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ES.0 EXECUTIVE SUMMARY

ES.1 Purpose

There are 21 Municipal Copermittees (Copermittees) covered under a municipal NPDES permit for discharge of urban runoff to waters of the United States (RWQCB Order No. R9-2007-0001) (Permit). The participating Copermittees share the costs of monitoring required for compliance with this permit. Copermittees include:

City of Carlsbad	City of Oceanside
City of Chula Vista	City of Poway
City of Coronado	City of San Diego
City of Del Mar	City of San Marcos
City of El Cajon	City of Santee
City of Encinitas	City of Solana Beach
City of Escondido	City of Vista
City of Imperial Beach	County of San Diego
City of La Mesa	San Diego Unified Port District
City of Lemon Grove	San Diego County Regional Airport Authority
City of National City	

The purpose of this report is to provide the data and analyses required by the Permit (Section III.A of the Order). The Receiving Waters and Urban Runoff Monitoring and Reporting Program section of the Permit requires the Copermittees to collaborate with all other Copermittees to develop, conduct, and report on an annual watershed-based Receiving Waters Monitoring Program. This report provides a summary of the 2008–2009 Receiving Waters Monitoring Program for the Copermittees identified as dischargers of urban runoff in the Permit.

This report marks the second year of monitoring and reporting under the Permit. The following monitoring activities were conducted by the Copermittees during the 2008–2009 Monitoring Season:

- Receiving waters monitoring program
  - Ambient weather monitoring (SMC Regional Monitoring Program Participation)
  - Wet weather monitoring of all MLS during one wet weather event for chemistry, toxicity, synthetic pyrethroids, and bacteria in accordance with the Permit.
  - Rapid stream bioassessment (RSB) monitoring was conducted as part of the Stormwater Monitoring Coalitions Regional Monitoring Program.
    - Ambient chemistry, toxicity, rapid stream bioassessment monitoring
    - Physical habitat assessments
    - Benthic algae monitoring (periphyton)
  - Bight ’08 Coastal Ecology (Lagoon/Estuary Sampling)
    - Chemistry, toxicity, and benthic macroinvertebrate community assessments

        - Data evaluated using recently approved Sediment Quality Objective Guidelines.
    - Coastal storm drain monitoring (CSDM).
    - Ambient bay and lagoon monitoring (ABLM; not required during 2007-2008 monitoring).
    - Third Party Data Assessments
        - Regional Harbor Monitoring Program (RHMP)
            - Applicable to Oceanside Harbor, Mission Bay, and San Diego Bay
        - Chollas Creek TMDL Monitoring and Special Studies
        - San Diego River Special Studies Monitoring
        - Lower Tijuana River Watershed Clean Beaches Initiative Grant data

- Urban runoff monitoring.
    - Municipal separate storm sewer system (MS4) outfall monitoring.
        - Random wet and dry weather sampling
        - Targeted dry weather sampling
    - Source identification monitoring program.
        - Dry weather runoff characterization of discharges from single-family residences (conducted in City of Del Mar and City of La Mesa)
    - Coastal storm drain monitoring (CSDM).
    - Jurisdictional dry weather monitoring program (DWM) and trash assessments.

- Watershed assessments for annual report.
    - Receiving water trend analysis.
    - Follow-up analysis and actions: Triad assessment.

ES.2 Watershed Water Quality Monitoring Methods

ES.2.1 Receiving Waters Monitoring Methods

ES.2.1.1 Ambient Monitoring (SMC Program)

Ambient weather condition monitoring was conducted in San Diego County in accordance with the Permit where applicable. Due to the participation in Bight ’08, ambient monitoring was not required as part of the core monitoring program. Ambient conditions in the receiving waters of San Diego County were assessed using data collected as part of the SMC Regional Monitoring Program. The program uses the following three major components of the assessment triad to evaluate the receiving waters: water quality, toxicity, and rapid stream bioassessment. Samples were randomly selected from three strata including open space, agriculture, and urban areas. Ambient weather water quality samples were collected as grab samples in accordance with the SMC Regional Monitoring Workplan. The results of the ambient monitoring event were summarized in the individual watershed management area (WMA) sections. Watersheds were compared by examining key constituents within the watersheds to determine similarities among the areas, land use, and watershed characteristics. Key constituents were defined either as a potential concern based on the frequency and magnitude of concentrations above the applicable

ambient weather water quality benchmark (benchmark) and/or an indicator of water quality within a constituent group (e.g., total phosphorus is an indicator constituent in the nutrient group). WMA specific findings are presented in Table ES-1 through Table ES-9. The regional summary of findings is discussed in Section ES.4.1.1.

ES.2.1.2 Wet Weather Monitoring

Wet weather (storm event) condition monitoring was conducted during one wet weather event in accordance with Permit Year 2 (Bight '08 Monitoring). Monitoring was conducted once at each of the historical MLS sites listed in the Permit. Storm event samples were collected using flow-weighted composite techniques and using grab samples for those parameters not conducive to compositing. The results of each storm event were summarized in the individual WMA sections. Watersheds were compared by examining key constituents across watersheds and over time to determine similarities among the areas, land use, and watershed characteristics. Key constituents were defined as having either been rated as a potential concern based on the frequency and magnitude of concentrations above the applicable wet weather benchmark and/or being an indicator of water quality within a constituent group (e.g., total phosphorus is an indicator constituent in the nutrient group). Post storm pyrethroid sediment monitoring was also implemented and described in the ambient monitoring sections. TIEs were not conducted in water samples during the 2008–2009 Monitoring Season. WMA specific findings are presented in Table ES-1 through Table ES-9. The regional summary of findings is discussed in Section ES.4.1.2.

ES.2.1.3 Rapid Stream Bioassessment Monitoring

RSB monitoring was conducted in accordance with Permit year two. The Fall 2008 bioassessment sampling was not required as a result of Addendum No. 2 of the Permit, which specified that fall bioassessment surveys would not be required if the Copermittees participated in the SMC Spring 2009 Regional Sampling Program. During the 2008–2009 Monitoring Season, the Copermittees elected to participate in the SMC Monitoring Program, and therefore, only conducted the RSB Program survey during Spring 2009. Samples were collected from 16 randomly selected sites in accordance with the SMC Regional Monitoring Workplan. Due to the Bight '08 monitoring year, RSB monitoring was not conducted at the MLS or TWAS during the 2008–2009 Monitoring Season. RSB monitoring was conducted pursuant to California Department of Fish and Game (CDFG) RSB monitoring procedures to provide a measure of stream health. During the RSB surveys, periphyton monitoring was conducted in accordance with the United States Environmental Protection Agency (USEPA) Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (EPA 841-B-99-002, Section 6.2).

ES.2.1.4 Bight '08 Coastal Ecology Lagoon/Estuary Monitoring

The Copermittees participated in the Bight '08 Program in lieu of conducting the complete regional storm water monitoring requirements during the 2008–2009 monitoring season as allowed in the Permit. The Copermittees contributed in-kind services and funds for three separate Bight '08 studies (Sediment Quality, Coastal Wetland Eutrophication, and Coastal Microbiology). The San Diego County Municipal Copermittees developed a San Diego Regional Bight 2008 Coastal Estuary Workplan. The Copermittees also supported the coastal wetland study in lieu of 2007–2008 Ambient Bay and Lagoon Monitoring (ABLM) as permitted by the

June 12, 2008, letter to the County of San Diego from Mr. John Robertus of the SDRWQCB. The Coastal Microbiology Workplan was still under development during the 2008–2009 Monitoring Season. For the purposes of this report, the Copermittees are reporting on Sediment Quality from the region's lagoons/estuaries.

The Copermittees selected eight lagoons/estuaries in the San Diego Region for inclusion in the Bight '08 program as follows:

- Santa Margarita Lagoon
- Agua Hedionda Lagoon
- Batiquitos Lagoon
- San Elijo Lagoon
- Los Peñasquitos Lagoon
- San Diego River Estuary
- Sweetwater River Estuary
- Tijuana River Estuary

The Copermittees Bight '08 Workplan was designed to provide data needed to answer questions related to the Southern California Bight, the San Diego Region, and the individual lagoons of study. San Diego Copermittees used a longitudinal-transect study to investigate changes in sediment conditions with greater distances from freshwater-input areas of lagoons. Lagoons were partitioned into five segments and sampling stations were located using a tessellated random sampling design consistent with Bight protocols. Sediment samples were collected and analyzed for chemistry, toxicity, and benthic community assemblages. Data were assessed using the recently developed SQOs. Surface water quality monitoring of bacteria and TSS during sediment sampling events also provide an assessment of ambient water quality in the lagoons during the summer months. The lagoon sediment sampling commenced in July 2008 and continued through September 2008 for consistency with the SCCWRP Bight '08 Program.

ES.2.1.5 Coastal Storm Drain Monitoring

Each coastal jurisdiction conducts a separate CSDM Program. The purpose of the CSDM Program is to detect and eliminate illegal connection and illicit discharges (ICIDs) resulting in coastal beach closures for bacteria. Samples are collected from outfalls and receiving waters and are analyzed for fecal indicator bacteria (total coliform, fecal coliform, and enterococci) in accordance with the CSDM Program Work Plan (SDCRC, 2007). The results from the CSDM Program are provided annually as a separate report in Appendix N.

ES.2.1.6 Ambient Bay and Lagoon Monitoring

The ABLM program was not required to be implemented during the 2008–2009 monitoring year as the San Diego RWQCB authorized a tradeoff of required program resources in order to provide additional support for the Bight '08 Monitoring Program (RWQCB WPS: Place Number 720562: lbusse). The Bight '08 Monitoring Program is a Southern California region-wide study conducted every five years. An extensive Bight '08 sediment study was implemented

in San Diego's lagoons during the Summer of 2008. The Copermittees Bight '08 Program is designed to answer specific questions related to assessing the ecological health of the lagoons and determine if any relationship or linkage could be inferred between the lagoon and the conditions at the mass loading stations (MLS). Sediment sample results from the lagoons will be assessed following the newly developed sediment quality guidelines. Following the results of the Bight '08 Monitoring Program, the Copermittees collaboratively developed a new ABLM Program to comply with the permit requirements. The program was submitted with the 2009-2010 (Permit year three) scope of work.

ES.2.2 Urban Runoff Monitoring Methods

ES.2.2.1 Municipal Separate Storm Sewer System Outfall Monitoring

During the 2007–2008 Monitoring Season, the Copermittees collaboratively developed the MS4 Outfalls Monitoring Program in San Diego County Watershed Management Areas (SDCRC, 2008). The purpose of this program is to characterize pollutant discharges from MS4 outfalls in each watershed during wet weather and dry weather as required by the Permit (Section II.B.1 of the Order). The targeted MS4 Outfall Monitoring Program was fully implemented in the 2008–2009 monitoring year. WMA specific findings are presented in Table ES-1 through Table ES-9. The regional summary of findings is discussed in Section ES.4.2.1.

ES.2.2.2 Source Identification Monitoring Program Methods

During the 2008–2009 Monitoring Season, the Copermittees developed and implemented their Source Identification Monitoring Program to assess dry weather runoff from single family residences. The goal of this study was to collect dry weather residential land use discharge data for application to regional assessments since residential land uses comprise the most common land uses in urban areas. Dry weather runoff samples were collected and analyzed for conventional chemistry, nutrients, fecal indicator bacteria, dissolved metals (cadmium, copper, lead, and zinc), organophosphate pesticides, and synthetic pyrethroids. A secondary goal of collecting the data was to compare data collected in San Diego County to data collected from an intensive residential land use runoff study under a Proposition 50 Grant in Orange County and Sacramento County (Haver, 2007) when it becomes available.

ES.2.2.3 Coastal Storm Drain Monitoring

The CSDM program is a requirement of the receiving waters monitoring program; however, the findings are applicable to the urban runoff monitoring program and, therefore included in the urban runoff area assessments. WMA specific findings are presented in Table ES-1 through Table ES-9.

ES.2.2.4 Jurisdictional Dry Weather Monitoring

Each jurisdiction conducts a separate Dry Weather Monitoring (DWM) Program described in each Jurisdictional Urban Runoff Management Program Annual Report. Dry weather samples are collected from the jurisdictions' MS4 to detect and eliminate ICIDs. Samples are collected from May 1 through September 30 each Permit year. The results of the 2008 DWM Program were included in this report's data assessment and provide a comparison of urban runoff in the MS4 to the ambient weather and storm event receiving water condition. WMA specific findings

are presented in Table ES-1 through Table ES-9. The regional summary of findings is discussed in Section ES.4.2.4.

ES.2.3 Watershed Assessments for Annual Report

ES.2.3.1 Receiving Water Trends Assessment

The results for the 2008–2009 Monitoring Season were combined with the previous years' results, and were statistically compared to identify temporal trends within each watershed. WMA specific findings are presented in Table ES-1 through Table ES-9. The regional summary of findings is discussed in Section ES.4.3.1.

ES.2.3.2 Follow-up Analysis and Action: Triad Assessment

The triad decision matrix incorporates the chemistry data from wet and dry weather events with the toxicity and bioassessment results to provide indications of pollutant loading, potential impacts to organisms and the ecological health of the watershed. The triad assessment presents possible conclusions regarding the watershed and provides possible actions or decisions for future monitoring and assessment. The regional summary of findings is discussed in Recommendation Section ES.5.

ES.2.3.3 2001–2006 Baseline Long-Term Effectiveness Assessment Ratings

The BLTEA ratings are used to guide long-term programmatic watershed activities and are performed on a five-year cycle. The WMA assessments are used to guide annual water quality monitoring activities and to evaluate annual differences or changes through time. The WMA COCs are compared to the BLTEA ratings to evaluate if activities are showing improvements or impairments through the five-year cycle. WMA specific findings are presented in Table ES-1 through Table ES-9.

ES.3 Summary of Monitoring Findings

San Diego County is divided into nine WMAs (Figure ES-1). The results of the water quality monitoring activities and the assessments are presented for each WMA within this report. A summary of the findings are presented in tables ES-1 through ES-9 for each WMA.

