1.0 INTRODUCTION

1.1 Purpose of Report and Project Background

National Pollutant Discharge Elimination System (NPDES) permitting requirements are mandated by the Federal Clean Water Act (CWA). In 1987, the CWA was amended by the Water Quality Act to require the U.S. Environmental Protection Agency (EPA) to develop discharge permits under the NPDES Program. In California, the municipal program is overseen by the State Water Resources Control Board and Regional Water Quality Control Boards (RWQCB) in accordance with the November 1990 Federal Regulations (40 CFR Part 122) and the Porter-Cologne Act. These regulations require all municipal separate storm sewer systems (MS4s) that serve a population over 100,000 to obtain coverage under a NPDES discharge permit. In Los Angeles County, the Los Angeles Region RWQCB oversees the NPDES permit program.

The Los Angeles County Flood Control District, the County of Los Angeles, and 84 incorporated cities within the Los Angeles County Flood Control District (collectively referred to as Permittees) are covered under a municipal NPDES permit for discharge of urban runoff to water of the United States. The discharges are covered under countywide waste discharge requirements contained in Order No. 96-054, which also serves as a NPDES permit for the discharge of municipal storm water. The current NPDES permit for municipal storm water and urban runoff discharges is covered under Order No. 01-182 (NPDES No. CAS-004001). The current permit expires on December 12, 2006.

This Integrated Receiving Water Impacts Report (IRWI) provides a comprehensive analysis of the results of the Monitoring and Reporting Program under Order No. 01-182 for the period from 2000 to 2005, and includes an overall analysis of the available data from the past 10 years of storm water quality monitoring. This report also serves as the fourth year monitoring report. This IRWI Report fulfills the requirements of Order No. 01-182, Monitoring and Reporting Program (MRP) program reporting requirements (Item D).

The purpose of the IRWI is to present a comprehensive analysis of the results of the data from each component of the Monitoring Program, and other pertinent available studies. The findings of this analysis of the data are used to develop conclusions and recommendations for future monitoring under the new NPDES permit. This report also provides a budget summary for each monitoring requirement.

This IRWI will be an integral part of the next Report of Waste Discharges (ROWD), which will be submitted by June 12, 2006. The ROWD and proposed Storm Water Quality Management Program (SQMP) in accordance with CCR Title 23 will serve as the application for re-issuance of the waste discharge requirements.

Although the IRWI will focus on data collected during the current permit cycle (2001-2005), monitoring results from 1994 to 2000 will be integrated into the report to analyze long-term trends in storm water quality. The objectives of the IRWI are:

- Document status and trends of stormwater quality since 1994;
- Assess whether the six primary objectives of the 2001 monitoring program, as stated in the MRP, were realized;
- Suggest refinement of the 2001 MS4 Permit Storm Water Quality Management Plan, if necessary; and
- Support the upcoming 2001 MS4 Permit Report of Waste Discharge (ROWD).

The NPDES Permit for Municipal Storm Water and Urban Runoff discharges for LA County includes the discharges from municipal separate storm sewer systems (MS4s) that flow to water courses within the Los Angeles County Flood Control District and into receiving waters of the LA Region. The permit includes all incorporated cities within LA County, except for the City of Long Beach. The watersheds within LA County that are part of the NDPES permit include:

- Malibu Creek Watershed
- Ballona Creek Watershed
- Los Angeles River Watershed
- San Gabriel River Watershed
- Dominguez Channel Watershed
- Santa Clara River Watershed

Weston Solutions, Inc. has been contracted by the Los Angeles County Department of Public Works (LACDPW) to prepare this IRWI Report.

1.2 Objectives of Monitoring Program

Storm water monitoring has been a condition of the NPDES permit granted to Los Angeles County every five years. Monitoring objectives are described in each NPDES permit, but the scope of the monitoring plan typically changes or expands between permits or over the period of a current permit based on prior monitoring results or need. This adaptive process allows Los Angeles County to refine its storm water management and better protect the beneficial uses of receiving waters within its jurisdiction. Objectives and key elements of monitoring plans associated with each of the three NPDES permits granted to Los Angeles County are described in the following sections.

