EXECUTIVE SUMMARY

ES.1 Monitoring Program Objectives

The following are the major monitoring program objectives, as outlined in the Municipal Stormwater Permit:

- Assess compliance with the Municipal Stormwater Permit CAS004001 (Permit).
- Measure and improve the effectiveness of the Stormwater Quality Management Program (SQMP).
- Assess the chemical, physical, and biological impacts of receiving waters resulting from urban runoff.
- Characterize stormwater discharges.
- Identify sources of pollutants.
- Assess the overall health in receiving water quality, and evaluate long-term trends.

Ultimately, the results of the monitoring requirements should be used to refine the SQMP for the reduction of pollutant loads and the protection and enhancement of the beneficial uses of the receiving waters in Los Angeles County. The monitoring program was designed to address these objectives through the implementation of the following elements:

- Mass emission monitoring.
- Water column toxicity monitoring.
- Tributary monitoring.
- Trash monitoring.

ES.2 Summary of Monitoring Results

ES.2.1 Mass Emission Monitoring

The goals of mass emission monitoring were as follows:

- Estimate the mass emissions from the municipal separate storm sewer system (MS4).
- Assess trends in the mass emissions over time.
- Determine if the MS4 is contributing water quality impacts by comparing results to applicable standards in the Water Quality Control Plan for the Los Angeles Region (Basin Plan), the California Toxics Rule (CTR), and emissions from other discharges.

Flows were measured and water quality samples were taken at the following seven mass emission stations (MES):

- Ballona Creek (S01).
- Malibu Creek (S02).
- Los Angeles River (S10).
- Coyote Creek (S13).
- San Gabriel River (S14).

- Dominguez Channel (S28).
- Santa Clara River (S29).

All MES, except the Santa Clara River site, are equipped with automated samplers with integral flow meters for collecting flow composite samples. A minimum of three storm events, including the first storm, and two dry weather events, excluding San Gabriel River MES, were sampled at each MES. Total suspended solids (TSS) were collected from five storm events at the Santa Clara River MES, twelve storm events from San Gabriel MES, thirteen storm events from Malibu Creek MES and Ballona MES, and fourteen events from Los Angeles River MES, Dominquez Channel MES, and Coyote Creek MES.

Based on results of the mass emission monitoring, the following three water quality analyses were conducted:

- A comparison to applicable water quality standards.
- An analysis of pollutant loads and trends.
- An evaluation of the correlation between constituents of concern and TSS.

The following subsections summarize the analyses.

ES.2.1.1 Comparison Study for Mass Emission Water Quality

Monitoring results were compared to water quality indicators based on water quality objectives established by the Basin Plan and the CTR. The Basin Plan is designed to enhance water quality and protect the beneficial uses of all regional waters. The CTR promulgates criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries.

Applicable water quality objectives were identified (see table below) for which no uncertainty regarding the applicable objectives, or the implementation with respect to frequency and duration was found. The numeric objectives in the table below that are listed as ranges are calculated values based on site-specific conditions. Ammonia concentrations were calculated using measured pH and Table 3-1 (COLD) and Table 3-2 (WARM) of the Basin Plan, assuming a temperature of 25°C (for COLD) and 20 °C (for WARM). Dissolved metals concentrations were calculated using measured hardness and procedures set forth in the CTR.

