% of the Cities' land area is accounted for in this approach, though not necessarily 100% of the sub-drainage area (i.e., other cities, LA County, and Caltrans discharge to each of the sub-drainage areas assessed at a particular CMP monitoring site).
2. On each CMP sample date, and for each sub-drainage area represented by the CMP sampling site, determine if the applicable TMDL target, and therefore WLA, has been met.
3. If the sample meets the corresponding numeric target, then 100% of the sub-drainage area represented by the CMP sampling site is effectively meeting the WLA, and therefore, the percent of the Cities in that sub-drainage area is meeting the WLA.
4. If the sample does not meet the corresponding numeric target, then 100% of the sub-drainage area represented by the CMP sampling site is not meeting the WLA, and therefore, the percent of the Cities in that sub-drainage area is not meeting the WLA.
5. Sum the percent of the Cities meeting the WLA for each CMP sample date and determine the percent of the Cities that are meeting the BPA goals.

Table 1 presents the CMP dry weather effectiveness sampling sites and the percent of the Cities upstream of the sites. Table 2 presents the CMP wet weather sampling effectiveness sampling site and the percent of the Cities upstream of the site.

Table 1. Percentage of the Cities of Burbank and Glendale Upstream of LA River Metals TMDL Coordinated Monitoring Program (CMP) Dry Weather Sampling Sites

Waterbody and Associated CMP Sampling Site	LA River Reach 3 Above LAGWRP at Zoo Drive	Burbank Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	Total
Fraction of Cities Upstream of CMP Sampling Site	23.5%	26.1%	50.5%	100%

Table 2. Percentage of the Cities of Burbank and Glendale Upstream of LA River Metals TMDL Coordinated Monitoring Program (CMP) Wet Weather Sampling Site at Figueroa Street

Waterbody and Associated CMP Sampling Site	LA River Reach 3 Below LAGWRP at Figueroa Street
Fraction of Cities Upstream of CMP Sampling Site	100%

The CMP collected nine monthly samples between the initiation of the program in October 2008 through June 2009, which represent the CMP's first year reporting period. These data provide seven samples to assess progress during dry weather and two samples to assess progress during wet weather.

Table 3 and Table 4 present an evaluation of dry weather total and dissolved copper data, respectively, collected by the CMP from October 2008 through June 2009 using the assessment methodology described herein. Table 5 and Table 6 present an evaluation of dry weather total and dissolved lead data, respectively, collected by the CMP from October 2008 through June 2009 using the assessment methodology described herein. Based on a review of the available CMP dry weather data, the Cities consistently meet the dry weather dissolved and total copper and lead targets and therefore the 2012 goal of 50% of the total drainage area is effectively meeting the dry weather WLAs for copper and lead.

Table 7 presents an evaluation of wet weather total and dissolved copper, lead, and zinc data collected by the CMP during storm events in February and March 2009 using the assessment methodology described herein. Based on a review of the available CMP wet weather data, the Cities:

- Consistently meet the wet weather total and dissolved lead targets and therefore the 2012 goal of 25% of the total drainage area is effectively meeting the wet weather WLAs for lead.
- Consistently meet the wet weather dissolved copper target, but not the total target. Therefore the 2012 goal of 25% of the total drainage area is effectively meeting the wet weather dissolved copper WLA but not the total copper WLA.
- Consistently meet the wet weather dissolved zinc target, but not the total target. Therefore the 2012 goal of 25% of the total drainage area is effectively meeting the wet weather dissolved zinc WLA but not the total zinc WLA.

Table 3. Evaluation of 2012 Metals TMDL Dry Weather Goal for Total Copper Based on Coordinated Monitoring Program Data

Waterbody and Sampling Site	LA River Reach 3 above LAGWRP at Zoo Drive	Burbank Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	% of Cities meeting dry weather WLA
Waterbody-Specific Numeric Targets (Table 3.2 of TMDL)	23	19	26	
TMDL Coordinated Monitoring Program Sample Date	LA River Above LAGWRP at Zoo Drive	Burbank-Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	
10/7/2008	12.10	20.80	10.1	74%
11/12/2008	7.51	13.20	6.94	100%
12/9/2008	7.28	7.11	5.48	100%
1/13/2009	9.21	8.02	8.24	100%
4/14/2009	14.80	6.16	3.35	100%
5/12/2009	15.20	13.40	6.28	100%
6/8/2009	17.80	9.80	8.32	100%

Table 4. Evaluation of 2012 Metals TMDL Dry Weather Goal for Dissolved Copper Based on Coordinated Monitoring Program Data

Waterbody and Sampling Site	LA River Reach 3 above LAGWRP at Zoo Drive	Burbank Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	% of Cities meeting dry weather WLA
Waterbody-Specific Numeric Targets (Table 3.2 of TMDL)	23	19	26	
TMDL Coordinated Monitoring Program Sample Date	LA River Above LAGWRP at Zoo Drive	Burbank-Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	
10/7/2008	9.48	17.7	6.24	100%
11/12/2008	5.21	12.3	4.76	100%
12/9/2008	6.1	7.28	5.34	100%
1/13/2009	8.85	9.41	3.86	100%
4/14/2009	3.02	4.65	<2.5	100%
5/12/2009	7.97	12.1	5.17	100%
6/8/2009	8.3	9.96	4.54	100%

< indicates the metal was not detected in the sample at the corresponding minimum level of quantifiable detection.

Table 5. Evaluation of 2012 Metals TMDL Dry Weather Goal for Total Lead Based on Coordinated Monitoring Program Data

Waterbody and Sampling Site	LA River Reach 3 above LAGWRP at Zoo Drive	Burbank-Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	% of Cities meeting dry weather WLA
Waterbody-Specific Numeric Targets (Table 3.2 of TMDL)	12	9.1	12	
TMDL Coordinated Monitoring Program Sample Date	LA River Above LAGWRP at Zoo Drive	Burbank-Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	
10/7/2008	<2.5	<2.5	<2.5	100%
11/12/2008	<2.5	<2.5	<2.5	100%
12/9/2008	<2.5	<2.5	<2.5	100%
1/13/2009	<2.5	<2.5	<2.5	100%
4/14/2009	19.00	<2.5	<2.5	77%
5/12/2009	3.56	<2.5	<2.5	100%
6/8/2009	4.00	<2.5	<2.5	100%

< indicates the metal was not detected in the sample at the corresponding minimum level of quantifiable detection.

Table 6. Evaluation of 2012 Metals TMDL Dry Weather Goal for Dissolved Lead Based on Coordinated Monitoring Program Data

Waterbody and Sampling Site	LA River Reach 3 above LAGWRP at Zoo Drive	Burbank-Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	% of Cities meeting dry weather WLA
Waterbody-Specific Numeric Targets (Table 3.2 of TMDL)	12	9.1	12	
TMDL Coordinated Monitoring Program Sample Date	LA River Above LAGWRP at Zoo Drive	Burbank-Western Channel Below BWRP at Riverside Drive	LA River Reach 3 Below LAGWRP at Figueroa Street	
10/7/2008	<2.5	<2.5	<2.5	100%
11/12/2008	<2.5	<2.5	<2.5	100%
12/9/2008	<2.5	<2.5	<2.5	100%
1/13/2009	<2.5	<2.5	<2.5	100%
4/14/2009	<2.5	<2.5	<2.5	100%
5/12/2009	<2.5	<2.5	<2.5	100%
6/8/2009	<2.5	<2.5	<2.5	100%

< indicates the metal was not detected in the sample at the corresponding minimum level of quantifiable detection.

Table 7. Evaluation of 2012 Metals TMDL Wet Weather Goal for Copper, Lead, and Zinc Based on Coordinated Monitoring Program Data Collected at Figueroa Street

Total Copper (Target = 17 ug/L)	Concentration (ug/L)	% of Cities meeting wet weather total WLA	**Dissolved Copper** (Target = 11 ug/L)	Concentration (ug/L)	% of Cities meeting wet weather dissolved WLA
2/5/2009	44.9	0%	2/5/2009	5.16	100%
3/4/2009	42.4	0%	3/4/2009	4.86	100%
Total Lead (Target = 62 ug/L)	Concentration (ug/L)	% of Cities meeting wet weather total WLA	**Dissolved Lead** (Target = 50 ug/L)	Concentration (ug/L)	% of Cities meeting wet weather dissolved WLA
2/5/2009	35.5	100%	2/5/2009	<2.5	100%
3/4/2009	40.7	100%	3/4/2009	<2.5	100%
Total Zinc (Target = 159 ug/L)	Concentration (ug/L)	% of Cities meeting wet weather total WLA	**Dissolved Zinc** (Target = 97 ug/L)	Concentration (ug/L)	% of Cities meeting wet weather dissolved WLA
2/5/2009	184	0%	2/5/2009	28.5	100%
3/4/2009	202	0%	3/4/2009	16.4	100%

< indicates the metal was not detected in the sample at the corresponding minimum level of quantifiable detection.