1.2.1 Historical Monitoring Objectives

The 1994-1995 storm season was the first season in which stormwater monitoring occurred under the initial NPDES permit granted to Los Angeles County in 1990. Sampling was conducted at nine stations throughout the Los Angeles Basin, including Ballona and Malibu Creeks. During the 1995-1996 storm season, stations at the Los Angeles River, Coyote Creek, and the San Gabriel River were added. Monitoring from 1994-1996 consisted of wet weather and dry weather sampling.

The 1996-1997 storm season was the first season in which stormwater monitoring was required by the second NPDES permit granted to Los Angeles County in 1996. The same stations monitored from 1994-1996 were sampled during the second permit cycle, which ended with the

2000-2001 storm season. Monitoring from 1996-2000 consisted of wet weather and dry weather sampling.

The goal of the monitoring program as described in the NPDES permit was to gain information to develop effective stormwater management by Los Angeles County. The major objectives of the monitoring program were:

- track water quality status, pollutant trends and pollutant loads, and identify pollutants of concern;
- monitor and assess pollutant loads from specific land uses and watershed areas;
- identify, monitor, and assess significant water quality problems related to stormwater discharges within the watershed;
- identify sources of pollutants in the stormwater runoff;
- identify and eliminate illicit discharges;
- evaluate the effectiveness of management programs, including pollutant reductions achieved by implementation of Best Management Practices (BMPs); and
- assess the impacts of stormwater runoff on receiving waters.

The Monitoring Program in the 1996 NPDES permit had several elements: Mass Emission runoff monitoring; Land Use runoff monitoring; and Critical Source runoff monitoring. During the permit cycle, the scope of the Monitoring Program was expanded to include the following requirements: 1) "Wide Channel" and "Low Flow" analyses, which were one-year pilot studies completed in 1997; 2) a three-year study of storm water impacts to beneficial uses of Santa Monica Bay, completed in 1999; 3) toxicity tests on storm water from the Los Angeles and San Gabriel Rivers; and 4) an assessment of impacts during the unexpected El Niño year. In addition, a voluntary three-year study to determine impacts to Santa Monica Bay from aerial deposition of pollutants was initiated.

1.2.2 Current Monitoring Objectives

Storm water monitoring requirements under NPDES Permit No. CAS004001, which was granted to the Los Angeles County Flood Control District (LAFCD) in 2001, are described in Monitoring and Reporting Program No. 6948 (MRP). The primary objectives of the 2001 MRP include:

1) assessing compliance with the NPDES Permit granted to Los Angeles County;
2) measuring and improving the effectiveness of the SQMPs;
3) assessing the chemical, physical, and biological impacts from urban runoff on receiving waters;
4) characterization of storm water discharges;
5) identifying sources of pollutants; and
6) assessing the overall health and evaluating long-term trends in receiving water quality.

Table 1-1 presents these objectives, the current monitoring program that addresses these objectives and the corresponding sections of this report that present the findings and conclusions for these programs.

Table 1-1. MRP Objectives and Corresponding 2001 Monitoring Programs and Report Section.

MRP Objective	Corresponding Monitoring Program/Activities that Addresses Objective in the 2001 Permit	Corresponding Report Section that Provides Findings/Conclusions that Address Objectives
1) Assessing compliance with the NPDES Permit granted to Los Angeles County	The Permit includes the monitoring program activities that are required by LACDPW.	• Section 3 provides a summary of the MRP requirements and the verification of compliance with these requirements for field and analytical methods.
2) Measuring and improving the effectiveness of the SQMPs	The SQMP contains programs in the areas of 1) Public Information; 2) Development Planning; 3) Development Construction; 4) Public Agency Activities; 4) Illicit Connection/ Illicit Discharge Elimination Program. Emphasis of the SQMP is pollution prevention through education, public outreach, planning, and implementation of BMPs.	• Sections 4-9 provide water quality results summary for each watershed and conclusions on the long-term trends related to reductions of constituents. • Section 10 provides a summary of the BMP effectiveness studies that assess goals of the MRP through BMP implementation. • Annual Unified Report
3) Assessing the chemical, physical, and biological impacts from urban runoff on receiving waters	The Core Monitoring program as required under the MRP includes water quality monitoring of the mass loading stations, tributaries for wet and dry weather. It also includes water quality toxicity monitoring at the mass emissions stations. The results from this program provide the basis for assessing the chemical, physical and biological impacts to the receiving waters.	• Sections 4-9 provide water quality results summary for each watershed related to impacts from urban runoff on receiving waters. • Section 11 provides a regional assessment of water quality using the results of the core monitoring program to assess regional chemical, physical and biological impacts on receiving waters.
4) Characterization of storm water discharges	The Core Monitoring program as required under the MRP includes characterization of the storm water at the mass loading stations, tributaries for wet and dry weather. It also includes water quality toxicity monitoring at the mass emissions stations.	• Sections 4-9 provide water quality results summary for each watershed. • Section 11 provides a regional assessment of water quality using the results of the core monitoring program.
5) Identifying sources of pollutants	The tributary monitoring program provides initial data to better define potential sources of higher constituent loading within the watersheds sampled. Tributary sampling has been conducted on LA River and Ballona Creek (Previous studies have only hypothesized about the potential sources of pollutants in the tributaries).	• Sections 5 and 7 present the results of the tributary sampling and provide conclusions on contributions to constituent loading form each tributary. • Section 7 includes a summary of the source study performed by the Southern California Coastal Water Project that investigated sources of bacteria and metals in Ballona Creek and the stormwater outfalls located along its tributaries.