Category 1 Water Quality Objectives

Constituent	Water Quality Objective	Unit	Reference	Beneficial Use
Chloride	Ballona Creek (S01) None Malibu Creek (S02) < 500 Los Angeles River (S10) < 150 Coyote Creek (S13) None San Gabriel River (S14) < 150 Dominguez Channel (S28) None Santa Clara River (S29) < 100	mg/L	Basin Plan	Groundwater recharge (GWR) and general water quality indicators
Sulfate	Ballona Creek (S01) None Malibu Creek (S02) < 500 Los Angeles River (S10) < 350 Coyote Creek (S13) None San Gabriel River (S14) < 300 Dominguez Channel (S28) None Santa Clara River (S29) < 300	mg/L	Basin Plan	
Total dissolved solids (TDS)	Ballona Creek (S01) None Malibu Creek (S02) < 2,000 Los Angeles River (S10) < 1,500 Coyote Creek (S13) None San Gabriel River (S14) <750 Dominguez Channel (S28) None Santa Clara River (S29) < 1,000	mg/L	Basin Plan	
pH	6.5–8.5	None	Basin Plan	Aquatic life habitat (WARM and COLD)
Dissolved oxygen (DO)	(All) > 5 (WARM) (Malibu Creek) > 6 (COLD) (Malibu Creek) > 7 (SPAWN)	mg/L	Basin Plan	Aquatic life habitat
Fecal coliforms	< 400	MPN/ 100 mL	Basin Plan	Water contact recreation (REC-1)

MPN = most probable number.

Category 1 Water Quality Objectives (continued)

Constituent	Water Quality Objective	Unit	Reference	Beneficial Use
Ammonia	0.7–5 (COLD) 0.9–30 (WARM) (based on pH and temperature)	mg/L	Basin Plan	Aquatic life habitat (acute exposure, chronic exposure during one event)
Cyanide	0.022	mg/L	CTR	
Dissolved arsenic	340	µg/L	CTR	
Dissolved cadmium	Hardness based	µg/L	CTR	
Dissolved chromium +6	Hardness based	µg/L	CTR	
Dissolved chromium	Hardness based	µg/L	CTR	
Dissolved copper	Hardness based	µg/L	CTR	
Dissolved lead	Hardness based	µg/L	CTR	
Dissolved nickel	Hardness based	µg/L	CTR	
Dissolved silver	Hardness based	µg/L	CTR	
Dissolved zinc	Hardness based	µg/L	CTR	

Constituents That Did Not Meet Water Quality Objectives at Mass Emission Stations

At the MES located in urbanized watersheds (i.e., Ballona Creek, Los Angeles River, and Dominguez Channel) dissolved zinc, fecal coliforms, and pH did not meet water quality objectives during at least one wet weather monitoring event. Fecal coliform concentrations were above the water quality objective during four storm events at the Los Angeles River MES, three storm events at Ballona Creek MES, and four storm events for Dominguez Channel MES. The cyanide concentration was above the water quality objective during one storm event at the Los Angeles River MES.

During dry weather conditions, pH was measured above water quality objectives during at least one sampling event at each of the urbanized watershed stations. Fecal coliform concentrations were also measured above water quality objectives during one dry weather event at Dominguez Channel MES and Los Angeles River MES.

Among the four less urbanized watersheds (i.e., Malibu Creek, Coyote Creek, San Gabriel River and Santa Clara River), fecal coliform and sulfate concentrations during wet weather were above water quality objectives at Malibu Creek MES during three storm events; and cyanide and pH were above were above water quality objectives during one storm event. Dissolved zinc and fecal coliform concentrations were above water quality objectives during four wet weather events in Coyote Creek MES, while pH did not meet water quality objectives during two events. In the San Gabriel River, the fecal coliform concentrations were above water quality objectives during one storm event, and pH levels were below the water quality objective of 6.5 pH units during two storm events. In the Santa Clara River, fecal coliform concentrations were above water quality objectives during five storm sampling events, dissolved zinc was above the water quality objective during one event, and pH did not meet water quality objectives during one event.

Among the four less urbanized watersheds during dry weather monitoring, sulfate and fecal coliforms were above water quality objectives during one dry weather sampling event at Malibu Creek MES. In Coyote Creek, fecal coliforms concentrations were above the water quality objective during one dry weather event. In the San Gabriel River, there were no exceedances of the water quality objective. In the Santa Clara River, there were no exceedances of water quality objectives. The results are summarized in the table below.