3.0 Potential Implementation Methods

Potential implementation methods to address metals issues within the LA River watershed and tributaries include both regulatory approaches and load reduction measures. Cost effective and appropriate methods to attain the final WLAs may require a combination of both measures. The regulatory approaches include development of site-specific criteria (e.g., recalculation of criteria and water-effect ratios) as well as site-specific translators. Load reduction measures include (1) source control, (2) City ordinances (which effectively result in source control and/or structural BMPs/treatment facilities), and (3) structural BMPs/treatment facilities. Each of these implementation methods are discussed below.

3.1 Regulatory Approaches

The implementation schedule in the TMDL Basin Plan Amendment (TMDL BPA) allows time for special studies that may serve to refine the estimate of loading capacity, waste load and/or load allocations, and other studies that may serve to optimize implementation efforts. Per the BPA, the Regional Board will re-consider the TMDL in 2011 in light of these studies.

3.1.1 Site-Specific Criteria

The USEPA publishes national water quality criteria (WQC) for the protection of aquatic life consisting of a concentration, an averaging period, and a return frequency. The WQC for the protection of aquatic life are calculated from laboratory-derived toxicity data. The USEPA compiles data from acceptable toxicity tests, which have been conducted in laboratory dilution water, from a wide range of species. Criteria are developed from the compiled data using the approach outlined in *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (Criteria Guidelines) (USEPA 1985). The Criteria Guidelines provide methods for calculating both acute and chronic criteria.

National WQC are intended to be protective of all waters of the United States. However, the Code of Federal Regulations (CFR) 40 CFR 131.11(b)(1)(ii) allows States to establish WQC that are "… modified to reflect site-specific conditions." The Water Quality Standards Handbook (USEPA 1994a) states that:

> *Site-specific criteria, as with all water quality criteria, must be based on a sound scientific rationale in order to protect the designated use. Existing guidance and practice are that EPA will approve site-specific criteria developed using appropriate procedures.*

Site-specific criteria are intended to provide the level of protection intended by the national criterion to the aquatic life of a specific site. A site may be defined as state, region, watershed, waterbody, or segment of waterbody (USEPA 1994a). Derivation of site-specific criteria does not change the intended level of protection. As described in the Water Quality Standards Handbook (USEPA 1994a), USEPA has developed a number of procedures that account for site-specific conditions in the determination of WQC. The following two are under consideration by stakeholders in the Watershed:

1. Recalculation Procedure. The Recalculation Procedure is intended to take into account relevant differences between the national dataset and the site. However, Recalculation can consist of any updates or revisions in the data set (not necessarily site specific updates) and therefore be conducted such that it is effectively an update to the national WQC.
2. Water-Effect Ratio Procedure. The Water-Effect Ratio (WER) Procedure is intended to take into account observed differences between the toxicity of metals in laboratory dilution water and in site water.

3.1.1.1 Recalculation Procedure

The Recalculation Procedure provides a method for adjusting the national dataset used to develop criteria based on more recent studies and/or for species that are present in the waterbody. The procedure is outlined in Appendix B of the *Interim Guidance on Determination and Use of Water-Effect Ratios for Metals* (USEPA 1994b) and called the "Interim Guidance" herein. The Recalculation Procedure consists of the following six steps.

A. Corrections are made to the national dataset.
B. Additions are made to the national dataset.
C. The deletion process may be applied if desired.
D. If the new dataset does not satisfy the applicable Minimum Data Requirements (MDRs), additional pertinent data must be generated; if the new data are approved by the USEPA, the Recalculation Procedure must be started again at step B with the addition of the new data.
E. The new criterion maximum concentration (CMC) or criterion continuous concentration (CCC) or both are determined. The CMC and CCC are generally referred to as the acute and chronic criterion, respectively.
F. A report is written.

Note that for steps A and B, as discussed in the Interim Guidance, only corrections and/or additions approved by USEPA can be made to datasets used in the recalculation of criteria. The first four steps (A, B, C, and D) are utilized to develop an appropriate dataset that satisfies the MDRs as outlined in the Criteria Guidance. Steps A and B are required, while step C is optional and can be used if desired for further modification of the dataset. Steps E and F are the process of using the dataset to generate new WQC and a report for review.

3.1.1.2 Water Effect Ratio (WER) Procedure

The 1994 Interim Guidance presents detailed protocols for adjusting the concentration portion of national metals WQC to reflect site-specific receiving water conditions using the "Water-Effect Ratio" (WER) method (USEPA 1994b). A WER is a factor that can be used under the USEPA's system of WQC to customize national aquatic life criteria, which include the CTR aquatic life criteria established by USEPA in 2000 and used in the TMDL, to reflect site-specific water column conditions. The WER is used to derive site-specific criteria that maintain the level of protection of aquatic life intended by the Criteria Guidelines and CTR. If the value of the WER exceeds 1.0, the site water reduces the toxic effects of the pollutant being tested. Conversely, the WER can be less than 1.0, in which case the toxic effects of the pollutant in site water would be greater than that in laboratory water and the site-specific WQC should be less than the WQC. For example, if a WER developed using LA River water is greater than 1.0, the CTR metals

WQC are lower than what is required to be protective for aquatic life in the LA River. Therefore, a site-specific objective (SSO) for the LA River may be set at a higher concentration than the national WQC and still be as protective of aquatic life beneficial uses as the CTR. The site-specific acute and chronic USEPA criteria are calculated by multiplying the USEPA's ambient WQC values by a locally developed WER.

The WER method requires rigorous parallel toxicity tests using USEPA-specified laboratory water and "site water" to determine whether physical and chemical characteristics in the site water affect the bioavailability and, therefore, the toxicity of trace metals to aquatic organisms. The difference in toxicity values is expressed as a WER (toxicity obtained in the site water divided by toxicity in the lab water). A WER is expected to account for (a) the site-specific toxicity of a metal and (b) synergism, antagonism, and additivity with other constituents present in the site water (USEPA 1994b). Toxicity is measured as an effects concentration 50 (EC50), which represents an estimate of a concentration where 50% of the test organisms are adversely affected (i.e., reduced growth or reproduction or mortality).

3.1.2 Metals Translator

The CTR metals criteria are expressed as dissolved concentrations. However, by federal regulations (40 CFR 122.45(c)), NPDES permit limits must be expressed as total recoverable metals. Thus an additional factor, a translator, is required to convert the dissolved criteria into total recoverable limits. Translators are unitless values ranging from zero to one that represent the ratio of dissolved metals concentration to total metals concentration. The most conservative translator is a value of one, implying that all metals are present in the dissolved form. The dissolved CTR criteria are adjusted to a total recoverable basis by dividing a total criterion by the conversion factor presented in the CTR. As such, the lower the translator (i.e., a lower percentage of the metals fraction is dissolved) the higher the corresponding total metals criteria. The following is an example of how the translator affects the conversion of the dissolved criterion to the total copper criterion.

CTR Chronic Copper Criterion at Hardness of 100 mg/L $CaCO_3$	Total Criterion using CTR Default Translator of 0.960	Total Criterion using Site-Specific Translator of 0.740
8.96 ug/L	9.23 ug/L	12.10 ug/L

The 1996 USEPA translator guidance[1] provides two approaches to determine a site-specific metal translator. The first, and most direct approach, is to base the translator on measured ratios of dissolved to total recoverable metals (fD) in the receiving water outside of the mixing zone. The second approach is to determine the translator indirectly as a function of a partition coefficient, which is normally estimated using ambient TSS levels (pH and organic carbon can also be used). When a statistically significant relationship between a translator and a spatial variable (such as TSS) cannot be determined, the translator guidance recommends using the geometric mean of fD as the translator value. The *2005 California State Policy for the Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of*

[1] The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion. EPA 823-B-96-007.