MRP Objective	Corresponding Monitoring Program/Activities that Addresses Objective in the 2001 Permit	Corresponding Report Section that Provides Findings/Conclusions that Address Objectives
6) Assessing the overall health and evaluating long-term trends in receiving water quality	The Core Monitoring program consisting of water quality monitoring at the mass emission stations at each of the seven watersheds and tributary monitoring provide for an assessment of overall health and long-term trends in the receiving water quality. Additional intra-regional and special studies including the bioassessment program and the estuary sampling also provide the basis for an overall assessment.	• Sections 4-9 provide assessment for each watershed on the long-term trends (1995-2005) related to quality of receiving waters. • Section 11 provides a regional assessment of long-term trends (1995-2005) and inter-relationships on the quality of receiving waters. • Section 10 provides an assessment of intra-regional monitoring and presents conclusions regarding overall health and long-term trends as applicable to the data and time-frame of the sampling program.

1.3 2001-2005 Monitoring Program

The Monitoring and Reporting Program (MRP) under the current NPDES Permit consist of three monitoring programs with defined objectives and specific sampling and analysis requirements. These monitoring programs are designed to meet the stated objectives presented in the previous subsection. The three monitoring programs that are being conducted as part of the 2001-2005 monitoring program consist of “Core Monitoring”, “Regional Monitoring”, or “Special Studies” based on their objectives. Each monitoring program of the current MRP and its objective are described in the sections that follow.

1.3.1 Core Monitoring Program

Core monitoring involves storm water sampling at established, representative stations throughout the Los Angeles Basin over the five year period of the NPDES permit. It also includes routine water quality sampling at established stations in receiving waters along the adjoining coast. The regular monitoring generates a long-term record of storm water quality, pollutant loading, or water quality at these stations, which is used to evaluate the efficiency of storm water management in Los Angeles County. This component of the MRP also identifies pollutants that may pose risks to biota in receiving waters and helps track the source of toxic or excess pollutants. Core monitoring meets the following objectives of the MRP: 1) stormwater characterization; 2) compliance with NPDES permit conditions; 3) measurement or improvement of SQMPs; 4) assessing impacts of urban runoff on receiving waters; 5) identification of pollutant sources; and 6) evaluating long-term trends in receiving water quality. Core monitoring involves Mass Emission Monitoring, Water Column Toxicity Monitoring, Tributary Monitoring, Shoreline Monitoring, and Trash Monitoring, the details of which are described below.

1.3.1.1 Mass Emission Monitoring

The objectives of mass emission monitoring are to estimate the mass emissions from the Municipal Separate Storm Sewer System (MS4), assess trends in the mass emissions over time, and determine if the MS4 is contributing to exceedances of water quality standards by comparing results to applicable standards in the Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan), the California Ocean Plan (Ocean Plan), or the California Toxics Rule (CTR), and with emissions from other discharges.

Los Angeles County monitors mass emissions from the following seven stations: Ballona Creek, Malibu Creek, Los Angeles River, Coyote Creek, San Gabriel River, Dominguez Channel, and the Santa Clara River. The Ballona Creek, Malibu Creek, Los Angeles River, San Gabriel River, and Coyote Creek stations have been monitored since 1994. Sampling at the Dominguez Channel and the Santa Clara River began in 2001 and 2002, respectively. Each station characterizes stormwater quality in one of the seven watersheds that comprise Los Angeles County and together monitor stormwater runoff from 2060 square miles.