Summary of Constituents that Did Not Meet Water Quality Objectives at Mass Emission Stations during 2010–2011 for One or More Events

Mass Emission/Watershed	Wet	Dry
Ballona Creek (S01)[1]	Fecal coliforms[2] pH[3] Dissolved zinc	pH[3]
Malibu Creek (S02)	Fecal coliforms Cyanide pH[3] Sulfate	Fecal coliforms Sulfate
Los Angeles River (S10)[1]	Fecal coliforms[2] pH[3] Dissolved zinc Cyanide	Fecal coliforms pH[3]
Coyote Creek (S13)	Fecal coliforms[2] pH[3] Dissolved Zinc	Fecal coliforms
San Gabriel River (S14)	Fecal coliforms[2] pH[3]	
Dominguez Channel (S28)[1]	Fecal coliforms[2] Dissolved copper Dissolved zinc	Fecal coliforms pH[3]
Santa Clara River (S29)	Fecal coliforms pH[3] Dissolved zinc	

[1] More urbanized watersheds
[2] Two of four storms met the requirements of the high flow suspension (LARWQCB, 2003)
3 pH was evaluated outside of holding time

ES.2.1.2 Water Column Toxicity Analysis

Water column toxicity monitoring was performed at all MES in accordance with the Municipal Stormwater Permit. In total, four samples were analyzed for toxicity at each site (i.e., two wet weather samples and two dry weather samples). Dry weather samples were collected on September 21, 2010 (2010–11Event02), and January 24, 2011 (2010–11Event13). Wet weather samples were collected during the first rain event of the season on October 5, 2010 (2010–11Event03), and on November 19, 2010 (2010–11Event06), at all MES. One freshwater species (i.e., water flea) and one marine species (i.e., sea urchin) were used for toxicity testing. The water flea, *Ceriodaphnia dubia*, was used in chronic 7-day reproduction and survival bioassays;

whereas the sea urchin, *Strongylocentrotus purpuratus*, was used in chronic fertilization bioassays.

Toxicity Results by Station – Wet Weather

Bioassay tests exposing *C. dubia* to wet weather effluent samples from each of the seven MES indicated that no toxicity was observed for either the survival or reproduction endpoints.

When the observable effect is sublethal (e.g., mean young per female), the term IC is used. For example, IC_{50} is the concentration that causes a 50% reduction in the selected sublethal biological response (e.g., reproduction). The IC_{25} and IC_{50} values were greater than 100% test substance for each of the MES wet weather samples. This indicates that the undiluted sample did not cause sublethal inhibition of reproduction in *C. dubia*.

The *C. dubia* survival and reproduction toxicity tests resulted in <1 toxicity unit (TU) for survival and <1 TU for reproduction for each of the MES. A TU is defined in the NPDES Municipal Permit as 100 divided by the calculated median test response (e.g., LC_{50} or EC_{50}). A TU value greater than or equal to 1 is considered substantially toxic and requires a Phase I TIE.

Toxicity tests measuring *S. purpuratus* fertilization in exposures to wet weather effluent samples from each of the seven MES indicated that no toxicity to *S. purpuratus* fertilization was observed in any of the test samples. The IC_{25} and IC_{50} values were greater than 100% test substance and TUs were <1 for each of the MES.

Toxicity Results by Station – Dry Weather

Bioassay tests exposing *C. dubia* to dry weather effluent samples from each of the seven mass MES indicated that toxicity to *C. dubia* was observed in dry weather samples collected from the Los Angeles River MES for reproduction. The IC_{25} value was 44.03, indicating that at 44.03% concentration, a 25% reduction in reproduction was observed. However, the IC_{50} value was greater than 100% test substance and therefore the TU was calculated to be <1.

For all the other MES stations, the IC_{25} and IC_{50} values were greater than 100% test substance, indicating that no observable adverse effects to either survival or reproduction in *C. dubia* occurred in exposure to the undiluted test samples. Additionally, the TUs for each test sample in the *C. dubia* 7-day chronic bioassay were calculated to be <1.