California (State Implementation Policy or SIP) dictates how a translator is derived for a location based on the set of ratios calculated:

> *The translator shall be derived using the median of data for translation of chronic criteria and the 90th percentile of observed data for translation of acute criteria.*

A review of the wet weather copper and zinc data collected by the CMP indicates that the dissolved CTR acute criteria and corresponding dissolved TMDL numeric target were met during both storm events monitored in 2009, while the total TMDL target was not met (Table 7). This suggests that the translator utilized to develop the TMDL targets does not always appropriately represent site-specific conditions. A site-specific translator could be developed based on the dry and wet weather monitoring that will occur in the LA River through the CMP. The monitoring program will use clean sampling techniques, low level detection limits, and field filtration methods that will support the development of a robust translator, if desired. Consideration should be given to reevaluating the translators utilizing the CMP data.

3.2 Source Control Measures

3.2.1 City Ordinances

City ordinances are a powerful tool to effectively implement source control BMPs. The ordinances can provide the Cities the ability to require implementation of certain BMPs from targeted industrial activities, allow for inspection of relevant facilities, and provide the ability to enforce those requirements, including the use of specific financial penalties. The TMDL TSR recognizes the role of city ordinances by noting, for example, that increased inspection of and enforcement on industrial facilities and construction sites may result in significant reductions in discharges of metals to the storm drain system.

3.2.2 Non-Structural BMPs

Table 8 presents removal efficiencies for various types of potential source control BMPs. Certain BMPs, such as street sweeping, catch basin cleaning, and removal of illicit connections/illegal discharges are existing MS4 permit requirements. However, such activities could be enhanced in order to achieve greater pollutant removal efficiencies. For example, street sweepers could be upgraded, certain industries/facilities could be targeted for increased inspection, and catch basin maintenance could be modified or increased. In addition to the MS4 required source control activities, other source control BMPs could be employed, including replacement of copper roofs, replacement of other roofing material, a local ban on copper-containing pesticides, removal of copper from brake pad liners, and replacement of lead from tire weights. Removal of copper from brake pad liners would result from the passage of Senate Bill 346 (Kehoe). SB 346 places a 5%-by-weight limit on the amount of copper used in brakes sold in California by 2021, and reduces that percentage to a minimal 0.5% by 2032.

Table 8. Source Control BMP Removal Efficiencies

Source Control BMP	Total Copper	Total Lead	Total Zinc	Total Cadmium	Applies to…	Notes & Sources
Street Sweeping	Mechanical: 35% Vacuum: 76%	Mechanical: 35% Vacuum: 76%	Mechanical: 47% Vacuum: 85%	Mechanical: 35% Vacuum: 76%	Land use	• NVPDC 1992 • Sweeping frequency not specified • Applied lowest removal efficiency to Cu and Cd • Assumed City fleets use mechanical sweepers
Catch Basin Cleaning	15%	25%	10%	10%	Land use	• Cu Source: Mineart and Singh 1994 • Pb and Zn Source: Pitt and Shawley, 1982 • Applied lowest removal efficiency (10%) to Cd
Illicit Connections & Discharges	Highly dependent on number and types				Urban runoff	• % removed is highly dependent on a wide variety of factors including number, types and correctability of illicit discharges and connections
Copper Roof Replacement	20%	--	--	--	Receiving waters	• Palo Alto Regional Water Quality Control Plant 2000 • To achieve a 20% reduction in receiving waters would require a replacement of all copper roofs. • City of Palo Alto estimates that Cu releases from Cu roofs accounts for 20% of Cu measured in local creeks

Source Control BMP	Total Copper	Total Lead	Total Zinc	Total Cadmium	Applies to…	Notes & Sources
Other Roofing Material Replacement	Pressure Treated Wood: 191 mg/kg	Galvanized metal roofing/: 1.61 mg/kg	Galvanized metal roofing: 16, 500 mg/kg	Galvanized metal roofing: 9,400 mg/kg	Land use	• Clark et al. 2008 • Numbers provided are estimates of laboratory leaching of building materials • Only included highest contributing building material for that particular constituent • From efficiency standpoint, could assume that these amounts would be eliminated for each rooftop replacement
Pesticide Ban	234 kg /yr	--	--	--	Land use	• Based on Sinclair 2005 • Number provided is an estimate of the amount of Cu in applied pesticides • # applies to the entire City of Burbank and City of Glendale • Could assume that this amount could be eliminated with a local pesticide ban or produce replacement
Brake Pad Material Replacement	0.5 mg/km	--	--	--	Land use	• Sinclair 2006 • Concentration of copper released to the road from brake lining material per vehicle
Tire Weight Material Replacement	--	13 g/ vehicle	--	--	Land use	• Root 2000 • Amount deposited on urban streets per vehicle • Could assume replacement or phase out of lead weights would completely remove this land use loading from streets and roadways

3.3 Structural Control Measures

Per the TMDL TSR, structural BMPs are intended to target specific land uses, critical sources, or specific periods of a storm event in order to achieve the TMDL WLAs. Table 9 presents the median of average effluent concentrations of various types of potential structural BMPs/Treatment Facilities (GeoSyntec et al. 2008).

Table 9. Median of Average Influent and Effluent Concentrations of Best Management Practices (GeoSyntec et al. 2008)

Constituents	Sample Location	Detention Pond (n=25)[1]	Wet Pond (n=46)[1]	Wetland Basin (n=19)[1]	Biofilter (n=57)[1]	Media Filter (n=38)[1]	Hydrodynamic Devices (n=32)[1]	Porous Pavement (n=6)[1]
Total Cadmium (µg/L)	Influent	0.71 (0.45-1.28)	0.49 (0.20-0.79)	0.36 (0.11-0.60)	0.54 (0.40-0.67)	0.25 (0.12-0.49)	0.74 (0.37-1.11)	xx
	Effluent	0.47 (0.25-0.87)	0.27 (0.12-0.61)	0.24 (0.11-0.55)	0.30 (0.26-0.35)	0.19 (0.1-0.37)	0.57 (0.25-1.33)	xx
Dissolved Cadmium (µg/L)	Influent	0.24 (0.15-0.33)	0.19 (0.10-0.28)	xx	0.25 (0.21-0.28)	0.16 (0.11-0.21)	0.33 (0.11-0.55)	xx
	Effluent	0.25 (0.17-0.36)	0.11 (0.08-0.15)	xx	0.21 (0.19-0.23)	0.13 (0.10-0.18)	0.31 (0.13-0.71)	xx
Total Copper (µg/L)	Influent	20.14 (8.41-31.79)	8.91 (5.29-12.52)	5.65 (2.67-38.61)	31.93 (25.25-38.61)	14.57 (10.87-18.27)	15.42 (9.20-21.63)	xx
	Effluent	12.10 (5.41-18.80)	6.36 (4.70-8.01)	4.23 (0.62-7.83)	10.66 (7.68-13.68)	10.25 (8.21-12.29)	14.17 (8.33-20.01)	2.78 (0.88-8.78)
Dissolved Copper (µg/L)	Influent	6.66 (0.73-12.59)	7.33 (5.40-9.26)	xx	14.15 (10.14-18.16)	7.75 (4.55-10.96)	13.59 (9.82-17.36)	xx
	Effluent	7.37 (3.28-11.45)	4.37 (3.73-5.73)	xx	8.40 (5.65-11.45)	9.00 (7.28-10.72)	13.92 (4.40-23.44)	xx
Total Lead (µg/L)	Influent	25.01 (12.06-37.95)	14.36 (8.32-20.40)	4.62 (1.43-11.89)	19.53 (10.11-28.95)	11.32 (6.09-16.55)	18.12 (5.70-30.53)	xx
	Effluent	15.77 (4.67-26.87)	5.32 (1.63-9.01)	3.26 (2.31-4.22)	6.70 (2.81-10.59)	3.76 (1.08-6.44)	10.56 (4.27-16.85)	7.88 (1.64-37.96)
Dissolved Lead (µg/L)	Influent	1.25 (0.33-2.17)	3.40 (1.12-5.68)	0.50 (0.33-0.67)	2.25 (0.77-3.74)	1.44 (1.05-1.82)	1.89 (0.83-2.95)	xx
	Effluent	2.06 (0.93-3.19)	2.48 (0.98-5.36)	0.87 (0.85-0.89)	1.96 (1.26-2.67)	1.18 (0.77-1.60)	3.34 (2.22-4.47)	xx
Total Zinc (µg/L)	Influent	111.56 (51.50-171.63)	60.75 (45.23-76.27)	47.07 (24.47-90.51)	176.71 (128.28-225.15)	92.34 (52.29-132.40)	119.08 (73.50-164.67)	xx
	Effluent	60.20 (20.70-99.70)	29.35 (21.13-37.56)	30.71 (12.80-66.69)	39.83 (28.01-51.56)	37.63 (16.80-58.46)	80.17 (52.72-107.61)	16.60 (5.91-46.64)
Dissolved Zinc (µg/L)	Influent	26.11 (5.20-75.10)	47.46 (37.65-57.27)	xx	58.31 (32.46-79.16)	69.27 (37.97-100.58)	35.93 (4.96-66.90)	xx
	Effluent	25.84 (10.75-40.93)	32.86 (17.70-48.01)	xx	25.40 (18.71-32.09)	51.25 (29.04-73.46)	42.46 (10.38-74.55)	xx