Figure ES-1. San Diego Watershed Management Areas

Table ES-1. Summary of Santa Margarita River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
Santa Margarita River WMA	Receiving Water Monitoring	Ambient Receiving Water Summary	▪ Constituent Summary: – TDS and total nitrogen > benchmark in 100% of samples (based on 2007–2008 data). ▪ Ambient monitoring was not conducted in 2008–2009 in the Santa Margarita River WMA due to the random site selection process in the Stormwater Monitoring Coalition (SMC) Program	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (fecal coliform) – Medium frequency of occurrence (TSS and turbidity) ▪ Constituents with a magnitude of exceedance by more than five times the benchmark included TSS, turbidity and fecal coliform. ▪ No persistent toxicity was observed.	
		Rapid Stream Bioassessment	▪ Historic benthic macroinvertebrate IBI ratings of Poor were observed at Willow Glen and De Luz Road suggesting some evidence of benthic alteration. Fair ratings were observed at Rainbow Creek and Sandia Creek (reference site) suggesting little evidence of benthic alteration.	
		Bight 08	▪ Data from the Santa Margarita Estuary indicated concentrations of bacteria and TSS were below benchmarks in all samples. ▪ Sediment results identified three sites as likely unimpacted and two sites as unimpacted based on SQO Guidelines.	
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4, CSDM)	▪ Results above action level or receiving water benchmarks: – Jurisdictional: No data – MS4: TDS, TSS, Nitrate, Nitrate/Nitrite, Total nitrogen, Total phosphorus, Fecal coliform, Enterococci, Total iron ▪ Results suggest that the MS4 discharges may have the potential to contribute to receiving water problems for some constituents such as TDS and enterococci. ▪ CSDM: coastal storm drains do not impact coastal receiving waters with any regular frequency.	3, 4
		Wet Weather Urban Runoff Assessment (MS4, CSDM)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ CSDM: coastal storm drains do not impact coastal receiving waters with any regular frequency.	
	WMA Assessment	Receiving Water Trend Assessment	▪ No significantly increasing trends were observed. ▪ Significantly decreasing trends were observed for fecal coliform.	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for fecal coliform was consistent with the 2001–2006 BLTEA ratings for bacteria/pathogens.	

1: Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking method is described in Appendix B.

Recommendations for Santa Margarita River WMA

The recommendations for the Santa Margarita River WMA are to continue monitoring at the MLS to determine long-term trends, to continue monitoring for toxic and benthic impacts, and to identify upstream sources of COCs.

Specific recommendations for the Santa Margarita River WMA are based on the triad assessment. Based on wet weather conditions, no action is necessary to address toxic chemicals. Addressing the potential role of urban runoff in causing physical habitat disturbance is also recommended.

Table ES-2. Summary of San Luis Rey River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
San Luis Rey River WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ Constituent Summary: – TDS > benchmark in 100% of samples. – Total nitrogen, total phosphorus, chloride, and sulfate and enterococci > benchmark in 75% of samples – Turbidity, COD, and fecal coliform > benchmark in 25% of samples. ▪ Total nitrogen was the only constituent with a magnitude of exceedance greater than five times its benchmark ▪ No persistent toxicity was observed. ▪ No pyrethroids were detected in post storm sediments*.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (TDS and fecal coliform). – Low frequency of occurrence (turbidity, total coliform and enterococci). ▪ Fecal coliform was the only constituent with a magnitude of exceedance more than five times the benchmark. ▪ No persistent toxicity was observed. ▪ Bifenthrin* was detected in storm water at concentrations likely to cause toxicity; however, no toxicity was observed.	
		Rapid Stream Bioassessment	▪ Altered benthic macroinvertebrate communities (Very Poor IBI ratings) were observed.	
		Third Party	▪ RHMP – in Oceanside Harbor, dissolved copper (likely associated with marine antifouling paint on boat hulls) was the only analyte to exceed water quality benchmarks. Sediment quality objective results indicated that one site was reference, one was possibly impacted, and one site was likely impacted based on SQO Guidelines. This site is hydrologic ally disconnected from the San Luis Rey River.	
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4, CSDM)	▪ Results above action levels or receiving water benchmarks: – Jurisdictional: pH, conductivity, turbidity, ammonia, orthophosphate, nitrate, Total coliform, Fecal coliform, Enterococci. – MS4: TDS, Chloride, TSS, Nitrate, Total Nitrogen, Total phosphorus, Fecal coliform, Enterococci). ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	3, 4
		Wet Weather Urban Runoff Areas Assessment (MS4, CSDM)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	
	WMA Assessment	Receiving Water Trend Assessment	▪ Significantly increasing trends were observed for indicator bacteria (total coliforms, fecal coliforms, and enterococci), dissolved phosphorus, and turbidity. ▪ Significantly decreasing trends were observed for TDS and total hardness.	5

Table ES-2. Summary of San Luis Rey River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for TDS, and fecal coliform are consistent with the 2001–2006 BLTEA ratings as it relates to Lower San Luis Rey HA.	

Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

* The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.

Recommendations for San Luis Rey River WMA

The recommendations for the San Luis Rey River WMA are to continue with the requirements of the Permit, including monitoring at the MLS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs. For the next full round of Permit monitoring in north San Diego County (Permit Year 2010-2011), the Copermittee Monitoring Workgroup will review and consider alternate locations for the TWAS to gather relevant information for assessing the watershed. Future MS4 Outfall and Source Identification Monitoring may be best focused in the areas of the Lower San Luis HA.

Specific recommendations for the San Luis Rey River WMA are based on the triad assessment. The recommended actions based on ambient and wet weather conditions include the following:

- No action necessary to address toxic chemicals.
- Address potential role of urban runoff in causing physical habitat disturbance.

Table ES-3. Summary of Carlsbad Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
Carlsbad WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ Constituent Summary: – Loma Alta HA ▪ TDS and total nitrogen > benchmark in 100% of samples – Buena Vista Creek HA ▪ TDS and total nitrogen >benchmark in 100% of samples; enterococci > benchmark in 50% of samples – Agua Hedionda Creek HA ▪ TDS >benchmark in 100% of samples; fecal coliform and enterococci > benchmark in75% of samples; total nitrogen and total phosphorus > benchmark in ≤ 50% of samples – San Marcos HA ▪ Chloride, sulfate, total nitrogen, total phosphorus > benchmark in 100% of samples (based on single sample) – Escondido Creek HA ▪ TDS and total nitrogen > benchmark in 100% of samples; enterococci > benchmark in 50% of samples; COC, total phosphorus and fecal coliform > benchmark in 25% of samples. ▪ No constituents were observed to have a magnitude of exceedance of greater than five times their benchmark. ▪ Pyrethroids were not detected above the reporting limit in post-storm sediment samples*.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of Concern[1]: – High frequency of occurrence: ▪ Loma Alta HA (TSS, turbidity, fecal coliforms, enterococci) (based on one year of data). ▪ Buena Vista (TSS, turbidity, total coliforms, fecal coliforms, enterococci) (based on one year of data) ▪ Agua Hedionda (TSS, turbidity, total coliforms, fecal coliforms, and enterococci ▪ Escondido Creek (TDS, turbidity, total coliforms, fecal coliforms, and enterococci) – Medium or low frequency of occurrence: ▪ Loma Alta (total coliforms) ▪ Agua Hedionda (TDS and Chlorpyrifos) ▪ Escondido Creek (TSS) ▪ Fecal coliforms had a magnitude of exceedance greater than five times the benchmark at Agua Hedionda Creek and Escondido Creek. ▪ Persistent toxicity to *Hyalella azteca* was observed at Buena Vista Creek, Loma Alta Creek and Agua Hedionda Creek sites. ▪ Pyrethroids were detected in receiving waters at concentrations above water quality benchmarks at Agua Hedionda MLS, but not Escondido Creek MLS.	
		Rapid Stream Bioassessment	▪ Altered benthic macroinvertebrate communities (Very Poor IBI ratings) were observed at all sites.	

Table ES-3. Summary of Carlsbad Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
		Bight 08	▪ Bacteria and TSS were low and below benchmarks in all ambient water samples collected in each lagoon monitored. ▪ Agua Hedionda Lagoon ▪ Sediment quality results identified two sites as unimpacted, two sites as likely unimpacted, and one site as possibly impacted. Batiquitos Lagoon – Sediment quality results identified two sites as likely unimpacted, one site as unimpacted, one site as possibly impacted, and one site as likely impacted based on SQO Guidelines. – A toxicity identification evaluation was conducted for the one site identified as likely impacted and indicated naturally occurring ammonia was the causative agent of toxicity and not toxic chemicals. The overall result of the likely impacted site was changed to likely unimpacted based on the SQO Guidance. ▪ San Elijo Lagoon – Sediment quality results identified three sites as likely unimpacted, one site as inconclusive, and one site as likely impacted. – The TIEs also identified the one site as likely impacted was due to naturally occurring ammonia and not toxic chemicals. The overall result of the likely impacted site was changed to likely unimpacted based on the SQO Guidance. • Benthic Community impacts were likely due to physical habitat disturbances and lagoon specific conditions, but were not associated with chemically mediated effects.	
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4, CSDM)	▪ Results above action levels or receiving water benchmarks: – Loma Alta HA: ▪ Jurisdictional: No data ▪ MS4: TSS, total nitrogen, total phosphorus, fecal coliform, enterococci – Buena Vista Creek HA: ▪ Jurisdictional: No data ▪ MS4: TDS, TSS, total nitrogen, total phosphorus, fecal coliform, enterococci – Agua Hedionda HA: ▪ Jurisdictional: pH, conductivity, turbidity, ammonia, orthophosphate, total coliform, fecal coliform, enterococci ▪ MS4: TDS, sulfate, nitrate, nitrate/nitrite, total phosphorus, fecal coliform, enterococci, total manganese, total selenium – San Marcos HA: ▪ Jurisdictional: No data ▪ MS4: TDS, total nitrogen, total phosphorus, fecal coliform, enterococci – Escondido Creek HA: ▪ Jurisdictional: pH, oil and grease, turbidity, nitrate, total coliform, fecal coliform, enterococci ▪ MS4: TDS, TSS, sulfate, total nitrogen, total phosphorus, fecal coliform, enterococci, total manganese, total selenium	3, 4

Table ES-3. Summary of Carlsbad Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
			▪ Assessments of trash indicated that Loma Alta and Buena Vista Creek HAs were impacted the most by trash. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	
		Wet Weather Urban Runoff Assessment (MS4)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters	
	WMA Assessment	Receiving Water Trend Assessment	▪ In the Agua Hedionda HA, significantly increasing trends were observed for COD, fecal coliforms, total copper, total lead, total nickel, total coliforms, TSS, turbidity and total zinc. Significantly decreasing trends were observed for dissolved arsenic and Diazinon. ▪ In the Escondido Creek HA, significantly increasing trends were observed for total zinc. Significantly decreasing trends were observed for dissolved nickel and Diazinon.	▪ 5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for TDS, TSS and turbidity and indicator bacteria are, in general, consistent with the 2001–2006 BLTEA ratings.	

Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

*The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.

Recommendations for the Carlsbad WMA

Where possible, given these differences in monitoring programs, the recommendations have been generalized for each HA in the Carlsbad WMA.

- The recommendations for the Carlsbad WMA are to continue with the requirements of the Permit, including monitoring at the MLS and TWAS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs.

- For the next full round of Permit monitoring in north San Diego County (Permit Year 2010–2011), the Copermittee Monitoring Workgroup will review and consider alternate locations for the TWAS in order to gather relevant information for assessing the watershed. In addition, continued monitoring at the TWAS will allow for establishing long-term trends, and assess toxic and benthic impacts.

- In addition, special studies targeted at identifying subwatershed sources of indicator bacteria, and TSS and turbidity would be useful for prioritization and characterization of the watershed.

Site specific recommendations are provided for each HA below.

Loma Alta:
Specific recommendations for the Loma Alta HA are based on the triad assessment listed in the Permit. Recommended actions for wet weather were not developed for 2008–2009 because no TWAS stations were located in the Loma Alta HA during this monitoring season.

The recommended action based on ambient weather conditions is to address upstream sources as a high priority.

Loma Alta HA:
Based on the possible actions or decisions from the WMA triad framework, a toxicity identification evaluation (TIE) should be considered to identify the toxic agent responsible for the observed toxicity, and an evaluation of potential sources of toxicity in the Loma Alta HA should also be considered. However, based on similar toxicity patterns identified in the Agua Hedionda, Buena Vista, and Escondido Creek HAs, pyrethroids (primarily Bifenthrin) are likely the toxic agent. A TIE identified pyrethroids as the likely toxic agent from the Agua Hedionda 2007–2008 storm event samples. Therefore, additional TIEs are not recommended for the Loma Alta HA. Consideration of additional parameters, continuation of monitoring to gather long-term trend information, and addressing upstream sources of TSS and turbidity is recommended.

Buena Vista:
Based on the possible actions or decisions from the WMA triad framework, a TIE should be considered to identify the toxic agent responsible for the observed toxicity, and an evaluation of potential sources of toxicity in the Buena Vista Creek HA should also be considered. However, based on similar toxicity patterns identified in the Agua Hedionda, Buena Vista, and Escondido Creek HAs, pyrethroids (primarily Bifenthrin) are likely the toxic agent. A TIE identified pyrethroids as the likely toxic agent from the Agua Hedionda 2007–2008 storm event samples. Therefore, additional TIEs are not recommended for the Buena Vista Creek HA. Consideration of additional parameters, continuation of monitoring to gather long-term trend information, and addressing upstream sources of TSS and turbidity is recommended.

Agua Hedionda:
Based on the possible actions or decisions from the WMA triad framework, a TIE is recommended to identify COCs; however, a TIE was conducted in 2007–2008 and pyrethroids were found to be the causative agent. Therefore, additional TIEs are not recommended at this time. Addressing upstream sources of TSS, and turbidity is recommended. Consideration of additional parameters, continuation of monitoring to gather long-term trend information, and consideration of the potential role of physical habitat disturbance is also recommended.

San Marcos:
The recommendations for this watershed are to continue with the requirements of the Permit, monitoring for toxic and benthic impacts and identification of upstream sources of COCs. A triad assessment could not be completed for the San Marcos HA because an ambient assessment was not conducted and no wet weather monitoring occurred in 2008–2009.