Toxicity tests measuring *S. purpuratus* fertilization in exposures to dry weather effluent samples from each of the seven MES indicated that no toxicity to *S. purpuratus* fertilization was observed in any of the test samples. The IC_{25} and IC_{50} values were greater than 100% test substance and TUs were <1 for each of the MES.

ES.2.1.3 Tributary Monitoring

The goals of tributary monitoring were as follows:

- Identify subwatersheds where stormwater discharges are causing or contributing to non-attainment of water quality standards.
- Prioritize drainage and sub-drainage areas requiring management actions.

Sampling for the 2010–2011 Monitoring Season was conducted at six tributary monitoring stations in the Dominguez Channel Watershed. A total of five storm events, including the first storm of the season, and two dry events were sampled at each tributary monitoring site.

The tributaries monitored included the following:

- **Project No. 1232 (TS19) –** Tributary is located on the northeast corner of Project 1232 and S. Main Street, south of Del Amo Boulevard, in the City of Carson.
- **PD 669 (TS20)** – Tributary is located in the south right-of-way of PD 669, on the southeast corner of Avalon Boulevard and PD 669, north of Del Amo Boulevard, in the City of Carson.
- **Project Nos. 5246 & 74 (TS21) –** Tributary is located north of Artesia Boulevard (State Route 91), east of Vermont Avenue, in the City of Los Angeles.
- **PD 21-Hollypark Drain (TS22)** – Tributary is located on the northeast corner of 135th Street at Dominguez Channel in the City of Gardena.
- **D.D.I. 8 (TS23) –** Tributary is located on the northwest corner of Dominguez Channel and the easterly prolongation of 132nd Street in the City of Gardena.
- **Dominguez Channel at 116th Street (TS24)** – Tributary is located at the corner of 116th Street and Isis Avenue in the City of Lennox.

Constituents That Did Not Meet Water Quality Objectives at Tributary Stations

This subsection summarizes the constituents that were measured above Basin Plan water quality objectives at the tributary monitoring stations during the 2010–2011 Monitoring Season. In general, the constituents that were above water quality objectives were similar to those found at the Dominguez Channel MES. During wet weather, dissolved copper and zinc concentrations were above the water quality objectives in at least one event at all tributary stations. At all tributary stations the pH did not meet water quality objectives during at least one event.

During dry weather, pH did not meet water quality objectives during at least one event at all tributary stations except TS20. Fecal coliform concentrations did not meet objectives during at least one event at all tributary stations except TS22 and TS24. The ammonia concentration did not meet water quality objectives during at least one event at Station TS23. The results are summarized in the table below.

Summary of Constituents that Did Not Meet Water Quality Objectives at Tributary Stations during 2010–2011 for One or More Events

Tributary/Sub-Watershed	Wet	Dry
Project No. 1232 (TS19)	Fecal coliforms Cyanide pH[1] Dissolved copper Dissolved lead Dissolved zinc	Fecal coliforms pH[1]
PD 669 (TS20)	Fecal coliforms Cyanide pH[1] Dissolved copper Dissolved zinc	Fecal coliforms Dissolved copper
Project Nos. 5246 & 74 (TS21)	Fecal coliforms Dissolved Oxygen pH[1] Dissolved copper Dissolved lead Dissolved zinc	Fecal coliforms pH[1]
PD 21-Hollypark Drain (TS22)	Fecal coliforms pH[1] Dissolved copper Dissolved lead Dissolved zinc	pH[1]
D.D.I. 8 (TS23)	Fecal coliforms pH[1] Dissolved copper Dissolved lead Dissolved zinc	Fecal coliforms pH[1] Ammonia Dissolved zinc
Dominguez Channel at 116th Street (TS24)	Fecal coliforms pH[1] Dissolved copper Dissolved zinc	pH[1] Dissolved copper Dissolved zinc