1 = Actual number of BMPs reporting a particular constituent may be greater or less than the number reported in this table, which was based on number of studies reported in database based on BMP category.

xx - Lack of sufficient data to report median and confidence interval. Values in parenthesis are the 95% confidence intervals about the median. Differences in median influent and effluent concentrations does not necessarily indicate that there was a statistically significant difference between influent and effluent. See “Analysis of Treatment System Performance, International Stormwater BMP Database (1997-2007) (GeoSyntec and WWE 2007) for more detailed information. Source: International Stormwater BMP Database June 2008 (www.bmpdatabase.org)

4.0 Implementation Approach

The TMDL TSR and the BPA recognize the benefit of optimizing implementation efforts through (1) conducting special studies that may refine the WLAs, (2) targeting specific sources through the implementation of non-structural BMPs, and (3) implementing structural BMPs only if other non-structural strategies are insufficient to meet the WLAs.

Specifically, the TMDL TSR and BPA state:

- *The implementation schedule (see Table 7-13.2) allows time for special studies that may serve to refine the estimate of loading capacity, waste load and/or load allocations, and other special studies that may serve to optimize implementation efforts. The Regional Board will re-consider the TMDL by January 11, 2011 in light of the findings of these studies*[2].
- *Since dry-weather exceedances appear to be episodic, the permittees are encouraged to initially concentrate on source reduction strategies...*[3]
- *Indeed, we believe that BMPs that result in source reductions rather than in-stream storm load reductions should be encouraged*[4].
- *If non-structural BMPs alone adequately implement the waste load allocations then additional controls are not necessary. Alternatively, if the non-structural BMPs selected prove to be inadequate then structural BMPs or additional controls may be imposed*[4].

The TMDL TSR and BPA also recognize the need for implementation to be conducted in a phased, iterative manner. Specifically, the TMDL TSR and BPA state:

- *For the MS4 and Caltrans storm water permittees, the implementation schedule shall consist of a phased approach*[5].
- *A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations*[6].
- *This [cost] analysis considers a potential strategy combining structural and non-structural BMPs through a phased implementation approach and estimates the costs for this strategy*[7].
- *Under a phased implementation approach, the permittees could monitor compliance using flow weighted composite sampling of runoff throughout*

[2] LARWQCB 2007: Key Findings and Regulatory Provisions/Special Studies, pg. 17
[3] LARWQCB 2005: Section 7.2.1 (Non-Structural BMPs), pg. 66
[4] LARWQCB 2005: Section 7.2.3 (Diversion and Treatment), pg. 67
[5] LARWQCB 2005: Section 7.3 (Implementation Schedule), pg. 67
[6] LARWQCB 2007: Key Findings and Regulatory Provisions/MS4 and Caltrans Permits, pg. 14
[7] LARWQCB 2005: Section 7.4 (Cost Analysis), pg. 70

representative storms to determine the effectiveness of this first step of implementing non-structural BMPs. If monitoring showed noncompliance, permittees could adapt their approach by increasing frequency of street sweeping or incorporating other non-structural BMPs. If compliance could still not be achieved through non-structural BMPs, permittees could incorporate structural BMPs[8].

Therefore, the Cities' implementation actions will be conducted through a phased approach (Table 10) based on optimizing implementation efforts by iteratively implementing three tiered elements (Figure 1):

- Regulatory Approaches (Special Studies)
- Source Controls (Point and Non-Point Sources)
- Structural Controls (BMPs/Treatment Facilities)

Phase I will focus on working in partnerships with the other responsible parties in the watershed and the Regional Board on applicable regulatory approaches while evaluating and implementing enhanced source control programs and structural BMPs/treatment facilities, if necessary. Phase I implementation actions and the schedule for implementation are detailed in Section 4.1 and 5.0, respectively. Phase II and Phase III implementation efforts will be dependent upon the results of the prior phases (e.g., improvements in water quality, success of implementation actions, developments in new technologies, etc.). This Implementation Plan will be adaptively managed within each phase and periodically evaluated in order to modify implementation actions as necessary to achieve the WLAs.

Table 10. City of Burbank and City of Glendale LA River Metals TMDL Implementation Plan Phases, Time Period, and Goals

Phase	Implementation Time Period	Goals
Phase I	Present – January 11, 2012	50% of area meets dry weather WLA 25% of area meets wet weather WLA
	January 11, 2012 – January 11, 2020	75% of area meets dry weather waste load allocation
Phase II	January 12, 2020 – January 11, 2024	100% of area meets dry weather waste load allocation 50% of area meets wet weather waste load allocation
Phase III	January 12, 2024 – January 11, 2028	100% of area meets both dry and wet weather WLAs

As shown in Table 10, Phase I actions are intended to meet the first two implementation goals outlined in the BPA. The Implementation Plan has been designed to provide reasonable assurance the Cities can meet the implementation goals and WLAs by implementing the Phase I actions discussed below. However, the Phase I goals represent the minimum to be achieved during the phase. The available information indicates that meeting both dry and wet weather WLAs in 100% of the drainage area may be achieved by the actions taken during Phase I as some of the implementation goals are already being achieved, as discussed in Section 2.0. As a

[8] LARWQCB 2005: Section 7.4.1 (Cost Estimate Based on a Phased Implementation Approach), pg. 71

result, specific Phase II and Phase III actions may not be necessary, rather a continuation of Phase I actions may be all that is necessary to meet the WLAs. Therefore, implementation actions under Phase II and Phase III will be defined, if necessary, depending on the results of earlier phases.