Escondido Creek:
Based on the possible actions or decisions from the WMA triad framework, identification of the upstream sources of turbidity should be considered. In addition, Consideration of additional parameters, continuation of monitoring to gather long-term trend information, and consideration of the potential role of physical habitat disturbance is recommended.

Table ES-4. Summary of San Dieguito Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
San Dieguito River WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ Constituent Summary: – TDS, chloride, sulfate, and total nitrogen > benchmark in 100% of samples. – Total phosphorus and enterococci > benchmark in 51 to 75% of samples. – TSS, Turbidity, and BOD > benchmark in 25 to 51% of samples. ▪ No constituents had a magnitude of exceedance greater than five times their benchmark.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (TDS). – Medium frequency of occurrence (fecal coliform) – Low frequency of occurrence (TSS and turbidity). ▪ No constituents had a magnitude of exceedance greater than five times the benchmark. ▪ No persistent toxicity was observed. ▪ Bifenthrin was not detected in storm water at the MLS site*. ▪ No pyrethroids were detected in post-storm sediment samples at the MLS.	
		Rapid Stream Bioassessment	▪ Altered benthic macroinvertebrate communities (Very Poor IBI rating at TWAS-1 and Poor at MLS).	
	Urban Runoff Monitoring	Ambient Urban Runoff Areas Assessment (Jurisdictional, MS4, CSDM)	▪ Results above action levels or receiving water benchmarks – Jurisdictional: Dissolved copper – MS4: TDS, TSS Chloride, Sulfate, Total phosphorus, Total nitrogen, Fecal coliform, Enterococci, Total Aluminum, and Total manganese) ▪ Results suggest that for some constituents, the MS4 runoff may have the potential to contribute to receiving water problems. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	3, 4
		Wet Weather Urban Runoff Areas Assessment (MS4, CSDM)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	
	WMA Assessment	Receiving Water Trend Assessment	▪ Significantly increasing trends were observed for TKN, total phosphorus, and conductivity. ▪ No significantly decreasing trends were evident.	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for TDS is consistent with the 2001–2006 BLTEA ratings as it relates to the Solana Beach, Hodges, and San Pasqual HAs.	

*The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.

Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

Recommendations for San Dieguito River WMA

The recommendations for the San Dieguito River WMA are to continue monitoring in accordance with the Permit requirements, including monitoring at the MLS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs. For the next full round of Permit monitoring in north San Diego County (Permit Year 2010–2011), the Copermittee Monitoring Workgroup will review and consider alternate locations for the TWAS to gather relevant information for assessing the watershed.

Specific recommendations for the San Dieguito River WMA are based on the triad assessment listed in the Permit. Based on wet weather conditions, no action is necessary to address toxic chemicals, but addressing the potential role of urban runoff in causing physical habitat disturbance is recommended.

Table ES-5. Summary of Los Peñasquitos Lagoon Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
Los Peñasquitos WMA	Receiving Water Monitoring	Ambient Receiving Water Summary	▪ Constituent Summary: – TDS, chloride, sulfate, and enterococci > benchmark in 100% of samples. – Total nitrogen > benchmark in 33% of samples – Total phosphorus > benchmark in 22% of samples ▪ No constituents had magnitudes of exceedance greater than five times their benchmark. ▪ Toxicity was observed for the *Ceriodaphnia dubia* reproductive endpoint, 96-hour survival, and 7-day survival at one random SMC site (Site SMC-01158)	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (TDS, fecal coliform). – Low frequency of occurrence (TSS, turbidity and enterococci). ▪ Fecal coliform was the only constituent with a magnitude of exceedance of more than five times the benchmark. ▪ Neither toxicity nor pesticides were detected during 2008-2009 wet weather monitoring at the MLS. ▪ Pyrethroid concentrations were below detection limits in all sediment samples[1].	
		Rapid Stream Bioassessment	▪ Altered benthic macroinvertebrate communities (Very Poor IBI ratings) were observed.	
		Bight 08	▪ Water column TSS and bacterial concentrations were below the ambient benchmarks ▪ Results indicated two of five sites were unimpacted and three of five sites were likely unimpacted based on SQO Guidelines.	
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4, CSDM)	▪ Results above action levels or receiving water benchmark: – Jurisdictional: conductivity, turbidity, ammonia, nitrate, total coliform, fecal coliform, enterococci – MS4: TDS, TSS, nitrate/nitrite, total N, fecal coliform, enterococci ▪ The dry weather MS4 monitoring results suggest that the MS4 effluent may have the potential to contribute to receiving water problems for some constituents. ▪ Trash assessments indicated portions of the upper watershed had the highest occurrence of observed trash. Trash sources were related to littering and dumping. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	3, 4

Table ES-5. Summary of Los Peñasquitos Lagoon Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
		Wet Weather Urban Runoff Summary (MS4)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ CSDM: Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	
		Source Identification Program	▪ Results indicated synthetic pyrethroids were associated with single family residential runoff. Nitrate and elevated TDS were likely associated with groundwater discharges as opposed to urban runoff from overland sources.	
	WMA Assessment	Receiving Water Trend Assessment	▪ Significantly increasing trends were observed for fecal coliform. ▪ Significantly decreasing trends were observed for total lead.	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for TDS and fecal coliform, together with the benthic alterations, are consistent with the 2001–2006 BLTEA ratings.	

1 The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.
Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking method is described in Appendix B.

Recommendations for Los Peñasquitos Creek WMA

The recommendations for the Los Peñasquitos Creek WMA are to continue with the requirements of the Permit, including monitoring at the MLS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs. For the next full round of Permit monitoring in north San Diego County (Permit Year 2010–2011), the Copermittee Monitoring Workgroup will review and consider alternate locations for the TWAS to gather relevant information for assessing the watershed.

Specific recommendations for the Los Peñasquitos Creek WMA are based on the triad assessments in the Permit. Based on wet weather conditions, no action is necessary to address toxic chemicals. Addressing the potential role of urban runoff in causing physical habitat disturbance is recommended.

Table ES-6. Summary of the Mission Bay and La Jolla Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
Mission Bay and La Jolla WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ Constituent Summary: – Total nitrogen > benchmark in 100% of samples – Chloride, sulfate, and total phosphorus > benchmark in 50% of samples ▪ No constituents were observed at a magnitude of exceedance more than five times the benchmark. ▪ Ambient toxicity was observed at one location in the upper Tecolote Creek Site during the SMC Monitoring. No toxicity was observed at the Rose Canyon Creek SMC Site.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (turbidity, total coliform, fecal coliform, enterococcus). ▪ Fecal coliform was the only constituent with a mean magnitude of exceedance more than five times the benchmark. ▪ No persistent toxicity was observed.	
		Rapid Stream Bioassessment	• Altered benthic macroinvertebrate communities (Very Poor IBI ratings) were observed at both monitored sites.	
		Third party	RHMP – dissolved copper was the only analyte to exceed water quality benchmarks. Throughout Mission Bay, overall sediment quality was determined to be unimpacted at 8 of 8 sites monitored based on SQO Guideline assessments.	
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4, CSDM)	▪ Results above action levels or benchmarks: – Jurisdictional: pH, Conductivity, Turbidity, Nitrate, Total coliform, Enterococci – MS4: TDS, Total nitrogen, Total phosphorus, Fecal coliform, Enterococci ▪ Fecal coliform and enterococci were the only constituents with a magnitude of exceedance greater than five times the benchmark. ▪ Trash assessment found no Submarginal or Poor rated sites. ▪ CSDM: coastal storm drains do not impact coastal receiving waters with any regular frequency.	3, 4
		Wet Weather Urban Runoff Areas Assessment (MS4, CSDM)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ CSDM: coastal storm drains do not impact coastal receiving waters with any regular frequency.	

Table ES-6. Summary of the Mission Bay and La Jolla Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
	WMA Assessment	Receiving Water Trend Assessment	▪ Significantly increasing trends were observed for total hardness and enterococcus. ▪ Significantly decreasing trends were observed for Diazinon and TSS.	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence ratings for turbidity and indicator bacteria (total coliforms, fecal coliforms, and enterococci) were consistent with the 2001–2006 BLTEA ratings as it relates to the Tecolote HA. ▪ In contrast to the 2001–2006 BLTEA rating, heavy metals, dissolved minerals, and nutrients were not identified as high frequency of occurrence COCs.	

[1] Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

Recommendations for the Mission Bay and La Jolla WMA

The recommendations for the Mission Bay and La Jolla WMA are to continue with the requirements of the Permit, including monitoring at the MLS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs. The addition of TWAS locations within the Mission Bay and La Jolla WMA during the 2009–2010 Monitoring Season will provide information regarding conditions in other areas of the WMA. Furthermore, conducting ambient weather monitoring at the Tecolote Creek MLS and future TWAS locations will provide information regarding the conditions in the receiving water during dry weather. MS4 Outfall Monitoring and Source Identification Monitoring will augment the data collected during the 2008–2009 Monitoring Season.

Specific recommendations for the Mission Bay and La Jolla WMA are based on the triad assessment in the Permit. Based on wet weather conditions, addressing upstream sources of turbidity are recommended. In addition, it is recommended to address the potential role of urban runoff in causing physical habitat disturbance.

Table ES-7. Summary of San Diego River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
San Diego River WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ Constituent Summary: – Chloride and TDS > benchmark in 76 to 100% of samples. – Total nitrogen, total phosphorus, and enterococci > benchmark in 51 to 75% of samples – Dissolved oxygen, enterococci, and selenium > benchmark in 26 to 50% of samples ▪ Total nitrogen was the only constituent with a magnitude of exceedance greater than five times its benchmark.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (turbidity and fecal coliform) – Low frequency of occurrence (enterococci, TDS, and total coliform) ▪ No persistent toxicity was observed. ▪ Fecal coliform was the only constituent with a magnitude of exceedance greater than five times its benchmark ▪ No pyrethroids were detected in post storm sediment samples*.	
		Rapid Stream Bioassessment	▪ Altered benthic macroinvertebrate communities (Very Poor IBI ratings) were observed. However, surveys conducted downstream of the Forester Creek Restoration Project yielded a Fair IBI rating during the June 2008 post construction survey.	
		Bight 08 (San Diego River Estuary)	▪ Bacteria and TSS were low and below benchmarks in ambient water samples collected in the estuary. • Sediment results identified two sites as likely unimpacted, two sites as possibly impacted, and one site as likely impacted based on SQO Guidelines. • A toxicity identification evaluation was conducted for the one site identified as likely impacted and indicated naturally occurring ammonia was the causative agent of toxicity and not toxic chemicals. The overall result of the likely impacted site was changed to likely unimpacted based on the SQO Guidance.	
		Third Party Data (San Diego River Jurisdictional Monitoring and Forester Creek Bioassessment Monitoring)	▪ Dry weather findings indicated TDS and enterococci concentrations were above the WQO at most receiving water sites. Indicators of recent human fecal pollution were not found during dry weather. ▪ Land use investigations during dry and wet weather indicated low density residential drainage areas contributed higher loads of bacteria. ▪ Catchbasins were determined to be a significant reservoir for bacteria. ▪ The Forester Creek Stream Restoration Project yielded a Fair IBI rating at the downstream site during the post construction survey in June 2008 while the upstream site had a Poor IBI rating. Results suggest that water and habitat quality improved as a result of stream restoration efforts.	

Table ES-7. Summary of San Diego River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4)	▪ Results above action levels or receiving water benchmarks: – Jurisdictional: pH, conductivity, turbidity, ammonia, Nitrate, orthophosphate, Total coliform, Fecal coliform, and enterococci – MS4: TDS, Chloride, Sulfate, Nitrate, Total nitrogen, Total phosphorus, Fecal coliform, Enterococci, Total Manganese	3, 4
		Wet Weather Urban Runoff Summary (MS4)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ Third party data indicated specific land uses contribute higher bacteria loads (residential and transportation) and that catchbasins provide a reservoir for bacteria.	
	WMA Assessment	Receiving Water Trend Assessment	▪ No significant increasing trends were observed. ▪ Significant decreasing trends were observed for nitrate and dissolved copper.	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for fecal coliforms is consistent with the 2001–2006 BLTEA ratings as it relates to Lower San Diego HA. ▪ WMA high frequency of occurrence rating for turbidity is consistent with the 2001-2006 BLTEA rating for the Boulder Creek HA.	

*The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.
Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

Recommendations for San Diego River WMA

The recommendations for this watershed are to continue with the requirements of the Permit, including monitoring at the MLS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs. The addition of TWAS locations within the San Diego River WMA during the 2009–2010 Monitoring Season will provide information regarding conditions in other areas of the WMA. Furthermore, conducting ambient weather monitoring at the San Diego River MLS and TWAS locations will provide information regarding the conditions in the receiving water during dry weather. Finally, future MS4 Outfall Monitoring and Source Identification Monitoring will augment the data collected during the 2008–2009 Monitoring Season.

Table ES-8. Summary of San Diego Bay Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
San Diego Bay WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ Constituent Summary – Pueblo San Diego: TDS, total nitrogen, and dissolved copper > benchmark in 100% of samples; turbidity, BOD, COD, and MBAS > benchmark in 50% of samples (based on 2 samples in 2007–2008) – Sweetwater HU: Chloride, total nitrogen, and total phosphorus > benchmark in 50% of samples (based on 2 samples in 2008–2009) ▪ No constituents with a magnitude of exceedance greater than five times their benchmark were found in the three SMC Sweetwater sites; the Pueblo San Diego and Otay HUs were not assessed. ▪ Although toxicity was observed in one of two samples in the Pueblo San Diego HU (Chollas), the data set was not large enough to determine persistent toxicity. Sweetwater and Otay HUs were not assessed.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence: Pueblo San Diego (Chollas; turbidity, TSS, total coliform, fecal coliform, and enterococci); Sweetwater (fecal coliform and enterococci). – Medium frequency of occurrence: Pueblo San Diego (Chollas; dissolved copper); Sweetwater (TDS) – Low frequency of occurrence: Pueblo San Diego (Chollas; BOD, COD, and dissolved zinc); Sweetwater (total coliform and Diazinon). ▪ Constituents with a magnitude of exceedance by more than five times the benchmark included: – Pueblo San Diego (Chollas; fecal coliform). – Sweetwater (fecal coliform). ▪ Persistent toxicity was observed in Pueblo San Diego (Chollas Creek) to *H. azteca*. ▪ Bifenthrin and Permethrin were detected in storm water in Pueblo San Diego (Chollas Creek) at concentrations likely to cause toxicity. ▪ Synthetic pyrethroids* (Bifenthrin, Cyfluthrin and Cypermethrin) were detected in Pueblo San Diego (Chollas) sediments at concentrations sufficient to cause toxicity. Concentrations were below the detection limit in Sweetwater and Otay HUs.	
		Rapid Stream Bioassessment	Altered benthic macroinvertebrate communities (Very Poor IBI ratings) were observed in both Pueblo San Diego and Sweetwater sites.	
		Bight 08	▪ Water quality analyses found low or non-detectable concentrations of bacteria and TSS and both were below the benchmarks. ▪ Sediment analyses identified two sites as possibly impacted, two sites as likely unimpacted, and one site as unimpacted. Synthetic pyrethroids were detected in low concentrations in Sweetwater River Estuary Sediments.	
		Third party	▪ RHMP – dissolved copper was the only analyte to exceed water quality benchmarks and occurred primarily in the Marina strata. Sediment quality objective results indicated that over half of the 60 stations assessed in San Diego Bay were classified as unimpacted, 10% were determined to be likely unimpacted, 25% were possibly impacted, 12% were likely impacted, and only one station was clearly impacted.	