1 pH was evaluated outside of holding time

ES.2.1.4 Priority Constituents and Correlation to Total Suspended Solids

Wet Weather – Mass Emission Sites

Consistent relationships were not observed in correlations between TSS and priority constituents (those constituents that did not meet water quality objectives in one or more monitoring events) across MES during wet weather. The results of the correlation analysis are summarized in the table below. In Ballona Creek, Malibu Creek, and Santa Clara River, aluminum and zinc were positively correlated with TSS. Aluminum was also positively correlated with TSS in the San Gabriel River. Dissolved aluminum was positively correlated with TSS in Malibu Creek, San Gabriel River, and Santa Clara River. Volatile suspended solids (VSS) were positively correlated with TSS in Ballona Creek, Coyote Creek, and Dominguez Channel. Dissolved iron and iron

were positively correlated with TSS in Los Angeles River, San Gabriel River, and Santa Clara River, whereas dissolved iron was positively correlated with TSS in Malibu Creek. In Coyote Creek, additional positive correlations with TSS were found with biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved lead, lead, dissolved zinc, and dissolved arsenic. Lead was also positively correlated with TSS in San Gabriel River while ammonia, BOD, NH3 as N, and VSS were negatively correlated with TSS for this MES. In Los Angeles River, additional positive correlations with TSS were found with cyanide, nickel, and chromium.

Negative correlations with TSS were found in Santa Clara River for alkalinity as $CaCO_3$, chloride, fluoride, hardness, specific conductance, TDS, and pH. In Ballona Creek, COD was negatively correlated with TSS, while in Malibu Creek, BOD and chloride were negatively correlated with TSS.

Many constituents have a strong binding affinity for sediment particles in stormwater effluent, particularly bacteria, metals, organics, and total organic carbon (TOC). It is important to note that the correlations discussed above were based on a very small data set and may not be representative of true conditions during a storm. This is especially true of the data set for San Gabriel River. Analysis of a larger data set would help determine the validity of these correlations.

Correlations Between Constituents and Total Suspended Solids at Mass Emission Stations

Mass Emission/Watershed	Wet	
	Positively Correlated with TSS	Negatively Correlated with TSS
Ballona Creek (S01)	Ammonia, VSS, zinc	COD
Malibu Creek (S02)	Aluminum, dissolved aluminum, dissolved iron, zinc	BOD, Chloride
Los Angeles River (S10)	Cyanide, dissolved iron, iron, nickel, chromium	None
Coyote Creek (S13)	BOD, COD, dissolved lead, dissolved zinc, lead, VSS, zinc, dissolved arsenic	None
San Gabriel River (S14)[1]	Aluminum, dissolved aluminum, dissolved iron, iron, lead	Ammonia, BOD, NH3 as N, VSS
Dominguez Channel (S28)	VSS	None
Santa Clara River (S29)	Aluminum, dissolved aluminum, dissolved iron, iron, zinc	Alkalinity as $CaCO_3$, chloride, fluoride, hardness as $CaCO_3$, specific conductance, sulfate, TDS, pH

Wet Weather – Tributary Stations

Several priority constituents (those that did not meet water quality objectives at tributary stations for one or more events) were found to have positive correlations with TSS during wet weather. At TS20, TS21, TS22, and TS23, dissolved zinc is a priority constituent and was found to positively correlate with TSS at all of these stations. Additionally, dissolved lead was positively correlated with TSS at TS22 and TS23, stations where dissolved lead is a priority constituent.

Other positive correlations include aluminum and dissolved aluminum at TS20, TS22, and TS23. Additionally, dissolved aluminum was also positively correlated with TSS at TS21. Dissolved iron and iron were positively correlated with TSS at TS22, and TS23, whereas dissolved iron was also positively correlated with TSS at TS20 and TS24. Chromium, lead, and zinc were positively correlated with TSS at TS22 and TS23, whereas lead was positively correlated with TSS at TS24 and zinc was positively correlated with TSS at TS20. In TS20, TS21 and TS22 VSS was positively correlated with TSS. Nickel was also positively correlated with TSS in TS21. In TS20, NH3 as N was positively correlated with TSS, whereas in TS23, nitrate (NO_3) and nitrate

as N were positively correlated with TSS along with antimony. The only correlations with TSS for TS19 were positive correlations with COD and glyphosate. The only negative correlation with TSS in any of the tributary stations occurred with cyanide in TS24.