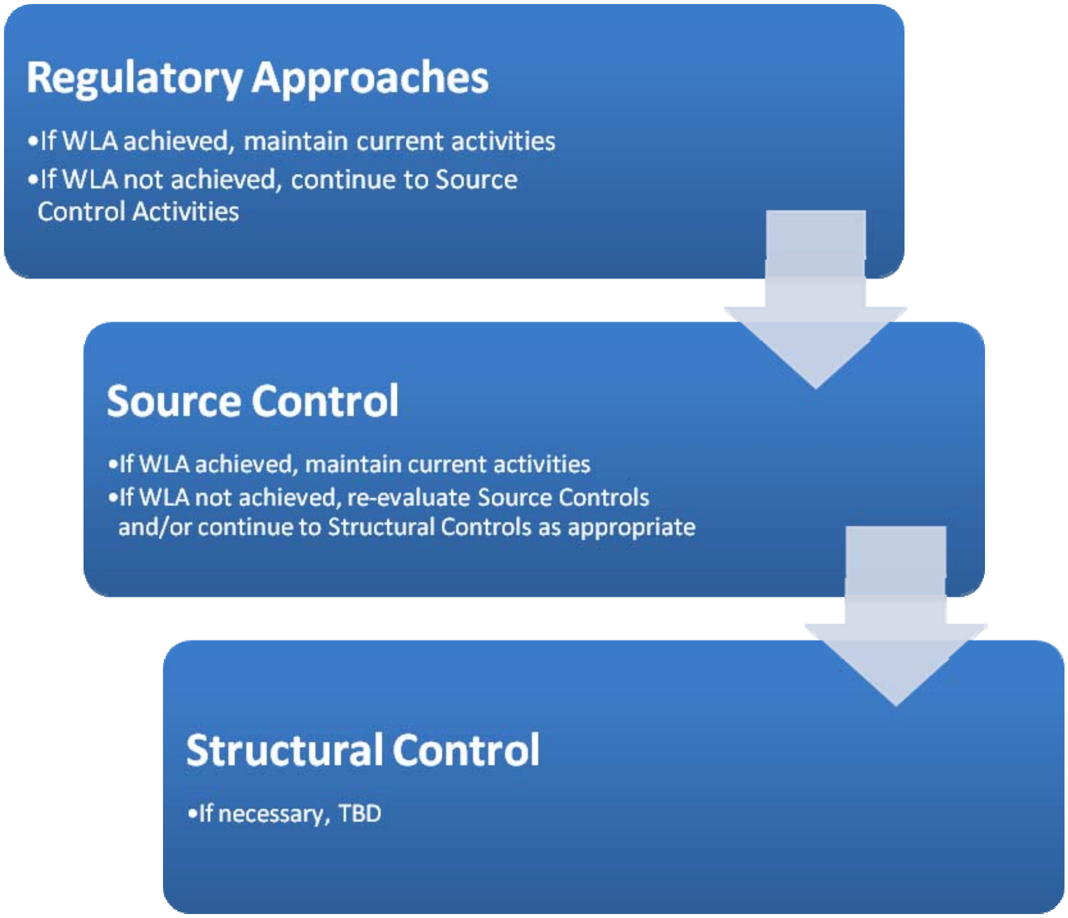

Figure 1. Tiered Implementation Elements for Each Phase

4.1 Phase I Implementation Actions

Based on the assessment of achieving TMDL implementation schedule goals detailed in Section 2.0, the available implementation options identified in Section 3.0, and the phased, iterative implementation approach discussed in Section 4.0, the Cities' implementation actions will initially focus on regulatory approaches and source control. During Phase I, a tiered approach to implementation will be taken to achieve the implementation goals (as shown in Figure 1). During future phases, the tiered approach will be evaluated and modified as necessary to achieve implementation goals and WLAs. Consideration of structural controls is reserved for instances where data indicate that iterative implementation of regulatory approaches and source control measures are not sufficient to meet WLAs and/or where implementation of structural controls are determined to be more cost-effective. This approach is consistent with the approach suggested in the TMDL TSR and BPA.

4.1.1 Regulatory Approaches

A copper WER study completed by the City of Burbank and City of Los Angeles Bureau of Sanitation's (BOS) Regulatory Affairs Division developed information in the Burbank Western Channel downstream of the BWRP as well as LA River Reaches 1, 2, 3, and 4 (LWA 2008). The results of that study indicated that copper targets and therefore WLAs could be higher and still be as protective as intended by the CTR and TMDL. Revisions to the copper target and WLAs based on a WER and lead targets based on a recalculation could either reduce the amount of or eliminate the reductions in loadings that may be required to meet the WLAs. As such, the Cities will actively participate in the implementation of the work plan and evaluation of results as part of Phase I implementation actions. The BOS Watershed Protection Division (WPD) is in the process of developing a work plan to develop SSOs for copper and lead based on the WER and recalculation procedures, respectively. The approach proposed in the work plan will allow for the application of SSOs to all waters to which the cities of Burbank and Glendale discharge dry and wet weather flows if the study is funded and completed. The TMDL targets and WLAs are based on the current CTR criteria, which could be significantly modified based on the SSOs.

Additionally, a site-specific translator could potentially be developed for copper, lead, and zinc based on the dry and wet weather monitoring data collected through the CMP. The monitoring program will use clean sampling techniques, low level detection limits, and field filtration methods that will support the development of a robust translator, if desired. The Cities will work with the CMP Technical Committee to utilize data collected to evaluate site-specific translators within the Watershed as part of Phase I implementation actions.

4.1.2 Source Control

The next step in the tiered approach to implementation under Phase I is to evaluate the use of source control strategies. Although, the outcome of the regulatory approaches may affect the level of source control actions required to meet WLAs, the Cities are committed to initiating enhancement of existing source control efforts in Phase I. As noted in Section 3.2, there are several source control options available to address metals loading in the Watershed. The source control options that are the focus of the Phase I efforts include:

- Use of alternative materials utilized in storm system drainage infrastructure
- Enhanced enforcement of City Ordinances
- Enhanced street sweeping

Both enforcement of City Ordinances and street sweeping are currently utilized in the Cities' stormwater programs; however, enhancement of these options has the potential to significantly reduce loadings to the MS4 system and subsequently receiving waters. Assessment of the effects of enhanced source control will allow the Cities to evaluate whether non-structural BMPs alone can adequately implement the WLAs while 1) allowing the regulatory options process to be completed and 2) providing information to support identification of appropriate structural BMPs and/or additional controls, if needed.

4.1.2.1 Phase I Actions – Institute Requirements for Drainage Infrastructure Materials

Galvanized piping is used to convey flows to and through the storm drain system and has the potential to leach zinc. The City of Burbank is currently considering incorporating language into the City's building code or thru an ordinance to revise their standards with regard to materials that are allowed for use in drainage infrastructure. For City (public owned) and private projects (i.e., building renovation, street improvements involving any soil disturbance, parking lot retrofit) and associated drainage facilities within the project's limits, projects may be required, dependent upon the final approach developed by the City, to eliminate or reduce metal deposition from drains by either installing new or replacing existing galvanized drains with non-corrosive, non-deposit metal drains (HDPE, PVC, or aluminum).

Section 5.0 presents the implementation time line for Phase I actions associated with the replacement of galvanized pipes.

4.1.2.2 Phase I Actions – City Ordinances

Ordinances provide the Cities the ability to require implementation of certain BMPs from targeted industrial activities, allow for inspection of relevant facilities, and provide the ability to enforce those requirements, including the use of specific financial penalties. The City of Burbank Municipal Code contains general discharge prohibitions (Article 10, Section 8-1003.D), prohibitions targeted to industrial or commercial activity (Article 10, Section 8-1003.F), runoff management requirements for industrial or commercial facilities (i.e., requires implementation of BMPs to the maximum extent practicable) (Article 10, Section 8-1004.C), and violation/enforcement provisions (Article 10, Section 8-1005.F and I). While the existing ordinances do not specifically address actions that would target metals reduction, the general and industrial/commercial discharge prohibitions, combined with requirements for industrial/ commercial facilities to implement BMPs to the maximum extent practicable, and the ability to enforce all provisions of the article, including the issuance of fines, gives Burbank flexibility to commence or increase inspection and enforcement activities to support meeting the WLAs.

The existing ordinances in the City of Glendale Municipal Code are mostly general in nature to water quality issues and not necessarily specific to actions that control discharges of metals. Additionally, the only applicable ordinance that includes enforcement action is under Controlling the Discharge of Pollutants Associated with Industrial or Commercial Activities (Section 13.42.030.B.7). Article V. Industrial Waste Disposal, discusses "industrial waste" which is defined in Section 13.40.300 as *"any and all substances or liquids discharged from a nonresidential facility into the sanitary sewer or storm drain system other than storm runoff water, residential sewage, or wastes from sanitary conveniences only."* However, as noted in Section 13.40.320, discharges of industrial waste to the storm drain system require a permit from the Regional Board. Therefore, such discharges are outside the regulation of the City of Glendale (beyond prohibiting an illicit discharge to the storm drain system). The remainder of Article V applies to regulation of discharges to the sanitary sewer system specifically. The existing ordinances do not address or require BMPs to the maximum extent practicable and, with the exception of runoff from washing impervious surfaces; the discharge prohibitions do not include an enforcement or penalty provision. Absent these two elements, the existing ordinances may be difficult as a basis to implement and enforce activities that result in reduction of metals to the storm drain system. The review of the City of Glendale's existing ordinances indicates that they do not provide the same flexibility as Burbank's ordinances and may not be sufficient as a basis to require the necessary implementation actions to assist in decreasing loadings to the MS4 system. However, Glendale is currently evaluating their ordinances and considering modifications that may require implementation of BMPs for relevant facilities, increase Glendale's flexibility to commence or increase inspections of relevant facilities, and the ability to enforce the ordinances, including specific penalties.

The Cities are committed to utilizing ordinances to support attainment of the WLAs. Phase I actions associated with city ordinances are:

Step 1. Evaluation of existing program and identification of enhancement opportunities

- Evaluate current inspection program (IC/ID, facility inspection) and the effectiveness of existing city ordinances and corresponding inspection and enforcement activities.
- Determine if increased, targeted inspections are warranted.
- Identify opportunities to 1) require the implementation/enhancement of BMPs at facilities with the potential to contribute metals loading to the MS4 system and 2) enhance inspection and enforcement activities utilizing existing city ordinances and associated costs and benefits.
- Evaluate potential modifications to existing city ordinances and/or development of new ordinances to support implementation of actions that have the potential to reduce metals loading to the MS4 system.

Step 2. Implementation of enhanced program

- Propose modifications to existing city ordinances and/or development of new ordinances to respective City Council based on the results of Step 1, if appropriate.
- Implement enhanced program as appropriate based on the results of Step 1 and modified and/or new city ordinances
- Evaluate effectiveness of revised program.