Mass emission stations capture runoff from major Los Angeles County watersheds that generally have heterogeneous land use. All mass emission sites, except the Santa Clara River site, are equipped with automated samplers with integral flow meters for collecting flow-composite samples. Although sample collections at the Santa Clara River station are performed manually, composite samples are achieved using the flow measurements by a United States Geological Survey (USGS) stream gauge that is at the Santa Clara River station.

1.3.1.2 Water Column Toxicity Monitoring

The objectives of water column toxicity monitoring are to analyze mass emission samples for toxicity to help identify the source of toxic conditions in receiving waters. Once the mass emission station causing the toxic condition is identified, the SQMP will be modified to implement additional practices that eliminate or reduce the delivery of toxic substances from that watershed management area.

1.3.1.3 Tributary Monitoring

The objectives of tributary monitoring are to identify sub-watersheds where storm water discharges are causing or contributing to exceedances of water quality standards, and to prioritize drainage and sub-drainage areas that need management actions.

Monitoring, as required by the permit, started on October 15, 2002 and focused solely on six tributaries within the Los Angeles River Watershed, namely Aliso Creek, Bull Creek, Burbank Western System Channel, Verdugo Wash, Arroyo Seco Channel, and Rio Hondo Channel. Each tributary was monitored during the 2002-2003 and 2003-2004 storm season. During the 2004-2005 storm season, sampling was conducted on six tributaries in the Ballona Watershed Management Area, including Centinela, Sepulveda, Benedict, Adams, Fairfax, and Cochran sampling sites. Automated flow weighted composite samples and grab samples were collected from each tributary location. The tributaries were sampled for a variety of constituents, including those identified during Water Column Toxicity Monitoring as causing toxic conditions in the Los Angeles River at the mass emission station.

1.3.1.4 Shoreline Monitoring

The Municipal Storm Water Permit requires the City of Los Angeles to routinely monitor shoreline stations to evaluate the impacts to coastal receiving water quality and the loss of recreational beneficial uses resulting from storm water/urban runoff in Santa Monica Bay. Eighteen stations along the shoreline within Santa Monica Bay were monitored and analyzed for total coliform, fecal coliform and enterococcus. The monitoring program began in 2001-2002, and has been conducted for the last three years.

1.3.1.5 Trash Monitoring

The objectives of trash monitoring are to assess the quantities of trash in receiving waters after storm events and to identify areas impaired for trash. In March 2002, Los Angeles County began conducting a Trash Baseline Study within the Ballona Creek and Los Angeles River watersheds. The study aims to quantify the amount and type of debris flowing into the storm drain system from these watersheds and link this information to the dominant land use type that exists upstream of each studied catch basin. To facilitate the study, LACDPW installed four full continuous deflective system (CDS) units and placed trash inserts in approximately 500 catch basins to retain debris that enters the catch basins. Following the installation, the County has periodically collected the debris captured by the inserts/CDS units following a significant rainfall event, and has sorted the man-made litter from the naturally occurring sediment and vegetation. Each type of debris is quantified in both weight and volume and recorded in a spreadsheet. This spreadsheet lists these quantities and separates the data into the five major land use categories: commercial, high-density single family residential, industrial, low-density single family residential, and parks. Visual observations of trash were made and a minimum of one photograph was taken at each mass emission station after each storm event for the first four storm events of the season.

1.3.2 Regional Monitoring

LACDPW is required to participate in regional monitoring programs that address public health concerns, monitor trends in natural resources and near shore habitats, and assess regional impacts from storm water pollutant sources. The regional programs include the following sampling programs and assessments.

1.3.2.1 Estuary Sampling

The estuary monitoring program is a component of the coastal ecology committee of the Southern California Bight 2003 project coordinated by the Southern California Coastal Waters Research Project (SCCWRP). The two primary objectives of Bight ‘03 are to estimate the extent and magnitude of ecological change in the Southern California Bight (SCB) and to determine the mass balance of pollutants that currently reside within the SCB. The goal of the estuary monitoring program is to sample estuaries for sediment chemistry, sediment toxicity, and benthic macroinvertebrate diversity to determine the spatial extent of sediment fate from storm water, and the magnitudes of its effects. Malibu Creek, Ballona Creek, Los Angeles River, San Gabriel River, and Dominguez Channel are the estuaries in Los Angeles County that are being monitored. Monitoring began in 2003 and will continue through 2006.