Table ES-8. Summary of San Diego Bay Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
			▪ City of San Diego TMDL Compliance Monitoring – Malathion, copper and zinc were above benchmarks with concentrations in the north fork higher than those in the south fork of the Creek. Concentrations of Diazinon continue to decline and were below the TMDL WLA during the three wet weather events in 2008–2009. ▪ City of San Diego Design Storm Evaluation – results indicated that while bacteria concentrations are relatively unaffected by fluctuations in the hydrograph, as much as half of the dissolved copper load may be accumulated during the tail end of the hydrograph and approximately 85–90% of the mass of copper and zinc is associated with particle size ranging from fine silt to very fine clay. ▪ City of San Diego Air Deposition –Total and dissolved copper concentrations were positively correlated (higher) with higher percent impervious surface area. Copper, lead, and zinc concentrations were higher in commercial and industrial land use areas compared with residential land use. City of San Diego Bacteria Source ID – bacteria found during dry weather at the mouth of Chollas Creek originate from localized sources that discharge directly to the mouth (i.e., storm drains) as opposed to upstream sources. Elevated concentrations were a result of ponded conditions from irrigation runoff in areas subject to tidal influences.	
	Urban Runoff Monitoring	Ambient Urban Runoff Areas Assessment (Jurisdictional, MS4, CSDM)	▪ Results above action levels or receiving water benchmarks Pueblo San Diego: – Jurisdictional: conductivity, turbidity, orthophosphate, total coliform, fecal coliform, and enterococci – MS4: total nitrogen, total phosphorus, fecal coliform, enterococci – CSDM: Coastal storm drains monitored in this program do not appear to be impacting receiving waters Sweetwater – Jurisdictional: pH, conductivity, nitrate, total coliform, fecal coliform, enterococci – MS4: TDS, total nitrogen, total phosphorus, fecal coliform, enterococci – CSDM: Coastal storm drains monitored in this program do not appear to be impacting receiving waters	3, 4
		Wet Weather Urban Runoff Areas Assessment (MS4)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions. ▪ Coastal storm drains monitored in this program do not appear to be impacting coastal receiving waters.	
	WMA Assessment	Receiving Water Trend Assessment	▪ In Pueblo San Diego, increasing trends were observed in nitrite, TKN, turbidity, copper and zinc. Decreasing trends were observed in TDS and Diazinon. ▪ In Sweetwater, a significantly increasing trend was observed for pH while a significantly decreasing trend was observed in total lead.	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence ratings in the Pueblo San Diego HU for TDS, turbidity, and indicator bacteria were consistent with findings in previous years. In the Sweetwater HU, the high frequency of occurrence COCs (fecal coliform and enterococci) were also similar to previous years. Dissolved lead and dissolved zinc were not	

Table ES-8. Summary of San Diego Bay Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
			identified as high frequency of occurrence COCs based on dissolved metals criteria in Pueblo San Diego (Chollas Creek) (previous assessments included total metals assessed with conversion factors for dissolved metals).	

Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

*The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.

Recommendations for the San Diego Bay WMA

The recommendations for the San Diego Bay WMA are to continue the Wet Weather Monitoring Program to gather long-term trend information and to identify where data gaps exist. Continued evaluation of dry (ambient weather) conditions is also recommended and will help to identify dry weather urban runoff COCs in addition to providing a more thorough evaluation of seasonal conditions within the watershed. Current data gaps in the upper portions of the Sweetwater and the Otay Watershed will be bridged through monitoring of TWAS during the 2009-2010 season. TWAS will provide needed information regarding constituent loading in the less urbanized upper watersheds.

Specific recommendations for the Pueblo San Diego HU are based on the triad assessments listed in the Permit. Based on wet weather conditions, conducting a TIE to identify COCs, based on TIE metric and addressing upstream sources as a high priority are recommended (however, recent TIEs and confirming water chemistry concentrations indicated synthetic pyrethroids as the causative agent of toxicity. Until concentration patterns change, a TIE is not recommended). Addressing upstream sources of high frequency of occurrence COCs is recommended for consideration.

Specific recommendations for the Sweetwater HU are based on the triad assessments listed in the Permit. Based on the possible actions or decisions from the WMA triad framework, no action is necessary to address toxic chemicals. Addressing the potential role of urban runoff in causing physical habitat disturbance is recommended.

Table ES-9. Summary of Tijuana River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
Tijuana River WMA	Receiving Water Monitoring Program	Ambient Receiving Water Summary	▪ No exceedances or data analyzed from this program to date.	1, 2
		Wet Weather Receiving Water Assessment	▪ Constituents of concern[1]: – High frequency of occurrence (TSS, turbidity, total coliform, fecal coliform, enterococci, Diazinon). – Medium frequency of occurrence (BOD, COD, and total phosphorus). – Low frequency of occurrence (MBAS). ▪ Constituents with a mean magnitude of exceedance by more than five times the benchmark included TSS, turbidity and fecal coliform, ▪ Persistent toxicity was observed to acute, chronic and reproductive endpoints of *Ceriodaphnia dubia*. ▪ The pyrethroids* Bifenthrin, Cypermethrin, and Permethrin were detected at the MLS in post-storm sediment samples at concentrations likely to cause toxicity.	
		Rapid Stream Bioassessment	• Altered benthic macroinvertebrate communities (Poor to Very Poor IBI ratings) were observed based on 2002–2007 data.	
		Bight 08	• Water quality results found bacteria indicators and TSS were below the benchmarks in all samples collected in the Tijuana Estuary. • Sediment monitoring results identified three sites as likely unimpacted, one site as inconclusive, and one site as possibly impacted. – A toxicity identification evaluation was conducted for the one site identified as possibly impacted and indicated naturally occurring ammonia was the causative agent of toxicity and not toxic chemicals. The overall result of the possibly impacted site was changed to likely unimpacted based on the SQO Guidance.	
		Third Party	• Localized discharges containing high concentrations of indicator bacteria, as well as indicators of recent human fecal pollution, were found in the MS4 system • During wet weather, high concentrations of indicator bacteria were found in receiving waters, together with widespread presence of indicators of recent human fecal pollution.	
	Urban Runoff Monitoring	Ambient Urban Runoff Summary (Jurisdictional, MS4,)	▪ Results above action levels or receiving water benchmarks: – Jurisdictional: Conductivity, turbidity, Total coliform, Fecal coliform, Enterococci – MS4: pH, Total nitrogen, Total phosphorus, Fecal coliform, Enterococci, Total manganese, Total selenium	3, 4
		Wet Weather Urban Runoff Areas Assessment (MS4)	▪ The MS4 random wet weather data suggest that at most sites, loads appear to have been influenced by the characteristics of the catchment, particularly land use and drainage area. Additional monitoring is needed to assess the extent to which wet weather effluent from the MS4 influences receiving water conditions.	

Table ES-9. Summary of Tijuana River Watershed Management Area Assessment Findings

WMA	Monitoring Program Elements	Assessment	Summary of Findings	Core Questions Addressed
	WMA Assessment	Receiving Water Trend Assessment	▪ Significantly increasing trends were observed for total coliforms, fecal coliforms, TSS, turbidity, total copper, total lead, total zinc, total arsenic, and nitrate. ▪ Significantly decreasing trends were observed for TDS, dissolved nickel, Diazinon, and conductivity	5
		2001–2006 Baseline Long-Term Effectiveness Assessment Ratings	▪ WMA high frequency of occurrence rating for TSS, turbidity, Diazinon, total coliform, fecal coliform, and enterococci were consistent with the 2001–2006 BLTEA ratings as it relates to the Tijuana Valley.	

* The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.

[1] Constituents of concern are determined by a rating system that evaluates the frequency and magnitude of a constituent above its relevant criteria. Low, medium, and high frequency of occurrence describe the relative ranking of those constituents. The ranking methodology is described in Appendix B.

*The Stormwater Monitoring Coalition suggests that the synthetic pyrethroid analytical method may be highly variable (Schiff, 2009). Pyrethroid benchmarks presented in this document are for comparison purposes only and for further assessment with toxicity results.

Recommendations for the Tijuana River WMA

The recommendations for the Tijuana River WMA are to continue with the requirements of the Permit, including monitoring at the MLS to determine long-term trends, monitoring for toxic and benthic impacts, and identification of upstream sources of COCs. The addition of two TWAS locations within the Tijuana River WMA during the 2009–2010 Monitoring Season will provide information regarding conditions in other areas of the WMA. Furthermore, conducting ambient weather monitoring at the Tijuana River MLS and TWAS locations will provide information regarding the conditions in the receiving water during dry weather. Finally, MS4 Outfall Monitoring and Source Identification Monitoring data will augment the data collected during the 2008–2009 Monitoring Season.

Specific recommendations for the Tijuana River WMA are based on the triad assessments listed in the Permit. Based on wet weather conditions, conducting TIEs to identify COCs, based on the TIE metric is recommended. In addition, Diazinon was previously identified as a causative agent and is still detected above the level expected to cause toxicity. Pyrethroids are also a likely source of toxicity to *H. azteca* based on TIEs conducted in other watersheds and observed chemistry results. Addressing upstream sources as a high priority is also recommended.

ES.4 Regional Assessment Conclusions

Receiving water monitoring at each MLS was conducted during one wet weather event. Annual receiving water monitoring is conducted on a rotating schedule between the north and south portions of San Diego County as described in Table 1 of the Permit with the exception of Chollas Creek that is monitored each year. Monitoring was reduced during Permit year two due the Copermittees Participation Bight'08 and the SMC Regional Monitoring Program. Each element of this monitoring program was designed to provide scientific data to address five core management questions. The core management questions, as listed in the Permit, are presented as follows:

1. Are conditions in receiving waters protective, or likely to be protective, of beneficial uses?
2. What is the extent and magnitude of the current or potential receiving water problems?
3. What is the relative urban runoff contribution to the receiving water problem(s)?
4. What are the sources of urban runoff that contribute to receiving water problem(s)?
5. Are conditions in receiving waters getting better or worse?

The core management questions were designed to provide focus in the research and development of specific study objectives and the execution of data collection, data analysis, and reporting for this monitoring program. Elements of the monitoring programs vary in the number of years applied and the spatial extent in which the collected data applies. Therefore, data support only partial resolution of each core management question. Through continued monitoring and the refinement of the Permit requirements a more complete understanding of the answers to each of the overarching management questions may be obtained. Each of the core management questions are addressed in the WMA specific executive summaries and conclusions.

ES.4.1 Regional Monitoring Conclusions

ES.4.1.1 Ambient Monitoring Conclusions

A comparison of the regional ambient weather condition data results and highlighted values for the 2008–2009 Monitoring Season are presented by constituent group as follows:

Ambient weather condition monitoring was conducted in San Diego County in accordance with the Permit where applicable. Due to the participation in Bight '08, ambient monitoring was not required as part of the core monitoring program. Ambient conditions in the receiving waters of San Diego County were assessed using data collected as part of the SMC Regional Monitoring Program. The program uses the following three major components of the assessment triad to evaluate the receiving waters: water quality, toxicity, and rapid stream bioassessment. Samples were randomly selected from three strata including open space, agriculture, and urban areas. Ambient weather water quality samples were collected as grab samples in accordance with the SMC Regional Monitoring Workplan. The results of the ambient monitoring event were summarized in the individual watershed management area (WMA) sections. Watersheds were compared by examining key constituents within the watersheds to determine similarities among the areas, land use, and watershed characteristics. Key constituents were defined either as a

potential concern based on the frequency and magnitude of concentrations above the applicable ambient weather water quality benchmark (benchmark) and/or an indicator of water quality within a constituent group (e.g., total phosphorus is an indicator constituent in the nutrient group).

Water samples collected from each site were monitored for the following water quality constituents (as summarized in Appendix B and detailed in the SMC Regional Monitoring Workplan) (WESTON, 2008):

- Physical chemistry.
- Nutrients.
- Total suspended solids (TSS).
- Synthetic pyrethroids.
- Total and dissolved metals.
- Toxicity

Water quality results were compared to the benchmarks provided in each table and are based on published values applicable to this monitoring program. These benchmarks were selected by the Copermittee Monitoring Workgroup based on the sources provided in the results table and referenced citations.

A comparison of the regional ambient weather condition data results and highlighted values for the 2008–2009 Monitoring Season are presented by constituent group as follows:

Physical chemistry – The physical parameters measured during the ambient monitoring were conductivity, pH, and water temperature. Conductivity, which is a measure of the dissolved solutes in the water, was relatively high at 15 of the 16 sites monitored. However, each of the 15 sites occur in relatively urbanized portions of their respective watersheds, and the range of conductivity values (1,200 to 4,421 µS/cm) are typical of urbanized streams during ambient conditions. The site with the lowest conductivity value (384 µS/cm) occurred in the upper portion of the Sweetwater River, well above urban land use influences. The pH values for all 16 sites fell within the range identified in the Basin Plan (6.5–9 pH units). There is no benchmark established for temperature and results ranged from 16.53 to 22.14˚C.