Section 5.0 presents the implementation time line for Phase I actions associated with city ordinances. Information developed during each step will be summarized in the Annual Progress Report as described in Section 7.0.

4.1.2.3 Phase I Actions – Street Sweeping

Street sweeping provides a cost effective mechanism for removal of multiple pollutants, including metals, prior to transport to the MS4 system and receiving waters. As mentioned previously, Burbank and Glendale currently conduct regular sweeping on all streets throughout their cities. However, various studies (Tetra Tech and Pacific Water Resources 2001, SPU 2009) have demonstrated that enhancements to sweeping programs can result in greater pollutant removal efficiencies and reductions in metals loadings as well as loading from other pollutants (i.e., total petroleum hydrocarbons). Such enhancements can include using newer sweepers with increased efficiencies, increased sweeping frequency at key locations/land uses, posting of streets for sweeping to remove cars that may impede street sweepers as well as increased enforcement, and modification to sweeping methods (i.e., reduced driving speed). These types of enhancements have the potential to have an immediate impact on pollutant loadings as compared to structural solutions, which can take a significant time to fund, design and build.

Table 11 and Table 12 summarize the current street sweeper fleets utilized by Burbank and Glendale, respectively. Table 13 and Table 14 summarize the frequency of the sweeping for the various street types for Burbank and Glendale, respectively.

Table 11. City of Burbank Street Sweeping Vehicle Summary

Manufacturer	**Model**	**Age** (yrs)	**Type** (brush or vacuum)	**Driving Speed Utilized by City** (MPH)	**Estimated Replacement Date**
Athey	2TE4DB	11	Brush	5 – 8	2009
Schwartz	A-7000	6	Vacuum	8 – 15	2012
Schwartz	M-6000	5	Brush	8 – 15	2012
Schwartz	M-6000	5	Brush	8 – 15	2012
Schwartz	M-6000	5	Brush	8 – 15	2012
Schwartz	M-6000	4	Brush	8 – 15	2013
Schwartz	M-6000	4	Brush	8 – 15	2013
Schwartz	M-6000	4	Brush	8 – 15	2013

Table 12. City of Glendale Street Sweeping Vehicle Summary

Manufacturer	**Model**	**Age** (yrs)	**Type** (brush or vacuum)	**Driving Speed Utilized by City** (MPH)	**Estimated Replacement Date**
Elgin	Crosswind	7	Regenerative Air	5 – 8	2009-10
Elgin	Broom Bear	7	Brush	5 – 8	2009-10
Elgin	Broom Bear	4	Brush	5 – 8	2010-12
Elgin	Broom Bear	2	Brush	5 – 8	2012-14
Elgin	Broom Bear	2	Brush	5 – 8	2012-14
Allianz	Johnson 4000	1	Brush	5 – 8	2014-16

Table 13. City of Burbank Street Sweeping Summary of Estimated Miles of Street Swept Annually

Street Type	**Miles of Streets Swept Annually**	**Sweeping Frequency**	**Are streets posted so that cars do not impede sweepers access to curb?**
Arterial	1,560	Weekly	No
Commercial	2,028	Weekly	No
Industrial	520	Weekly	No
Residential	7,280	Weekly	73 % of the Residential streets are posted
Alleys	600	Monthly	No
Total	11,988		

Table 14. City of Glendale Street Sweeping Summary of Estimated Miles of Street Swept Annually

Street Type	Miles of Streets Swept Annually	Sweeping Frequency	Are streets posted so that cars do not impede sweepers access to curb?
Arterial	2,964	Every 2 weeks	No
Commercial	1,548	Every 2 weeks	Posted
Industrial	912	Every 2 weeks	No
Residential	35,048	Monthly	Posted and not posted
Commercial	3,696	4 times a week	No
Alleys	0	NA	NA
Total	44,168		

The City of Burbank and City of Glendale removed an estimated 1,763 and 2,018 tons of street dirt, respectively, last year. Table 15 presents estimates of the annual loadings of cadmium, copper, lead, and zinc removed through the Cities' current sweeping programs. Potential loading removed was estimated utilizing representative concentration data for street dirt and grain size distributions obtained from the literature (Tetra Tech and Pacific Water Resources 2001 and USEPA 1983, respectively). Concentration and grain size distribution data vary across studies; however, the two studies utilized represent a reasonable range for the purposes of developing the estimate presented in Table 15 and establishing the Phase I steps associated with sweeping presented below. Estimates for each metal were developed by multiplying the tons of street dirt removed by the representative percentage of grain size present in street dirt collected by street sweepers by the representative concentration of the metal of interest by grain size as shown below:

Estimate of Total Pounds of Metal Removed =

Tons of Street Dirt Removed * %Silt/Clay (<75um) * concentration of Silt/Clay +
Tons of Street Dirt Removed * %Fine Sand (75-250um) * concentration of Fine Sand +
Tons of Street Dirt Removed * %Coarse Sand (>251um) * concentration of Coarse Sand

Street sweeping performance/efficiency is a function of accumulation (magnitude and particle size distribution), street texture and condition, type of sweeper utilized (mechanical, vacuum, regenerative air), driving speed, interference due to parked cars, and street surface moisture.
With the exception of the Elgin Crosswind, which provides "good" to "excellent" pickup efficiency, the other sweepers utilized by the Cities would be rated "fair," or a pickup efficiency on the order of 25 to 50 percent. Given the speeds, generally 10 to 15 mph, it is likely that the actual efficiency is closer to 25 percent. Through a combination of enhancement techniques, it is estimated that efficiencies could be increased to 75 to 90 percent, or a factor of 3 to 3.6. Annual pollutant removal estimates were developed based on potential enhancements to the Cities' sweeping programs (Table 15) assuming efficiency was increased to 75 percent.

Expected increases in pickup efficiencies and associated potential pollutant load removal as presented in Table 15 are expected to result in considerable reductions in loadings of the metals of interest to the LA River and tributaries. Increases in pollutant loads removed through sweeping have been demonstrated to reduce the magnitude of high concentration events (often considered outliers) and reduce the 90-percentile observed in datasets (Pacific Water Resources and Resource Planning Associates 2004). This is of particular importance given that exceedances of TMDL targets generally appear to be attributable to episodic high concentration events with the average long-term concentrations below targets. As such, it is expected that implementation of enhanced sweeping programs by the Cities will achieve the implementation goals of the TMDL.

Table 15. Estimate of Annual Pollutant Removal based on Current and Enhanced Sweeping Program for the cities of Burbank and Glendale

City	Estimated Annual Total Pollutant Removal for Current Program					Estimated Annual Total Pollutant Removal for Enhanced Program Using Estimated 3 fold Increase in Pickup Efficiency				
	Total Material Removed (tons)	**Cd** (lbs)	**Cu** (lbs)	**Pb** (lbs)	**Zn** (lbs)	**Total Material Removed** (tons)	**Cd** (lbs)	**Cu** (lbs)	**Pb** (lbs)	**Zn** (lbs)
Burbank	1,763	3	275	173	720	5,289	10	825	518	2,159
Glendale	2,018	4	315	198	824	6,054	12	944	593	2,471
Total	3,781	7	589	370	1,543	11,343	22	1,768	1,111	4,630

The increase in estimated pollutant load reductions through enhanced elements of street sweeping programs provides an opportunity to implement source control actions that will result in measurable improvements. The Cities are committed to implementation of enhanced elements of street sweeping into their respective programs. The Phase I actions associated with enhanced street sweeping are:

Step 1. Implement Enhanced Sweeping Pilot Program

- Implement a pilot program to evaluate load reduction potential based on potential enhancements. The pilot program is necessary to evaluate conditions specific to the Cities. While helpful in identifying the potential to significantly reduce pollutant loadings (metals in particular) the majority of available information on the effectiveness of street sweeping and associated enhancements were not generated in the arid west environment. Enhancements will be evaluated through the collection of street dirt quantity, physical property, and chemistry data in control areas (i.e., areas where enhancements **are not** implemented) and treatment areas (i.e., areas where enhancements **are** implemented. Enhancements evaluated would include, but are not necessarily limited to:
  i. Reduced driving speed – current driving speeds utilized by the Cities may reduce pickup efficiencies. The effects of reduced driving speeds on loading potential will be evaluated.

ii. Increased posting of streets – current postings of streets for sweeping does not appear to allow for maximizing the sweeping of curb miles (i.e., parked cars effectively block three car lengths of curb swept due to the need for sweepers to go around the parked cars). The effects of posting of streets on loading potential will be evaluated.
iii. Sweeper maintenance – the proper maintenance of street sweeping vehicles, particularly mechanical sweepers, can affect pick up efficiencies. The effects of the current maintenance practices (i.e., the frequency of broom replacement on mechanical sweepers) and enhanced maintenance practices on loading potential will be evaluated.
iv. Use of more effective street sweeping vehicles – the street sweeping vehicles currently used by the Cities are predominantly mechanical sweepers. The effects of utilizing street sweeping vehicles with higher pickup efficiencies (i.e., vacuum sweepers) on loading potential will be evaluated.