Correlations Between Constituents and Total Suspended Solids at Tributary Stations

Tributary Station/Watershed	Wet	
	Positively Correlated with TSS	Negatively Correlated with TSS
Project No. 1232 (TS19)	COD, glyphosate	None
PD 669 (TS20)	Ammonia, dissolved aluminum, dissolved iron, dissolved zinc, NH3 as N, VSS, zinc	None
Project Nos. 5246 & 74 (TS21)	Dissolved aluminum, dissolved zinc, VSS, nickel	None
PD 21-Hollypark Drain (TS22)	Aluminum, dissolved aluminum, dissolved iron, dissolved lead, dissolved zinc, iron, lead, VSS, zinc, chromium	None
D.D.I. 8 (TS23)	Aluminum, BOD, dissolved aluminum, dissolved iron, dissolved lead, dissolved zinc, iron, lead, nitrate (NO_3), nitrate as N, zinc, chromium, antimony	None
Dominguez Channel at 116th Street (TS24)	Dissolved iron, lead	Cyanide

ES.2.1.5 Wet Weather and Dry Weather Constituent Loads for Each Mass Emission Station

Constituent loads were calculated for each sampling event based on flow rates and constituent concentrations. The storm event beginning December 17, 2010 (2010–11Event08) had substantially higher rainfall totals than any of the other monitored storm events and, thus, generally had the highest loads for most constituents. At the more urbanized watershed monitoring stations, a first-flush signature (i.e., higher loads during the first monitored storm of the season than would be expected based on rainfall totals) was not observed for most constituents, due to the large amount of rain that fell during the December 17th storm event. The

total TSS load for each MES is shown in Table 4-8. An estimate of the total constituent loads for each MES is shown in Table 4-9. Overall, calculated TSS loads on the Los Angeles River were approximately one to two orders of magnitude greater than TSS loads at any of the other six MES during wet weather.

During dry weather, constituent loads varied greatly from station to station and among sampling events. Calculated TSS loads on the Los Angeles River were approximately one to two orders of magnitude greater than TSS loads at any of the other six MES during dry weather.

ES.2.1.6 Total Suspended Solids Trend Analysis

TSS concentrations from 2000 to 2011 were evaluated for normality and log-normal distributions separately for wet and dry weather at each MES. If the TSS concentrations were normal or log-normally distributed, then a regression analysis was used to evaluate trends. Multiple samples during each monitoring year were treated as replicates. If a normal or log-normal distribution was not found, then it was determined that the distribution of the data was not known. These results were evaluated for trends using the Mann-Kendall non-parametric method. The summary table below presents the method used for trend evaluation and the statistical trend information on TSS data collected at each of the MES over the past 11 years. The data are shown graphically on Figures 4-13.1 through 4-13.4.

Coyote Creek had the only significant wet weather trend (i.e., p-value less than 0.05) in TSS concentrations over the last 11 years. The TSS concentrations at Coyote Creek showed a negative trend, indicating that TSS concentrations have decreased significantly over time at this location. Malibu Creek (p-value = 0.055) also had a negative trend but the p-value was slightly greater than 0.05, the cutoff for significance.

No dry weather significant trends for TSS were found.

Trend Analysis of Wet Weather Total Suspended Solids Concentrations at Mass Emission Stations from 2000–2011

Station	p-value	Method	Trend
Ballona Creek at Sawtelle (S01)	0.110	Mann-Kendall	Not significant
Malibu Creek at Piuma (S02)	0.055	Regression	Not significant
Los Angeles River at Wardlow (S10)	0.670	Regression	Not significant
Coyote Creek at Spring (S13)	**0.025**	Mann-Kendall	Significant Decreasing
San Gabriel River (S14)	0.353	Regression	Not significant
Dominguez Channel at Artesia (S28)	0.156	Mann-Kendall	Not significant
Santa Clara River (S29)	0.137	Mann-Kendall	Not significant

Shading indicates significant p-value.