Nutrients – Several nutrients were monitored as part of the ambient monitoring analyte list, including ammonia, nitrate, nitrite, total kjeldahl nitrogen (TKN), total nitrogen, and total phosphorus. Of the 16 sites sampled, none were above the established benchmark values for ammonia, nitrate, nitrite, TKN, and total orthophosphate. However, total nitrogen concentrations were above the benchmark value of 1 mg/L at 12 of the 16 sites sampled and were primarily driven by nitrate results above 1.0 mg/L. Similarly, nine of the 16 sites sampled were above the established total phosphorus benchmark concentration of 0.1 mg/L. Of interest is the fact that eight of the nine sites above the benchmark for total phosphorus were also above the benchmark for total nitrogen. It should be noted that the State of California is currently developing nutrient

numeric endpoints for assessment of beneficial use impacts from nutrients and the current benchmarks for total nitrogen and total phosphorus may not necessarily indicate a biostimulatory response in the watershed.

Total suspended solids – TSS is an important parameter for estimating the relative amount of sediment carried by a stream. Sample results indicated that in ambient weather conditions TSS concentrations were generally low in San Diego watersheds, which is typical of low flow conditions. TSS concentrations were below the benchmark value of 58 mg/L at all sites except at Site SMC-00473 in San Dieguito River. Site SMC-00473 is located two miles downstream of Lake Hodges.

Synthetic pyrethroids – In recent years there has been an observed shift in pesticide usage to synthetic pyrethroids, which have become increasingly detected in urban watershed assessments (WESTON, 2009). These pesticides are relatively toxic at low levels and tend to be associated more with sediment than with water in environmental samples. Thirteen synthetic pyrethroids were monitored in water column samples as part of the ambient monitoring program. Concentrations of all 13 synthetic pyrethroids were below their respective benchmark limits at 15 of the 16 sites sampled. Site SMC-01606, located in the Miramar HA, was above the benchmark concentration for the synthetic pyrethroid Bifenthrin. Although synthetic pyrethroid concentrations were generally low, Bifenthrin, Cypermethrin, and Fluvalinate were the most commonly detected pyrethroids in the county during ambient conditions.

Total and dissolved metals – The total and dissolved fractions of eight metals were assessed at each of the 16 sites monitored in the SMC Program. Total metal concentrations at a site were compared to Basin Plan standards (except for selenium), and dissolved metal concentrations were compared to standards based on the hardness of the site water. Concentrations of both total and dissolved metals were generally low at all sites sampled. Of all the metals analyses performed, only one site, SMC-01990 (Mission San Diego), was found to be above benchmark standards. Site SMC-01990 (Murphy Canyon) was found to have a selenium concentration slightly above the benchmark concentration of 0.005 mg/L. The area surrounding Site SMC-01990 has a considerable amount of commercial and industrial land uses in the drainage area.

Toxicity – The ambient receiving water samples collected as part of the SMC Monitoring Program were also analyzed for toxicity to *Ceriodaphnia dubia*. Three toxicity tests were conducted for each site monitored, including 96 hour survival, 7-day survival, and 7-day reproduction, and all were conducted as screening tests in the 100% sample.

Of the 16 sites monitored, toxicity was observed in three samples. Sites SMC-01158 (McGonigle Canyon, Los Peñasquitos Creek WMA), SMC-01258 (Sweetwater River), and SMC-1046 (Tecolote Creek, Mission Bay and La Jolla WMA) demonstrated a significantly different percent survival, as well as a significant difference in the reproductive test as compared to the control organisms.

Overall, the samples collected in San Diego County will be incorporated with the SMC Regional Monitoring Program Data to provide an assessment of Southern California watersheds. The data

will be analyzed to provide an assessment of three strata that include open space, agriculture, and urban land uses.

ES.4.1.2 Wet Weather Monitoring Conclusions

Wet weather monitoring was conducted at the 11 MLSs in San Diego County in accordance with the Permit. A comparison of the regional wet weather condition results and highlighted values for the 2008–2009 Monitoring Season are presented by constituent group as follows:

Wet weather monitoring was conducted at the 11 MLSs in San Diego County in accordance with the Permit. Storm event samples were collected using flow-weighted composite techniques and using grab samples for those parameters not conducive to compositing. The results of each storm event were summarized in the individual WMA sections. Watersheds were compared by examining key constituents across watersheds and over time to determine similarities among the areas, land use, and watershed characteristics. Key constituents were defined as having either been rated as a potential concern based on the frequency and magnitude of concentrations above the applicable wet weather benchmark and/or being an indicator of water quality within a constituent group (e.g., total phosphorus is an indicator constituent in the nutrient group).

A comparison of the regional wet weather condition results and highlighted values for the 2008–2009 Monitoring Season are presented by constituent group as follows:

Bacteria – Bacterial concentrations were elevated throughout the region for all three of the indicator bacteria. Fecal coliform concentrations were above the benchmark in all of the wet weather samples collected during the season. The highest fecal coliform concentrations were observed at the Tijuana River MLS Site (9,000,000 most probable number (MPN)/100 mL). The Tijuana River bacterial concentrations are higher than in any other watershed in the monitored region.

Total dissolved solids – TDS concentrations were generally elevated throughout San Diego County during monitored storm events. Nine of the 11 MLS stations were greater than their respective benchmarks, suggesting a region-wide concern. Higher TDS concentrations may indicate greater contributions from higher dissolved mineral salts from groundwater/base flow or imported water stored in local reservoirs. TDS is a known issue related to importation of municipal water supplies, over-irrigation, and documented recycled water use. The San Diego Regional 303(d) Workgroup developed an issue paper titled, *An Analysis of the Proposed 303(d) Listings for Total Dissolved Solids in San Diego County Watersheds* (San Diego Regional 303(d) Workgroup, 2002). This report noted that many of the dissolved solids in surface water in San Diego County are derived from imported water used in agriculture and other applications within the basins. Furthermore, many of the watersheds monitored are downstream of local reservoirs supplied by Colorado River water.

Total suspended solids – As mentioned above, TSS is an important parameter for estimating the relative amount of sediment carried by a stream. TSS concentrations were above the benchmark in three of 11 samples tested. These three samples were collected at the Santa Margarita MLS, Chollas Creek MLS, and the Tijuana River MLS. Of interest is that at each of the three sites that were above the TSS benchmark value (100 mg/L) were also the only three sites above the

benchmark for turbidity. These TSS data, in conjunction with the turbidity data, suggest that sedimentation during wet weather is an issue of concern at these sites. High concentrations of TSS indicate the potential for hydromodification and transport of organic constituents. The intensity and duration of storm events can affect TSS concentrations.

Nutrients (i.e., phosphorus, nitrate, and nitrite) – Total phosphorus concentrations were below the wet weather benchmark in all but one site (Tijuana River MLS), which had results above the benchmark during the one monitored storm event. Historically, phosphate concentrations have been above the wet weather benchmark at the Tijuana River MLS in 68% of the monitored storms at this site. During the 2008–2009 Wet Weather Monitoring Season there were no nitrate or nitrite results above the wet weather benchmark. It should be noted that the State of California is currently developing nutrient numeric endpoints for assessment of beneficial use impacts from nutrients and the current benchmarks for total nitrogen and total phosphorus may not necessarily indicate a biostimulatory response in the watershed.

Pesticides – The organophosphate pesticides (Chlorpyrifos, Diazinon, and Malathion) were below the wet weather benchmark at all sites monitored except at the Tijuana River MLS. Diazinon concentrations were nearly four times higher than the benchmark concentration (0.08 mg/L) during the December 16, 2008 storm at the Tijuana River MLS. Aside from Diazinon in the Tijuana River, Chlorpyrifos and Diazinon were below the detection limit at remaining ten sites monitored during 2008–2009. Of the three organophosphate pesticides analyzed, Malathion was most frequently reported above the detection limit (six of 11 samples), yet at no sites was it reported above the benchmark. It is evident that Diazinon use and detections have dramatically decreased since the first restriction date in 2002. An example of Diazinon usage detections is presented for the Chollas Creek historical monitoring location in Figure ES-2. However, a shift in pesticide use to readily available synthetic pyrethroids has been noted in urban land use drainage areas. Synthetic pyrethroid assessments are presented further in a separate section in accordance with the Permit requirements. The Copermittees have implemented a region-wide assessment of synthetic pyrethroids and have added pyrethroids to the wet weather analytical constituent list. Post-storm pyrethroid sediment monitoring was also implemented and described previously in the ambient weather monitoring section.

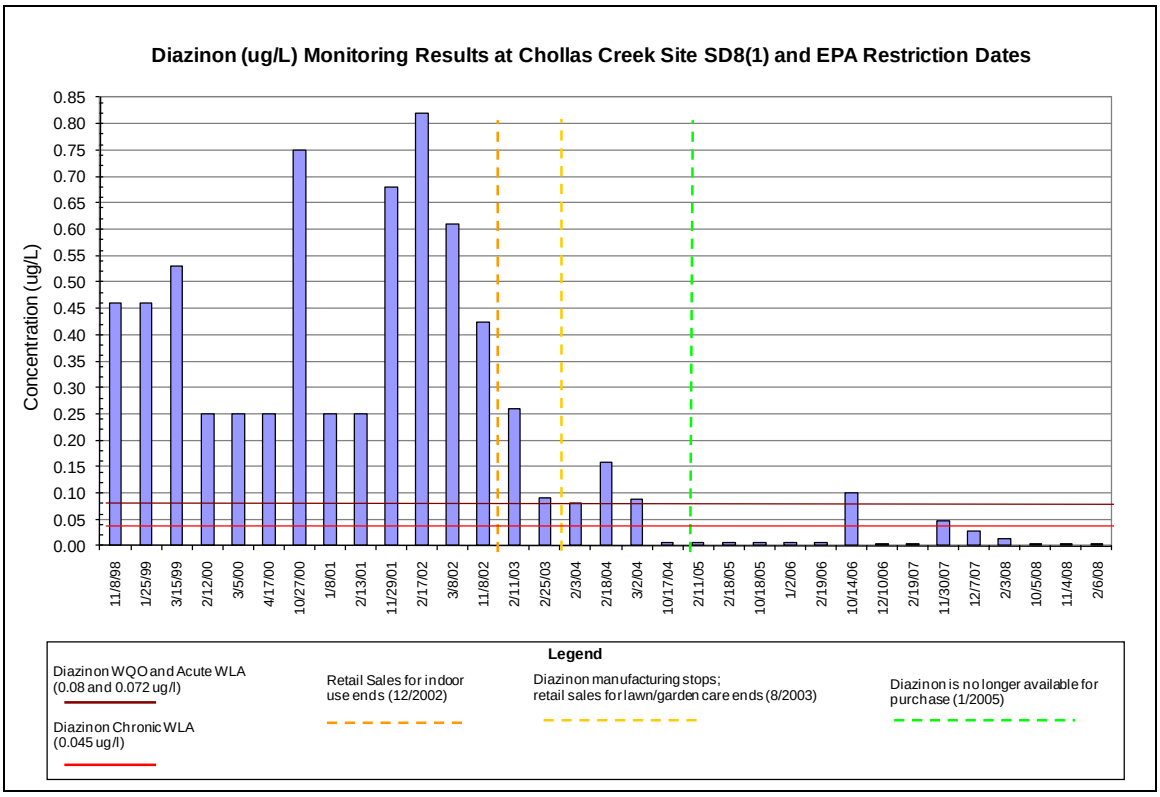

Figure ES-2. Historical Wet Weather Diazinon Concentrations at Site SD8(1) with Restriction Dates

Metals – There were few results above the metals benchmarks during the 2008–2009 Monitoring Season. Chollas Creek was the only watershed with results above the dissolved metals wet weather benchmarks, which are based on the California Toxics Rule (CTR) hardness based acute criteria. Dissolved copper and dissolved zinc were detected above the CTR acute criteria during wet weather monitoring events. Chollas Creek has a TMDL for dissolved copper, dissolved lead, and dissolved zinc. There are known issues related to atmospheric deposition, high impervious area, and low hardness results. As a result, Chollas Creek has the lowest benchmark criteria compared with all other watersheds.

Toxicity – Toxicity testing was conducted using three test species (*C. dubia*, *Hyalella azteca*, and *Selenastrum capricornutum*). Toxicity was observed at one of 11 sites monitored during wet weather for the acute or chronic survival endpoints for *C. dubia*, which occurred at the Tijuana River MLS. Toxicity was observed to the *C. dubia* reproductive endpoint in four of 11 samples collected (one sample each from Santa Margarita River MLS, Chollas Creek MLS, Sweetwater River MLS, and Tijuana River MLS). Toxicity to *H. azteca* was observed in four of 11 wet weather monitoring samples (one sample each from Santa Margarita River MLS, Tecolote Creek MLS, Chollas Creek MLS, and Tijuana River MLS). Toxicity to the test organism *S. capricornutum* was observed in two of 11 samples (one each at San Luis Rey MLS and Sweetwater River MLS).

Every sample where toxicity was observed to *H. azteca* was associated with a detection of the synthetic pyrethroid Bifenthrin above the published water LC_{50} for *H. azteca*. Toxicity to *H. azteca* as a result of synthetic pyrethroids is a region-wide and state-wide problem and is currently being addressed by the Department of Pesticide Regulation (DPR). The California Stormwater Quality Association (CASQA) Pesticide Subcommittee is actively working with DPR during the re-registration period for these compounds. The CASQA Pesticide Subcommittee is also a valuable resource for information sharing on synthetic pyrethroids and other pesticides.

Toxicity Identification Evaluation - TIEs were not conducted as part of the MLS monitoring during the 2008–2009 Monitoring Season. However, TIEs have been conducted on storm water samples collected from Agua Hedionda Creek using *H. azteca* during the 2007–2008 Monitoring Season and in Chollas Creek during the 2006–2007 Monitoring Season. Both results confirmed that synthetic pyrethroids were the likely causative agent of toxicity which was also supported by the chemistry samples collected.