- Based on the results of the pilot program the quantity, physical property, and chemistry data will be analyzed to evaluate the effect of enhancements and combination of enhancements on loading potential. The analysis will be extrapolated beyond the pilot program area to evaluate the effect of potential enhancements for long-term program modifications and potential to meet WLAs. The costs and benefits of the enhancements will be compared in relation to structural solutions to determine appropriate next steps.

Step 2. Implement Enhanced Sweeping Program

- If appropriate based on Step 1, enhancements will be implemented based on the recommendations identified in Step 1.
- Determine if expansion of program is sufficient to meet WLA or if additional source control/structural controls are needed.

Section 5.0 presents the implementation time line for Phase I actions associated with enhanced street sweeping. Information developed during each step will be summarized in the Annual Progress Report as described in Section 7.0.

4.1.3 Structural Control Measures

Structural controls require significant capital investment and operational and maintenance expenditures. As the outcome of the regulatory approaches may significantly affect the level of efforts required to meet WLAs, and source control efforts are expected to result in the attainment of current or revised WLAs, consideration of implementing structural controls will occur after the regulatory approaches have been completed and the benefits of source control activities have been evaluated. Implementation of structural control measures is reserved for instances where data indicate that iterative implementation of source control measures, as described above or modified during Phase I, are not sufficient to meet WLAs and/or where implementation of structural controls are determined to be more cost-effective. Structural controls will only be implemented during Phase I if the Phase I implementation goals are not achieved. However, if not implemented in Phase I, they will be considered during future phases as necessary to achieve Phase II and III implementation goals and WLAs. Section 5.0 presents the implementation time line for Phase I actions associated with structural controls.

4.2 Phase II and Phase III Implementation Actions

As stated above, the Phase I actions may result in compliance with the WLAs and implementation goals of the TMDL. Phase II and Phase III actions will be determined after the completion of Phase I based on the status of compliance with the WLAs using the process outlined in Section 2.0. Phases II and III will also consist of a tiered approach to implementation as outlined in Figure 1 starting with additional or enhanced source control and progressing to targeted structural BMP implementation to meet the final WLAs in the TMDL.

Prior to the beginning of Phase II and Phase III, implementation plans will be developed that outline the steps to be taken within each phase and the rationale for the actions based on the results of the previous phase. In general, Phase II and Phase III implementation plans will follow the process outlined for Phase I, but include additional actions as necessary to meet the WLAs.

5.0 Implementation Schedule and Milestones

As presented in Section 4.0, the Cities' implementation actions will be conducted through a phased approach (Table 16) based on optimizing implementation efforts by iteratively implementing the three tiered elements: Regulatory Approaches, Source Controls**,** and Structural Controls.

Phase I will focus on meeting the 2012 and 2020 implementation goals by working on applicable regulatory approaches while evaluating and implementing enhanced source control programs and potentially structural controls. Figure 2 presents the Cities implementation schedule and milestones. Additional implementation actions for Phase II and Phase III will be developed based on adaptive management through an evaluation of results of Phase I implementation actions. Near-Term milestones for Phase I as well as Long-Term milestones for Phases I through III are presented in section 5.1 and 5.2, respectively.

Table 16. LA River Metals TMDL Implementation Plan Phases, Time Period, and Goals for the Cities of Burbank and Glendale

Phase	Implementation Time Period	Goals
Phase I	Present – January 11, 2012	50% of area meets dry weather WLA 25% of area meets wet weather WLA
	January 11, 2012 – January 11, 2020	75% of area meets dry weather waste load allocation
Phase II	January 12, 2020 – January 11, 2024	100% of area meets dry weather waste load allocation 50% of area meets wet weather waste load allocation
Phase III	January 12, 2024 – January 11, 2028	100% of area meets both dry and wet weather WLAs

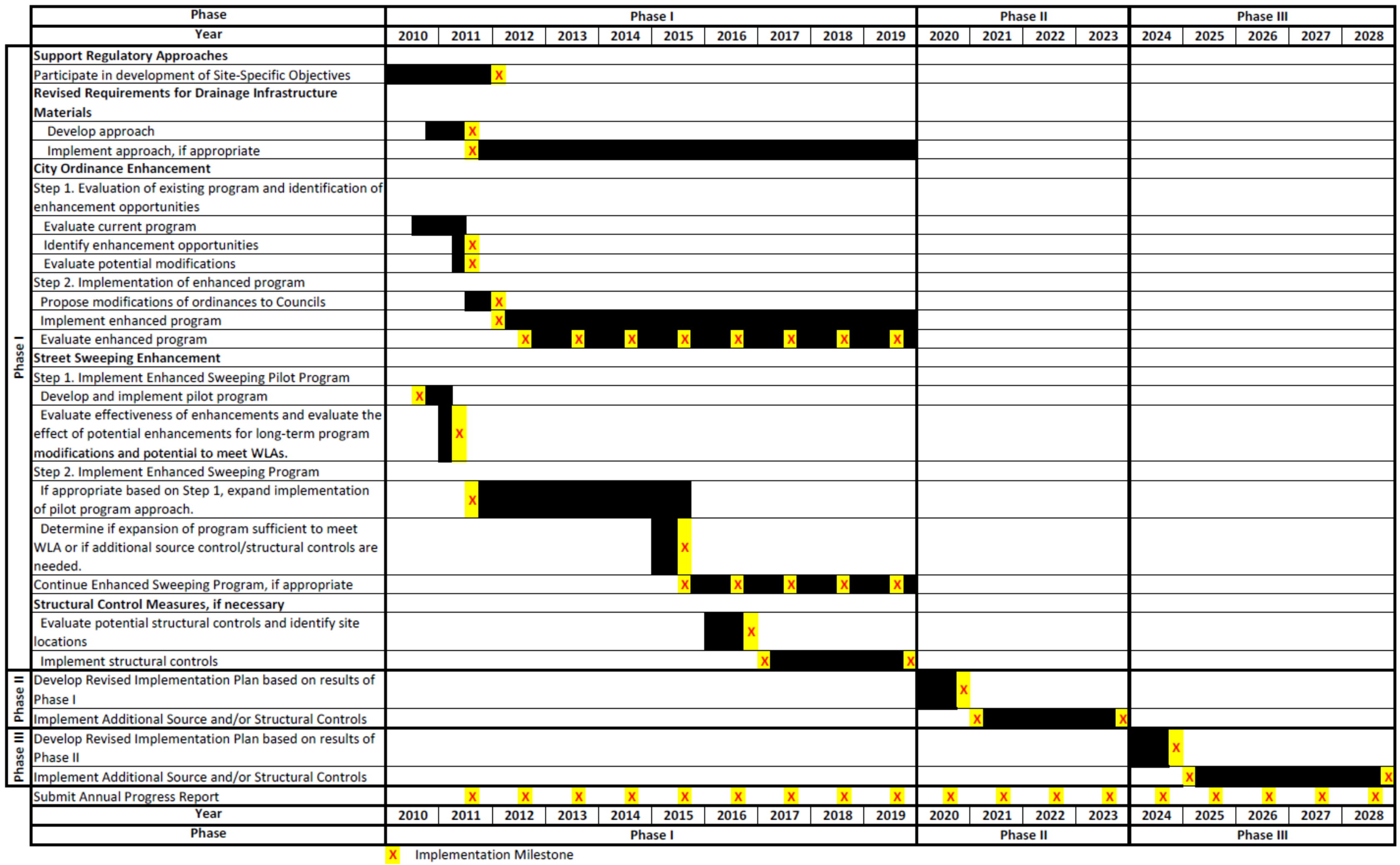

Figure 2. Los Angeles River Metals TMDL Implementation Schedule for the Cities of Burbank and Glendale

5.1 Near-Term Milestones

Near-Term milestones are focused on the enhancement of source control measures and evaluation of their ability to attain WLAs. Near-Term milestones are summarized in Table 17 and are the milestones presented in Figure 2 between July 2010 and September 2015.