Trend Analysis of Dry Weather Total Suspended Solids Concentrations at Mass Emission Stations from 2000–2011

Station	p-value	Method	Trend
Ballona Creek at Sawtelle (S01)	0.605	Regression	Not significant
Malibu Creek at Piuma (S02)	0.101	Regression	Not significant
Los Angeles River at Wardlow (S10)	0.626	Regression	Not significant
Coyote Creek at Spring (S13)	0.181	Regression	Not significant
San Gabriel River (S14)	0.436	Regression	Not significant
Dominguez Channel at Artesia (S28)	0.451	Regression	Not significant
Santa Clara River (S29)	0.308	Mann-Kendall	Not significant

ES.2.1.7 Trash Monitoring

The objectives of trash monitoring are as follows:

- Assess the quantities of trash in receiving waters after storm events.
- Identify areas impaired for trash.

Visual observations of trash were made, and at least one photograph was taken at each MES after the first storm event and three additional storm events.

Results of trash compliance monitoring can be found in Appendix C (pictures), Appendix I (*Ballona Creek Watershed Trash Compliance Monitoring Report*), and Appendix J (*Los Angeles River Watershed Trash Compliance Monitoring Report*).

ES.3 Recommendations

The following recommendation for improving monitoring techniques is presented below. As it is a recommended monitoring change, it could be initiated by LACFCD, after appropriate consultation with the Los Angeles RWQCB and Copermittees

- Monitoring for the Dominguez tributaries was extended to a third year (2010-2011) to collect more data, and therefore the recommendation from the 2009-2010 Annual Monitoring Report to monitor Malibu Creek tributaries was not implemented during the 2010-2011 period. Tributary monitoring is still recommended for Malibu Creek to distinguish between naturally occurring and anthropogenic concentrations of sulfate and other priority constituents. Tributary concentrations in developed areas of the watershed could be compared against undeveloped areas of the watershed to identify naturally occurring constituent concentrations. If no significant sulfate concentrations are detected in the developed portion of the watershed, it could be inferred that any concentrations measured above these concentrations are naturally occurring.

- A literature review of the cyanide method used for evaluation may provide interesting information about whether or not interference from other analytes is expected to affect cyanide results. In addition, the analytical method to test for total cyanide levels should be assessed and other methods proposed as necessary to determine the bioavailable fraction of cyanide in the environment.

- Sample analysis of *e. coli* is recommended for future monitoring, based on the recently adopted Resolution No. R10-005. Currently, fecal coliform are analyzed for both storm water and ambient or dry conditions at the MES. However, because bacteria standards have been changed to require *e. coli* monitoring, instead of fecal coliform, *e. coli* should replace fecal coliform and fecal coliform monitoring should be discontinued.

- The analysis of TSS and other constituents is limited to one year of monitoring data, and it is recommended that the past five to ten years of data be included in next year's evaluation to determine whether or not TSS and other monitored constituents are often correlated.

- It is recommended that pH levels should be monitored in the field to limit effects of water hardness and alkalinity on changes to the pH levels measured in the analytical laboratory. The holding time for pH is approximately 10-15 minutes, and so composite samples may be out of holding time when the sample arrives at the laboratory.

- It is recommended that an evaluation of the bioavailable fraction of dissolved metals (including the copper, lead, and zinc dissolved metals) should be estimated by using the biotic ligand model as a data evaluation exercise of available data. Because the dissolved metals water quality objectives are low, due to low hardness levels, and the toxicity results are also low, it is possible that the measured dissolved metals concentrations are not negatively impacting aquatic life.