TIEs were also conducted on three separate sediment samples as part of the Bight'08 monitoring program in San Diego County lagoons/estuaries. TIEs were conducted for sediment samples that exhibited significant toxicity to the species *Mytilus galloprovincialis* in one sample each from Batiquitos Lagoon, San Diego River Estuary, and Tijuana River Estuary. The results of the TIE confirmed that toxicity was due to naturally occurring ammonia and not likely due to contaminants of concern (COCs), which were also supported by chemistry results. In accordance with the SQO Guidelines, which have a provision for naturally occurring conditions, the results of the three samples overall assessment would change from likely impacted to likely unimpacted. It should be noted that the results of the paired toxicity tests with *Eohaustorius estuarius* were determined to be non-toxic at these sites.

ES.4.1.3 Rapid Stream Bioassessment Monitoring Conclusions

RSB monitoring was conducted in accordance with Permit year two. The Fall 2008 bioassessment sampling was not required as a result of Addendum No. 2 of the Permit, which specified that fall bioassessment surveys would not be required if the Copermittees participated in the SMC Spring 2009 Regional Sampling Program. During the 2008–2009 Monitoring Season, the Copermittees elected to participate in the SMC Monitoring Program, and therefore, only conducted the RSB Program survey during Spring 2009. Samples were collected from 16 randomly selected sites in accordance with the SMC Regional Monitoring Workplan. Due to the Bight '08 monitoring year, RSB monitoring was not conducted at the MLS or TWAS during the 2008–2009 Monitoring Season.

RSB monitoring was conducted pursuant to California Department of Fish and Game (CDFG) RSB monitoring procedures to provide a measure of stream health. During the RSB surveys, periphyton monitoring was conducted in accordance with the United States Environmental Protection Agency (USEPA) Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (EPA 841-B-99-002, Section 6.2).

Results of the Spring 2009 bioassessment survey are summarized in Table ES-10. Results show that all urban or agriculture sites were rated Poor or Very Poor, while the single site from open space sampled above urban influences in the upper Sweetwater River was rated Good.

Table ES-10. Summary of Index of Biotic Integrity Scores and Ratings from Spring 2009 Bioassessment Survey

Watershed	SMC Site	SMC Strata	Total IBI Score	IBI Rating
San Diego Bay	00282	Open Space	42	Good
San Luis Rey	00457	Agriculture	26	Poor
San Luis Rey	01909	Agriculture	22	Poor
San Diego River	04054	Urban	12	Very Poor
San Diego Bay	01258	Urban	10	Very Poor
San Luis Rey	00153	Urban	9	Very Poor
Los Peñasquitos Creek	00198	Urban	9	Very Poor
Mission Bay	01046	Urban	8	Very Poor
San Diego River	01990	Urban	8	Very Poor
Carlsbad	00729	Urban	7	Very Poor
San Luis Rey	01717	Agriculture	7	Very Poor
Los Peñasquitos Creek	00710	Urban	6	Very Poor
San Dieguito Creek	00473	Urban	5	Very Poor
Mission Bay	01606	Urban	5	Very Poor
San Luis Rey	00153 DUP	Urban	4	Very Poor
San Diego River	02006	Urban	3	Very Poor
Los Peñasquitos Creek	01158	Agriculture	1	Very Poor

IBI – Index of Biotic Integrity

ES.4.1.4 Bight 2008 Coastal Ecology Monitoring in San Diego Lagoons/Estuaries Conclusions

The Copermittees participated in the Bight '08 Program in lieu of conducting the complete regional storm water monitoring requirements during the 2008–2009 monitoring season as allowed in the Permit. The Copermittees contributed in-kind services and funds for three separate Bight '08 studies (Sediment Quality, Coastal Wetland Eutrophication, and Coastal Microbiology). The San Diego County Municipal Copermittees developed a San Diego Regional Bight 2008 Coastal Estuary Workplan. The Copermittees also supported the coastal wetland study in lieu of 2007–2008 Ambient Bay and Lagoon Monitoring (ABLM) as permitted by the June 12, 2008, letter to the County of San Diego from Mr. John Robertus of the SDRWQCB. The Coastal Microbiology Workplan was still under development during the 2008–2009 Monitoring Season. For the purposes of this report, the Copermittees are reporting on Sediment Quality from the region's lagoons/estuaries.

The Copermittees selected eight lagoons/estuaries in the San Diego Region for inclusion in the Bight '08 program as follows:

- Santa Margarita Lagoon

- Agua Hedionda Lagoon
- Batiquitos Lagoon
- San Elijo Lagoon
- Los Peñasquitos Lagoon
- San Diego River Estuary
- Sweetwater River Estuary
- Tijuana River Estuary

The Copermittees Bight '08 Workplan was designed to provide data needed to answer questions related to the Southern California Bight, the San Diego Region, and the individual lagoons of study. San Diego Copermittees used a longitudinal-transect study to investigate changes in sediment conditions with greater distances from freshwater-input areas of lagoons. Lagoons were partitioned into five segments and sampling stations were located using a tessellated random sampling design consistent with Bight protocols. Sediment samples were collected and analyzed for chemistry, toxicity, and benthic community assemblages. Data were assessed using the recently developed SQOs. Surface water quality monitoring of bacteria and TSS during sediment sampling events also provide an assessment of ambient water quality in the lagoons during the summer months. The lagoon sediment sampling commenced in July 2008 and continued through September 2008 for consistency with the SCCWRP Bight '08 Program.

Sediment quality in the San Diego County's lagoons/estuaries was generally found to be unimpacted (eight of 40 samples) or likely unimpacted (20 of 40 samples) based on the SQO Guidelines (Table ES-11). A total of seven of 40 sites were identified as possibly impacted and three of 40 sites were likely impacted. No sites were identified as clearly impacted and two of 40 sites were identified as inconclusive.

Table ES-11. Regional Sediment Quality Objective Assessment Summary for San Diego Lagoons/Estuaries

Final Site Assessment Category	Total Number of Sites in All Lagoons	Number of Sites in Category
Unimpacted	40	8
Likely Unimpacted	40	20
Possibly Impacted	40	7
Likely Impacted	40	3
Clearly Impacted	40	0
Inconclusive	40	2

When evaluating the lines of evidence supporting the overall sediment quality results, it is evident that the benthic community results are the primary driver of possibly impacted or likely impacted site results (Table ES-12). A total of 29 of 40 results had moderate or high benthic community impact results. However, the result often did not indicate that chemically mediated effects were related to the overall assessment finding. There were no high impacts found for the

chemistry line of evidence and only four of 40 moderate impacts. Thirty-six of 40 chemistry assessments were either low or minimal.

Table ES-12. Regional Line of Evidence Summary for San Diego Lagoons/Estuaries

LOE Category	Number of Sites	Impact Category			
		Minimal, Reference, or Nontoxic	Low	Moderate	High
Sediment Chemistry Exposure	40	28	8	4	0
Benthic Community Condition Impact	40	3	8	19	10
Sediment Toxicity	40	25	11	4	0

Chemical assessments were also compared to the sediment Effects Ratio-Low (ER-L), Effects Ratio-Mean (ER-M), and LC_{50}s, where applicable (Table ES-13). Metals were all below the ER-M and only eight of 40 samples had results above the ER-L. One sample had total dichlorodiphenyltrichloroethane (DDTs) above the ER-M and 26 sites had results above the ER-L. Chlordane was also detected above the ER-M in two of 40 samples, but was only above the ER-L in four of 40 samples. This suggests that legacy pesticides are still being detected in lagoons sediments. The currently available synthetic pyrethroids were detected in nine of 40 samples, and only one sample was detected above the LC_{50}. However, no toxicity was observed to *E. estuarius* in this sample. Polychlorinated biphenyl (PCB) congeners were rarely detected. One sample had results above the ER-L and none were above the ER-M. There were no polycyclic aromatic hydrocarbons (PAHs) detected above the ER-L or ER-M.

Likewise, toxicity was rarely observed and 25 of 40 results were identified as non-toxic. Eleven of 40 were identified as low toxicity, and four sites were identified with moderate toxicity. The four moderate toxicity results were identified to be the result of naturally occurring ammonia that induced toxicity to one of the two species tested (*M. galloprovincialis*). TIEs were conducted on these samples and recommendations for re-assessment were made to the Bight Committee.

Table ES-13. Regional Sediment Chemistry Results for San Diego Lagoons/Estuaries

Chemical Analyte	Total Number of Sites	Number of Sites with Detections	Number of Sites with Detections above ER-L	Number of Sites with Detections above ER-M	Number of Sites with Detections above LC_{50}
Metals	40	40	8	0	NA
Total DDTs	40	26	26	1	NA
Total Chlordanes	40	4	4	2	NA
Pyrethroids	40	9	NA	NA	1
Total PCBs	40	7	1	0	NA
Total PAHs	40	30	0	0	NA

NA = Not Applicable

The following summarizes the results presented above with respect to addressing the core management questions:

1. **Are conditions in receiving waters protective, or likely to be protective, of beneficial uses?**

Based on the monitoring and data analyses conducted on samples collected as part of the Bight '08 Program, the data suggest that conditions are generally protective of the beneficial uses. Seventy percent of sites were identified as unimpacted or likely unimpacted based on the SQO guidelines. However, in some lagoons, site specific variations were noted. Additionally, water quality samples collected for fecal indicator bacteria and TSS were below Basin Plan standards in all lagoons. These two analytes were analyzed in water column samples to assess these regionally problematic constituents.

2. **What is the extent and magnitude of the current or potential receiving water problems?**

The Copermittees developed their Bight '08 Monitoring Program to provide spatial characterization of the lagoon using a transect design with five samples. The lagoon was segmented into five equidistant portions, and samples were selected randomly following the Bight '08 sampling protocols. There were no clear patterns evident in any lagoon/estuary that suggests the watershed inputs are related to issues identified in any lagoon. Since most impacts were driven by either moderate or low benthic community scores, results may reflect the variability of physical characteristics within the lagoon. Because these are marginal and transitional environments, factors such as predation, temperature, depth, organic matter, and salinity all play a role in the benthic community condition.

3. What is the relative urban runoff contribution to the receiving water problem(s)?

The inputs of sediment to a lagoon originate from watershed sources, local drainages, erosion of local sediments, and tidal inputs from the ocean inlet. Because pesticides originate from anthropogenic sources only, the results suggest that urban runoff may have contributed minor concentrations of legacy organochlorine pesticides (e.g., DDT isomers) and more recent (i.e., currently used) synthetic pyrethroid pesticides. The relative urban runoff contribution cannot be fully assessed using sediment quality data alone. However, it is anticipated that future studies will provide more insight into each lagoons dynamics (e.g., Total Maximum Daily Load (TMDL) modeling efforts or future ambient bay and lagoon monitoring.

4. What are the sources of urban runoff that contribute to receiving water problem(s)?

This question can be partially answered by assessing the nature of contaminants found in the lagoon/estuary sediments. For instance, pesticides (e.g., organochlorines, organophosphates, and synthetic pyrethroids) do not occur naturally in the environment. Thus, if they are found in the receiving waters, the likely sources originate from watershed inputs, but may occur via different transport mechanisms. The result varied by each lagoon. However, many indications of particular constituents were reflective of the land uses represented in the immediate area.

5. Are conditions in receiving waters getting better or worse?

The Bight '08 studies conducted in the region's lagoons/estuaries provide valuable baseline data for comparing the SQO results in future sediment surveys. In comparison to previous ambient bay and lagoon surveys and the Bight '03 sediment survey, similar results were observed in the sediment samples collected. Chemistry results were generally low, toxicity results were also low or non-toxic, and benthic community assessments varied between reference conditions to high impacts and varied by site.

ES.4.1.5 Synthetic Pyrethroid Monitoring

The Copermittees collaboratively developed the Monitoring Work Plan for the Assessment of Synthetic Pyrethroids in San Diego County (WESTON, 2007). The work plan was developed in response to the permit requirements outlined in Section II.A.7 of the Order.

To measure and assess the presence of synthetic pyrethroids, the following questions were developed in the workplan:

Q1. Are synthetic pyrethroids being detected in San Diego County Watersheds and if so, at what concentrations?

This question was addressed by collection and analysis of sediment samples at the mass loading stations (MLS) and temporary watershed assessment stations (TWAS) one time during the monitoring season on a rotational basis. Water column samples were also collected during storm events only from the existing MLS and TWAS as part of the Regional Monitoring Program

analytical constituent list. Water column analyses during storm events provided information on the spatial distribution of synthetic pyrethroids within the watershed during storm events.

Q2. If detected, are synthetic pyrethroids in San Diego County Watersheds causing toxicity to aquatic organisms in the water column or detected at equal to or above published LC_{50}s for Hyalella azteca in sediment?

This question was addressed by comparing water column synthetic pyrethroid sample results collected during storm events to water column toxicity results. Water column toxicity was performed as part of the standard Permit monitoring requirements. Detected concentrations of synthetic pyrethroids in sediment were compared to published literature values for LC_{50}s for the test organism *Hyalella azteca (H. azteca).* Additionally, total organic carbon and grain-size distribution data were collected to provide relevant information for assessing synthetic pyrethroid concentrations in sediment.

The Synthetic Pyrethroid Monitoring Program included monitoring for water and/or sediment quality at MLS and TWAS monitoring locations during the 2007–2008 and 2008–2009 Monitoring Seasons. In addition, synthetic pyrethroids were also added to the constituent list for the SMC Regional Bioassessment Survey, the Bight '08 Lagoon Monitoring Program, and the RHMP Program. Synthetic pyrethroids were also analyzed for the 2008–2009 Source Identification Monitoring Program conducted for dry weather residential runoff from La Mesa and Del Mar.

Conclusions

To address the questions developed in the workplan, the following conclusion are presented:

Q1. Are synthetic pyrethroids being detected in San Diego County Watersheds and if so, at what concentrations?