Table 17. Los Angeles River Metals TMDL Implementation Near-Term Milestones (Phase I) for the Cities of Burbank and Glendale

Milestone	Date	Deliverables
Completion of Special Studies to Support Regulatory Approaches	January 2012	NA
Revise Requirements for Drainage Infrastructure Materials		
Develop approach	September 2011	Summary section in MS4 Annual Report
Implement approach	September 2012	NA
City Ordinance Enhancement		
Complete evaluation of existing program	August 2011	Summary section in MS4 Annual Report
Implementation of enhanced program	January 2012	NA
Evaluation of enhanced program	August 2012	Summary section in MS4 Annual Report
Street Sweeping Enhancement		
Develop and implement pilot program	August 2010	NA
Evaluate effectiveness of pilot program	June 2011	Summary report of findings
Implement enhanced program	September 2012	NA
Evaluation of enhanced program	September 2015	Summary report of findings
Annual Progress Report	September of each year starting in 2011	Summary section in MS4 Annual Report

NA – Not Applicable – no deliverables correspond to the milestone

5.2 Long-Term Milestones

Long-Term milestones are focused on actions that are dependent upon the outcome of the Near-Term milestones (i.e., regulatory approaches and effectiveness of enhanced source control). Long-Term milestones are summarized in Table 18 and are the milestones presented in Figure 2 that occur after September 2015.

Table 18. Los Angeles River Metals TMDL Implementation Long-Term Milestones (Phase I, II, and III) for the Cities of Burbank and Glendale

Milestone	Date	Deliverables
Phase I		
Street Sweeping Enhancement		
Continue enhanced program and evaluate effectiveness	September of each year starting in 2011	Summary section in MS4 Annual Report
Structural Control Measures, if necessary		
Evaluate structural control measures and identify site locations	December 2016	Summary report of findings
Begin process of implementation of structural controls (i.e., predesign, bidding, construction, initiate operation)	January 2017	NA
Complete implementation of structural controls	December 2019	NA
Phase II		
Develop Phase II Implementation Plan	December 2020	Phase II Implementation Plan
Begin implementation of Phase II actions (i.e., enhanced source and/or structural controls)	January 2021	NA
Complete implementation of Phase II actions	December 2023	NA
Phase III		
Develop Phase III Implementation Plan	December 2024	Phase III Implementation Plan
Begin implementation of Phase III actions (i.e., enhanced source and/or structural controls)	January 2024	NA
Complete implementation of Phase III actions	December 2028	NA
Annual Progress Report	September of each year starting in 2011	Summary section in MS4 Annual Report

NA – Not Applicable – no deliverables correspond to the milestone

6.0 Monitoring Approach

The TMDL BPA identified three monitoring components associated with TMDL Implementation: Ambient Monitoring, TMDL Effectiveness Monitoring, and Special Studies. Monitoring related to special studies is not addressed in this Implementation Plan. Ambient Monitoring is described in the TMDL as follows:

> *An ambient monitoring program is necessary to assess water quality throughout the Los Angeles River and its tributaries. The MS4 and Caltrans NPDES permittees assigned waste load allocations in each jurisdictional group are jointly responsible for implementing the ambient monitoring program. The responsible agencies shall sample for total recoverable metals, dissolved metals, and hardness once per month at each ambient monitoring location until at least year five when the TMDL is reconsidered.*

TMDL Effectiveness Monitoring is described in the TMDL as follows:

> *The MS4 and Caltrans stormwater NPDES permittees in each jurisdictional group are jointly responsible for assessing progress in reducing pollutant loads to achieve the TMDL. Each jurisdictional group is required to submit for approval by the Executive Officer a coordinated monitoring plan that will demonstrate the effectiveness of the phased implementation schedule for this TMDL which requires that the waste load allocations be met in prescribed percentages of each sub watershed over a 22-year period. The monitoring locations specified for the ambient monitoring program may be used as effectiveness monitoring locations.*
>
> *The stormwater NPDES permittees will be found to be effectively meeting the dry-weather waste load allocations if the in-stream pollutant concentration or load at the first downstream effectiveness monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation. Alternatively, effectiveness of the TMDL may be assessed at the storm drain outlet based on the numeric target for the receiving water. For storm drains that discharge to other storm drains, effectiveness will be based on the waste load allocation for the ultimate receiving water for that storm drain system.*
>
> *The stormwater NPDES permittees will be found to be effectively meeting wet-weather waste load allocations if the loading at the downstream monitoring location is equal to or less then the daily storm volume multiplied by the wet-weather numeric targets as defined in the table below. For practical purposes, this is when the EMC is less than or equal to the numeric target.*

The members of the LA River Metals TMDL Technical Committee (TC) developed the Coordinated Monitoring Plan (CMP) approved by the Regional Board on April 11, 2008. Representatives from the cities of Burbank and Glendale participated in the development of the CMP. The CMP established dry and wet weather water quality monitoring locations within the Watershed for two distinct purposes: 1) to characterize ambient water quality and 2) to measure attainment of WLAs specified in the effectiveness monitoring portion of the TMDL. Ambient and effectiveness monitoring utilize the same monitoring sites. Most of the 13 Tier I ambient monitoring sampling sites, each representing major portions of the total drainage area, were identified in the TMDL as potential monitoring sites and are used for effectiveness monitoring. Three Tier I dry weather sites provide the ability to assess the attainment of dry weather WLAs by the Cities as described in Section 2.0. One Tier I wet weather sites provides the ability to assess the attainment of wet weather WLAs by the Cities as described in Section 2.0. Effectiveness monitoring is accomplished through a three-tiered approach. The tiered approach provides the responsible agencies with a predetermined set of locations to investigate sources of possible exceedances that may occur at the CMP sites. Once effectiveness monitoring is required by the TMDL, the Tier II Activation and Deactivation Criteria listed below will be applied to the data from the Tier I sites to determine when monitoring at the upstream Tier II locations would begin and end, in order to narrow the search for the source of the exceedances. The CMP identified three Tier II sites by further subdividing the LA River watershed into smaller tributary areas. One of the three Tier II locations (Verdugo Wash at Concord Street) provides the Cities the ability to evaluate attainment of WLAs if the activation criteria are met at the LA River Reach 3 at Figueroa Street site.

CMP Three Tier Monitoring Approach:

1. Tier I – Main River and Large Tributary Sampling – Thirteen sampling sites located in the main channel and large tributaries of the river and large portions of discharge area contribute to the potential runoff at these points.
2. Tier II – Additional Tributary Sampling – These sampling sites are upstream of Tier I locations, but at the most downstream end of a tributary.
3. Tier III – Investigatory Sampling – These intra-jurisdictional sampling sites will be determined as appropriate.

Tier II Activation Criteria: Two consecutive exceedances of WLAs at a Tier I monitoring site after effectiveness monitoring is required.

Tier II Deactivation Criteria: Data from two consecutive Tier II monitoring events is less than the WLAs.

Per the CMP, monitoring will only be conducted at the Tier II sites that are immediately upstream of a Tier I site where the WLA exceedances occurred. If a Tier II location has two consecutive instances of not meeting the WLAs, upstream Tier III monitoring will be initiated in an attempt to identify the source(s) causing the exceedances.

As described above, the CMP monitoring sites and tiered approach provide the Cities with the ability to evaluate the effectiveness of their implementation actions to meet WLAs as required by the TMDL. The Cities will continue to work to implement the CMP and, if necessary, coordinate through the CMP implementation of Tier II monitoring and identify Tier III sites, if needed, to further evaluate attainment of WLAs. Compliance with the Cities WLAs and implementation goals will be determined using the applicable CMP data per the approach described in Section 2.0.

7.0 Annual Progress Reports

Annual Progress Reports on TMDL implementation will be submitted as a section in each of the Cities' Annual MS4 Report. The Annual Progress Reports will contain, as appropriate, the following information:

- A summary and evaluation of effectiveness monitoring data available collected within the reporting period.
- An assessment of compliance with implementation goals and WLAs per the procedure outlined in Section 2.0.
- A summary of studies implemented and completed within the reporting period as well as any relevant documentation associated with the studies (i.e. work plans, reports, etc.).
- A summary of control measures implemented, enhanced, continued, and/or discontinued within the reporting period.
- A summary of next steps in the next reporting period.
- A summary of revisions to the Implementation Plan.

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