Synthetic pyrethroids are being detected in San Diego County Watersheds both in the storm water and to a lesser degree in sediments within the receiving waters. Storm water quality concentrations are being detected primarily in urban areas with residential, commercial, and industrial land uses. Over the past two years of monitoring, sites with storm water pyrethroid results above LC_{50}s included the following sites:

- Santa Margarita MLS-new
- San Luis Rey MLS
- San Luis Rey TWAS-1
- Loma Alta TWAS-1
- Buena Vista Creek TWAS-1
- Agua Hedionda MLS
- Agua Hedionda-TWAS-1
- Escondido Creek-MLS
- Escondido Creek-TWAS-1
- San Dieguito Creek-MLS
- San Dieguito Creek-TWAS-1
- Los Peñasquitos Creek-MLS
- Los Peñasquitos Creek-TWAS-1
- Los Peñasquitos Creek-TWAS-2
- Tecolote Creek-MLS
- Chollas Creek-MLS
- Tijuana River-MLS

Concentrations tend to increase with an increasing presence of urbanized land use. Synthetic pyrethroids are also being detected in receiving water sediments, but concentrations tend to be low and near the detection limit of the method. Over the past two years of monitoring, sites with sediment pyrethroid results above sediment LC_{50}s included the following sites:

- Escondido Creek-MLS
- Buena Vista Creek TWAS-1
- San Dieguito Creek-MLS
- Los Peñasquitos Creek-MLS
- Rose Creek (MB-TWAS-1)
- Chollas Creek-MLS
- Tijuana River-MLS

Synthetic pyrethroids were infrequently detected in San Diego's bays and lagoons/estuaries and did not exhibit toxicity to *E. estuarius* in the sites where detections occurred above the sediment $LC_{50.}$ Only 4 of 111 samples collected as part of the San Diego County Bight 08 estuary sampling or as part of RHMP monitoring had a Bifenthrin concentration above the sediment $LC_{50.}$ However, none of the samples exhibited toxicity to *E. estuarius* at these sites.

Q2. If detected, are synthetic pyrethroids in San Diego County Watersheds causing toxicity to aquatic organisms in the water column or detected at equal to or above published LC_{50}s for Hyalella azteca in sediment?

Pyrethroids detected in storm water samples above the LC_{50} are often associated with toxicity to *H. azteca* in storm water column toxicity tests. However, during ambient receiving water monitoring, no toxicity was observed to *H. azteca* at the MLS or TWAS. Though sediment toxicity was not tested in the post-storm sediment samples, there is evidence suggesting some sites have the potential to induce toxicity to sediment dwelling organisms sensitive to synthetic pyrethroids at these sites.

As mentioned above, lagoon and embayment sediments also had infrequent detections and were generally trace amounts near the method detection limits. Only 4 of 111 samples collected had a Bifenthrin concentration above the sediment $LC_{50.}$ However, none of the samples exhibited toxicity to *E. estuarius* at these sites.

ES.4.2 Urban Runoff Monitoring Conclusions

ES.4.2.1 Municipal Separate Storm Sewer System Outfall Monitoring Conclusions

During the 2007–2008 Monitoring Season, the Copermittees collaboratively developed the MS4 Outfalls Monitoring Program in San Diego County WMAs (SDCRC, 2008). The purpose of MS4 Outfall Monitoring Program is to characterize pollutant discharges from MS4 outfalls in each watershed during wet weather and dry weather, as required by the Permit (Section II.B.1 of the Order). The collection and analysis of water samples discharging from MS4 outfalls to receiving waters will be used to address Core Management Question 3:

What is the relative urban runoff contribution to the receiving water problem(s)?

The design of the MS4 Outfall Monitoring Program is based on a combination of random and targeted samples to be collected during dry weather and wet weather periods. The program has the following four monitoring components: random dry weather, random wet weather, targeted dry weather, and targeted wet weather. The first three elements were conducted for the first time in 2008–2009 as the first phase of the program. Targeted wet weather monitoring will be implemented in 2009–2010.

Dry Weather MS4 Outfall Monitoring

The Random Dry Weather MS4 Outfall Monitoring Program was developed to deduce statistically valid inferences regarding the region as a whole, rather than analyzing each isolated MS4 station. Outfalls without dry weather flows were documented, and the next outfall on the randomized list was sampled. A maximum of 12 sites were visited in each WMA, but in some cases, fewer than six storm drains were flowing at the time of the site visit. Where flowing or ponded water was observed, samples were taken and analyzed for the regional high-priority water quality pollutants (TSS, indicator bacteria, total nitrogen, and total phosphorus).

In addition to addressing Core Management Question 3, random sampling was conducted to address the following subquestions:

1. What are the characteristics of the pollutants discharged from the MS4?
2. Are pollutant loadings changing over time?

Question 1 is best answered in a regional context, based on the study design for the random dry weather program. The regional assessment is presented in Section 12. Question 2 will be addressed in subsequent years of the program when additional data are available for temporal comparisons.

Random Dry Weather MS4 Outfall Monitoring

Results from the random DWM revealed that 53% of the visited sites were dry. The remaining sites were either ponded or flowing. Instantaneous loading calculations could not be calculated for locations with ponded conditions; however, the ponded water was sampled and could be compared to benchmarks. The results suggest that nitrogen and phosphorus compounds and indicator bacteria (i.e., enterococci) in MS4 dry weather runoff from random monitoring sites may have the potential to contribute to receiving water problems. Results were variable and no statistically relevant patterns were observed at this time. Future years will likely provide a more robust data set for analysis.

Random MS4 Wet Weather Monitoring

The protocol for the random wet weather monitoring is analogous to that of the random dry weather sampling program, but the sampling is conducted during a storm event in the Wet Weather Season (October 1 through April 30). Regionally, 38 random MS4 outfall wet weather events were monitored in 2008–2009. The majority of WMAs were monitored at four locations. Results from the random wet weather monitoring suggest that total nitrogen, total phosphorus, and fecal coliform concentrations from the MS4 may potentially contribute to receiving water problems. As with the random dry weather data, results were variable and no statistically relevant patterns were observed at this time. Future years will likely provide a more robust data set for analysis.

Targeted MS4 Outfall Monitoring

The targeted MS4 Outfall Monitoring Program was implemented during Summer 2009. Targeted sampling was conducted to address the following subquestions:

1. Which of the targeted MS4 outfalls have the greatest pollutant loading?
2. Are the pollutant loadings decreasing from these MS4 outfalls?

Targeted Dry MS4 Outfall Monitoring

The targeted dry portion of the MS4 Outfall Monitoring Program focuses monitoring efforts on those MS4 outfalls that are most likely to contribute to receiving water problems (e.g., largest potential pollutant loading). As part of the program, sampling is to occur once each year at pre-selected outfalls during the dry season (May 1 through September 30). Sampling is conducted by each individual jurisdiction.

The results suggest that nitrogen compounds and indicator bacteria (i.e., enterococci) in MS4 dry weather runoff from targeted monitoring sites may have the potential to contribute to receiving water problems. Because the targeted monitoring portion of MS4 Outfall Monitoring Program addresses watershed specific issues, the results and recommendations are discussed in each individual WMA section.

Targeted Wet Weather Monitoring

Targeted wet weather monitoring was not conducted as part of the 2008–2009 monitoring Scope of Work. The program was developed in 2008–2009 and will be implemented during the 2009–2010 Monitoring Season.

The MS4 Outfall Monitoring Program employs random and target monitoring of MS4 outfalls throughout the county to determine the characteristics, loading, and changes in loading over time. Monitoring and sampling occur at random and targeted locations during both dry and wet weather. Water quality samples are collected and instantaneous flow measurements are collected

to allow instantaneous pollutant loading. Ultimately, relative loads are determined to identify the highest relative loading at the outfalls which may then be used to prioritize follow-up activities.

This was the first year of monitoring for the MS4 Outfall Monitoring Program; the preliminary results noted in each sectional WMA write-up should be compared to subsequent data (three years) before meaningful trends may be developed.

ES.4.2.2 2008-2009 Source Identification Monitoring

During the 2008–2009 Monitoring Season, the Copermittees developed and implemented their Source Identification Monitoring Program to assess dry weather runoff from single family residences. The goal of this study was to collect dry weather residential land use discharge data for application to regional assessments since residential land uses comprise the most common land uses in urban areas. A secondary goal of collecting the data was to compare data collected in San Diego County to data collected from an intensive residential land use runoff study under a Proposition 50 Grant in Orange County and Sacramento County (Haver, 2007) when it becomes available.

Primary study questions from the 2008–2009 Source Identification Workplan are as follows:

1. **When are the dry weather or nuisance flows detected from single-family residences (during what part of the day/week)?**
2. **What is the water quality and load of constituents of dry weather or nuisance flows from single-family residences?**
3. **What are the potential sources of dry weather flows from single-family residences?**

In accordance with the Permit, the Copermittees developed the 2008–2009 Source Identification Workplan with respect to collecting data useful in addressing the goals and management questions listed in the Permit. The Permit provided flexibility in developing their Source Identification Study and the questions were tailored to fit the Copermittees' needs. To address the study questions the following conclusions are presented:

1. **When are the dry weather or nuisance flows detected from single-family residences (during what part of the day/week)?**

In general, peak discharge times varied amongst all sites. It is likely that individual residences water use activities occur at different times and at different schedules. Based on a review of the data, residential flow in La Mesa was highest during the week, specifically on Tuesdays. However, flows at the lower site in La Mesa were indicative of groundwater influences and may be associated with a lag time from residential water uses over the weekend. In Del Mar, flow was highest on the weekend, specifically on Saturday.

2. What is the water quality and load of constituents of dry weather or nuisance flows from single-family residences?

Overall, concentrations from the general chemistry constituents were below the WQOs, with the exceptions of total nitrate and total phosphorus, which were above their respective WQOs for all samples measured. The highest loads were from TDS and chloride and were measured at LM-SID-1. Based on the levels of the general chemistry constituents, it is possible that Site LM-SID-1 has a groundwater influence, explaining the continuous flow at this location and the high TDS, chloride, and nitrate levels.

Organophosphorus pesticides were not detected in either of the drainage areas monitored. Synthetic pyrethroids were detected in 6 of the 7 samples collected. Of the samples which did have detectable pyrethroid results, Bifenthrin was above the LC_{50} in the Del Mar study area and Permethrin was above the LC_{50} in the La Mesa study area. The Permethrin result was recorded at Site LM-SID-2, during the second sampling event. But, of the pyrethroid load per acre results for the entire monitoring season, Site DM-SID-1 had the higher results. This also suggests that single-family residences present a likely source of synthetic pyrethroids in urban runoff. The results are also consistent with the findings from the *Characterization and Assessment of Storm Drain Sediments from Switzer Creek* (WESTON, 2009). Synthetic pyrethroids were most commonly detected in the sediments in storm drains which drained residential areas, and specifically in the upper reaches of the drainage areas studied.

Dissolved metals (i.e., cadmium, copper, lead, and zinc) were not detected above the benchmarks from any of the residential runoff samples collected. The loads per acre were slightly higher in the La Mesa study area, but loads for these constituents were generally very low. These low load results, especially in the Chollas Creek subwatershed, where dissolved metals are constituents of concern, may be reflective of the small commercial and industrial land use in the upper drainage areas included in the study.

Indicator bacteria (i.e., total coliforms, fecal coliforms, *E. coli,* and enterococci) were highest in the smaller drainage areas monitored in La Mesa study area (i.e., LM-SID-2 and LM-SID-3) and also in the Del Mar site. Between the two residential sites, DM-SID-1 had the greater bacterial concentrations. Site DM-SID-1 also was above the benchmark for fecal coliforms whereas the Site LM-SID-1 was not. However, due to the larger flow volume, greater bacterial loads were observed for the LM-SID-1 residential runoff site.

3. What are the potential sources of dry weather flows from single-family residences?

Flows from single-family residences occur from various activities. In general, it was evident that dry weather flows from the upper sites in La Mesa and the Del Mar site likely occurred from residential lawn watering which were observed periodically during the sampling events or from random discharges associated with urban areas. However, flows from the lower site at La Mesa appear to be from groundwater sources, which may be associated with residential over-irrigation and low permeability soils.

This study was also designed to be comparable to the Prop 50 Non-Point Source Grant Study being conducted by Dr. Darrin Haver from UC Davis. However, due to the current State of California economic conditions, the State has withheld funding for this study. Therefore, at this time, the results of Dr. Haver's study are not available for comparison.

ES.4.2.3 Coastal Storm Drain Monitoring Conclusions

Each coastal jurisdiction conducts a separate CSDM Program. The purpose of the CSDM Program is to detect and eliminate ICIDs resulting in coastal beach closures for bacteria. Samples are collected from outfalls and receiving waters and are analyzed for fecal indicator bacteria (i.e., total coliforms, fecal coliforms, and enterococci) in accordance with the CSDM Program Work Plan (SDCRC, 2007).

The results from the CSDM Program are provided annually as a separate report in Appendix N. The reporting period of the CSDM Program occurs from October 1 through September 30 of each monitoring year.

The CSDM Program primarily answers two core management questions, which address urban runoff discharges in coastal areas and the relation to receiving water impairments: 3) What is the relative urban runoff contribution to the receiving water problem(s)? and 4) What are the sources of urban runoff that contribute to receiving water problem(s)?

ES.4.2.4 Jurisdictional Dry Weather Monitoring Conclusions

Each jurisdiction conducts a separate Dry Weather Monitoring (DWM) Program described in each Jurisdictional Urban Runoff Management Program (JURMP) Annual Report. Dry weather samples are collected from the jurisdictions' MS4 to detect and eliminate illegal connections and illicit discharges (ICIDs). Samples are collected from May 1 through September 30 each Permit year. The results of the 2008 DWM Program were included in this report's data assessment and provide a comparison of urban runoff in the MS4 to the ambient weather and storm event receiving water condition. The DWM Program primarily answers two core management questions, which address urban runoff discharges in the MS4: 3) What is the relative urban runoff contribution to the receiving water problem(s)? and 4) What are the sources of urban runoff that contribute to receiving water problem(s)?

During the 2008 DWM Program, out of 8,655 individual field and analytic samples, 661 samples had results measured above the dry weather action levels (Table ES-14) for an exceedance rate of only 7.6%. Table ES-14 also shows the exceedance rate for each analyte measured under the DWM Program. The analyte with the highest rate of results above the action level for 2008 was total coliforms (29.1%). Conductivity had the second highest exceedance rate (18.3%), which is consistent with the known regional issues related to TDS. Out of 389 dry weather samples collected from the region and analyzed for Diazinon, there were no dry weather action level exceedances. Of 387 dry weather samples collected and analyzed for Chlorpyrifos, only one sample (in Point Loma) was reported as an action level exceedance. Among the four dissolved metals for which analyses were conducted (i.e., cadmium, lead, copper, and zinc), dissolved copper had the greatest number of reported exceedances (12 exceedances in 380 samples).

Dissolved lead was found to be above the dry weather action level in five of 376 samples and dissolved cadmium exceeded the action level in one of 380 samples. No exceedances were reported for dissolved zinc in the region. The dissolved metals action levels are based on the CTR hardness based criteria.

Table ES-14. 2008 Jurisdictional Dry Weather Monitoring Data Summary of Action Level Exceedances

Constituent Group	Analyte	Number of Dry Weather Samples Collected Regionally	Number of Dry Weather Action Level Exceedances	Percentage of Action Level Exceedances (%)
General chemistry	pH	824	27	3.3
	Conductivity*	829	152	18.3
	Oil & grease	264	1	0.4
	Ammonia (NH_3-N)	807	39	4.8
	Methylene blue active substance (MBAS)	12	0	0
	Turbidity**	807	110	13.6
Nutrients	Orthophosphate (PO_4-P)	808	33	4.1
	Nitrate (NO_3-N)	807	59	7.3
Metals	Cadmium (dissolved)	380	1	0.3
	Copper (dissolved)	380	12	3.2
	Lead (dissolved)	376	5	1.3
	Zinc (dissolved)	380	0	0
Pesticides	Chlorpyrifos	387	1	0.3
	Diazinon	389	0	0
Bacteria	Total coliforms	402	117	29.1
	Fecal coliforms	402	40	10.0
	Enterococci	401	64	16.0
Grand Total		**8,655**	**661**	**7.6**

* The action levels were adopted by the Dry Weather Workgroup and are based on best professional judgment (BPJ).
** The turbidity action level is BPJ, however, the Basin Plan WQO was used for the interim watershed assessments.
Results are reported as provided by the Dry Weather Workgroup.

When the Regional Monitoring Program implemented the analysis of organophosphate pesticides in 2001, it is was based on the threat of these pesticides entering the region's receiving waters, evidence of persistent exceedances of Diazinon and Chlorpyrifos, and evidence of pesticide-induced acute and chronic toxicity to *C. dubia*. DWM results for Chlorpyrifos and Diazinon over the past six years are shown in Table ES-15. The dry weather exceedance rates for Diazinon and Chlorpyrifos have steadily declined over the past six years of monitoring and have been less than 1% in each year over the past four years. With respect to the USEPA ban on the pesticides Diazinon and Chlorpyrifos and the infrequent (or lack of) detections for these analytes in the DWM Program, this analysis could be justifiably removed from monitoring program requirements.

Table ES-15. Jurisdictional Dry Weather Monitoring Results for Chlorpyrifos and Diazinon for the Period 2003–2008

Monitoring Year	Analyte	Number of Dry Weather Samples Collected Regionally	Number of Dry Weather Action Level Exceedances	Percentage of Action Level Exceedances (%)
2003	Chlorpyrifos	373	117	31.4
2004	Chlorpyrifos	241	1	0.4
2005	Chlorpyrifos	285	0	0
2006	Chlorpyrifos	382	1	0.3
2007	Chlorpyrifos	333	0	0
2008	Chlorpyrifos	387	1	0.3
2003	Diazinon	373	129	34.6
2004	Diazinon	240	6	2.5
2005	Diazinon	286	2	0.7
2006	Diazinon	377	2	0.5
2007	Diazinon	333	0	0
2008	Diazinon	389	0	0

ES.4.3 Watershed Assessments for Annual Report Summaries

ES.4.3.1 Summary of Receiving Water Trends Assessments

The results for the 2008–2009 Monitoring Season were combined with historical results, and were compared statistically to identify temporal trends within each watershed. The high frequency of occurrence constituents of concern (COCs) identified through the WMA assessment process and the observed significant Mann-Kendall statistical trends are shown in Table ES-16.

Table ES-16. Table Mass Loading Station or Base Temporary Watershed Assessment Station Persistent Constituents and Trends

Mass Loading Station	Persistent Ambient Weather Constituents of Concern	Persistent Wet Weather Constituents of Concern	Significant Wet Weather Trends Observed[1]
Santa Margarita River	TDS	Fecal coliform	Decreasing – fecal coliform[2]
San Luis Rey River	TDS Total nitrogen Enterococci	TDS Fecal coliform	Decreasing – TDS, total hardness Increasing – dissolved phosphorus, turbidity, total coliform, fecal coliform, enterococci
Loma Alta Creek	TDS	TSS Turbidity Fecal coliform Enterococci	Insufficient data to conduct trend analysis
Buena Vista Creek	TDS Enterococci	TSS Turbidity Total coliform Fecal coliform Enterococci	Insufficient data to conduct trend analysis
Agua Hedionda Creek	TDS Fecal coliform Enterococci	TSS Turbidity Total coliform Fecal coliform Enterococci	Decreasing – dissolved arsenic, Diazinon Increasing – chemical oxygen demand (COD), TSS, turbidity, total copper, total lead, total nickel, total zinc, total coliform, fecal coliform
Escondido Creek	TDS Enterococci	TDS Turbidity Total coliform Fecal coliform Enterococci	Decreasing – dissolved nickel, Diazinon Increasing – total zinc
San Dieguito River	TDS Chloride Sulfate Total nitrogen	TDS	Increasing – conductivity, TKN, total phosphorus
Los Peñasquitos Creek	TDS Chloride Sulfate Enterococci	TDS Fecal coliform	Decreasing – total lead Increasing – fecal coliform
Tecolote Creek	Total nitrogen	Turbidity Total coliform Fecal coliform Enterococci	Decreasing – TSS, Diazinon Increasing – total hardness, enterococci
San Diego River	TDS Chloride Total nitrogen Enterococci	Turbidity Fecal coliform	Decreasing – nitrate, dissolved copper
Chollas Creek	TDS Turbidity Total coliform Fecal coliform Enterococci Dissolved copper	TSS Turbidity Total coliform Fecal coliform Enterococci	Decreasing – TDS, Diazinon, toxicity to *H. azteca* Increasing – turbidity, nitrite, TKN, total copper, total zinc
Sweetwater River	No persistent COC	Fecal coliform Enterococci	Decreasing – total lead Increasing – pH

Mass Loading Station	Persistent Ambient Weather Constituents of Concern	Persistent Wet Weather Constituents of Concern	Significant Wet Weather Trends Observed[1]
Tijuana River	No ambient weather monitoring to date	TSS Turbidity Total coliform Fecal coliform Enterococci Diazinon	Decreasing – conductivity, TDS, Diazinon, dissolved nickel Increasing – TSS, turbidity, nitrate, total arsenic, total copper, total lead, total zinc, total coliform, fecal coliform

1. Only one year of ambient weather analyses conducted; therefore, only wet weather trends are presented.
2. Based on historical trend from 2007–2008 Monitoring Season. A new site was located upstream in the County's jurisdiction and trends cannot be analyzed at this time.

ES.5 2008–2009 Recommendations: Follow-up Analysis and Action

The recommended actions from the triad assessments are summarized in Table ES-17 and include continuing water quality monitoring in all watersheds to gather long-term trend information and investigating upstream sources of contaminants. While several recommended actions are to conduct TIEs for persistent toxicity to *H. azteca* during wet weather conditions, the Copermittees have demonstrated that toxicity to this organism is most likely associated with the presence of the synthetic pyrethroid Bifenthrin in storm water runoff. Pyrethroids were detected in many of the sediments collected in urban areas during the post-storm sediment sampling. However, the following sites did have detections above the sediment benchmark:

- Rose Creek TWAS-1.
- Chollas Creek MLS.
- Tijuana River MLS.

Further studies using sediment exposures with *H. azteca* are recommended to deteremine if sediment samples are impacting test organisms. As previosly mentioned, toxicity to *H. azteca* as a result of synthetic pyrethroids is a region-wide and state-wide problem, and is currently being addressed by the DPR. The CASQA Pesticide Subcommittee is actively working with DPR during the re-registration period for these compounds. The CASQA Pesticide Subcommittee is also a valuable resource for information sharing on synthetic pyrethroids and other pesticides, and these studies will further the information needed to influence DPRs decision-making process during the re-registration period.

Based on the results of ambient weather monitoring during the 2007–2008 Monitoring Season, a TIE was recommended for ambient weather toxicity to *C. dubia* reproduction in the Los Peñasquitos WMA at Site LPC-TWAS-1 (Carroll Canyon). However, toxicity results were below the threshold recommended for a TIE during the two events monitored in 2007–2008. In the event that persistent low level toxicity is observed during the next ambient weather monitoring cycle in north San Diego County, additional dilution series to refine *C. dubia* toxic endpoints and/or implementation of additional highly sensitive tests are recommended.

Since the USEPA has banned the retail sale of Diazinon and Chlorpyrifos and with the increased public outreach and education regarding the handling of pesticides in general, a decreasing trend for the organophosphate pesticide compounds is evident and should continue. Continued monitoring of the organophosphate compounds in receiving water samples should show an overall decrease in the number of benchmark exceedances and concentrations over time with the expectation that residual public supply and use will eventually be exhausted. However, based on the DWM data collected for these compounds and the less than 1% exceedance rate over the past four years of monitoring, this analysis could be justifiably removed from the monitoring program requirements during the scheduled report of waste discharge. This would result in potential cost savings to the Copermittees on a region-wide basis and is consistent with the intentions of the SMC concept of adaptive management.

Table ES-17. Recommended Actions From the Triad Assessment

Watershed	Condition	Chemistry	Toxicity	Bioassessment	Action
Santa Margarita River[1]	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
San Luis Rey River	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
Loma Alta	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **TSS, Turbidity**	Evidence of persistent toxicity. ***Hyalella***	Indications of alteration.	Conduct TIE to identify contaminant of concern once chemistry results show a change in conditions in terms of Pyrethroids.* Address upstream sources as a high priority.
Buena Vista	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **TSS, Turbidity**	Evidence of persistent toxicity. ***Hyalella***	Indications of alteration.	Conduct TIE to identify contaminant of concern once chemistry results show a change in conditions in terms of Pyrethroids.* Address upstream sources as a high priority.
Agua Hedionda	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **TSS, Turbidity**	Evidence of persistent toxicity. ***Hyalella***	Indications of alteration.	Conduct TIE to identify contaminant of concern once chemistry results show a change in conditions in terms of Pyrethroids.* Address upstream sources as a high priority.
Escondido Creek	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **Turbidity**	No evidence of persistent toxicity.	Indications of alteration.	Address upstream sources as a high priority.
San Dieguito River	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.

Table ES-17. Recommended Actions From the Triad Assessment

Watershed	Condition	Chemistry	Toxicity	Bioassessment	Action
Los Peñasquitos Creek	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance
Tecolote Creek	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **Turbidity**	No evidence of persistent toxicity.	Indications of alteration.	Address upstream source as a high priority.
San Diego River	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **Turbidity**	No evidence of persistent toxicity.	Indications of alteration.	Address upstream source as a high priority.
Chollas Creek	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent o concern identified). **TSS, Turbidity**	Evidence of persistent toxicity. ***Hyalella***	Indications of alteration.	Conduct TIE to identify contaminant of concern once chemistry results show a change in conditions in terms of Pyrethroids.* Address upstream sources as a high priority.
Sweetwater River	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
Tijuana River	Wet Weather	Persistent exceedance of Water quality objectives (high frequency constituent of concern identified). **TSS, Turbidity, Diazinon**	Evidence of persistent toxicity. ***(C. dubia acute, chronic, and reproductive endpoints)***	Indications of alteration.	Conduct TIE to identify contaminant of concern once chemistry results show a change in conditions in terms of Diazinon and Pyrethroids.* Address upstream sources as a high priority.

Note: Insufficient data to assess ambient results due to Bight '08 monitoring year.

[1] The Santa Margarita MLS was relocated to the County of San Diego's Jurisdiction during 2008–2009. Changes in assessment findings may be reflective of the change in MLS location.

* Toxicity to *H. azteca* has been linked to detections of synthetic pyrethroids (primarily Bifenthrin) in storm water runoff at these sites.

ES.6 Document Structure

This report is organized to represent a watershed-based approach for reviewing the results. The Permit requires that Copermittees assess and report the findings of annual monitoring activities conducted under the Receiving Waters and Urban Runoff Monitoring Program on a watershed-basis for each of the hydrologic units (HUs) in the San Diego Region. Section 1, Introduction, provides a summary of the goals and the core management questions relevant to the Permit and a description of the regional setting. Section 2, Scope of Work, provides a description of the activities that were completed during the 2008–2009 monitoring year, which include storm water monitoring, rapid stream bioassessment, watershed management area (WMA) assessments, and data analyses. The WMAs are presented in Section 3 through Section 11. Section 12 presents regional assessments of the MS4 Outfall Monitoring, Source Identification Monitoring, and Synthetic Pyrethroid Monitoring Programs. Section 13 presents conclusions, any regional highlights, and recommendations for the 2009–2010 Receiving Waters Monitoring Program. All supporting information is provided in the appendices. Table ES-18 provides a brief layout of the 2008–2009 report organization.

Table ES-18. Report Organization

Section	Description
1	Introduction
2	2008–2009 Scope of Work
3	Santa Margarita River WMA
4	San Luis Rey River WMA
5	Carlsbad WMA
6	San Dieguito River WMA
7	Los Peñasquitos River WMA
8	Mission Bay WMA
9	San Diego River WMA
10	San Diego Bay WMA
11	Tijuana River WMA
12	Regional Assessments
13	Conclusions and Recommendations
14	References
Appendices	Appendices

Each WMA section is structured as follows with the section number indicated as "X":

- ES.X WMA-specific executive summary.
- X.1 Watershed core management question discussion.
- X.2 Watershed management area description with regulatory water quality challenges.
- X.3 Watershed monitoring activities summary, including receiving water assessment and urban runoff assessments.
- X.4 A loading analysis.
- X.5 Additional monitoring data summaries (from third parties).
- X.6 Watershed management area assessment.
- X.7 Conclusions and recommendations to answer the five core management questions.