1.3.2.2 Stream Bioassessment Monitoring

Section II.G of the storm water monitoring requirements requires LACDPW to perform annual bioassessments on streams in Los Angeles County beginning in 2003 and continuing through 2005.

The objectives of stream bioassessment are to assess biological integrity and to detect biological trends and responses to pollution in receiving waters throughout the region. Bioassessment includes the collection and identification of stream benthic macroinvertebrates, and also assesses the quality and condition of the in-stream physical habitat and adjacent riparian zone. This information may complement monitoring programs that test water quality parameters which provide a measure of habitat conditions only at the moment sampling occurs.

The twenty monitoring reaches assessed in this study were located in five major watersheds throughout Los Angeles County, including the Santa Clara River Watershed, the Santa Monica Bay Watershed (Ballona Creek Watershed and Malibu Creek Watershed), the Dominguez Channel Watershed, the Los Angeles River Watershed, and the San Gabriel River Watershed. Sampling and sample analysis followed protocols described in the California Stream Bioassessment Procedure (Harrington, 1999) established by the Surface Water Ambient Monitoring Program within the California Department of Fish and Game.

1.3.3 Special Studies

As required by the 2001 Municipal Storm Water Permit, LACDPW is conducting special monitoring programs, including the following:

1.3.3.1 New Development Impacts Study in the Santa Clara River Watershed

The objective of the New Development Impacts Study in the Santa Clara Watershed is to evaluate the effectiveness of the Standard Urban Storm Water Mitigation Plan (SUSMP) Best Management Practices at reducing pollutants in storm water runoff. This evaluation will be accomplished by a computer model. Modeling is on-going. Sampling will take place in 2005-2006.

1.3.3.2 Peak Flow Discharge Impact Study

The goal of the Peak Flow Discharge Impact Study was to assess the potential connection between urbanization and stream erosion in natural drainage systems. The main objective was to evaluate peak flow impacts and, ultimately, use this relationship to determine numeric criteria to prevent or minimize erosion of natural stream channels and banks caused by urbanization. In 2002-2003 and 2003-2004, approximately ten stream reaches in catchments with varying degrees of urbanization in southern California were selected for evaluation of their morphometric attributes. The reaches were selected to represent the various geomorphic channel types in the study area and were used to help classify stream and establish baseline conditions for each stream class.

1.3.3.3 Evaluation of Stormwater BMP Effectiveness

The goal of this project is to assess the effectiveness of BMPs for reducing the concentration of pollutants in stormwater. Samples of stormwater from upstream and downstream of the BMP

are analyzed for the concentration of contaminants associated with stormwater. A key product expected from this project will be a matrix describing the effectiveness of various BMPs. These data will be of high value to agencies statewide in their effort to develop and implement watershed management plans.

BMP types with the greatest potential for implementation and effectiveness in southern California coastal areas have been selected and monitored at multiple study locations. BMPs include continuous deflection separation (CDS) units, storm drain inserts, and detention ponds. The objective of the monitoring protocols will be to obtain data on BMP removal efficiency for toxicity and toxicologically important constituents, such as pesticides and biologically available forms of trace metals. Samples for chemical and toxicity measurements will be collected from each BMP location during 5-8 storm events from 2004 through 2006. Flow-weighted composite samples will be collected both upstream and downstream of structural BMPs. Toxicity tests will be conducted with marine species known to be sensitive to urban runoff toxicity and chemical measurements will include diazinon, chlorpyrifos, and dissolved metals (zinc, copper, lead). Data will also be obtained on suspended solids, runoff volume, flow rate, rainfall intensity, and storm duration.

1.4 Previous Studies (Prior to 2000)

A number of previous studies have been completed to meet the historical objectives of the previous NPDES permit period (1996-1999). The following subsections present a summary of these previous studies. Because this IRWI Report includes an evaluation of long-term trends including data from the past 10 years, and not specifically on the current permit period, the conclusions of these previous studies will be utilized where applicable in assessing these long-term trends.

1.4.1 Santa Monica Receiving Waters Study

The Study of the Impact of Stormwater Discharge on the Beneficial Uses of Santa Monica Bay was completed in 1999. The “Receiving Waters Study” performed toxicity tests with wet weather storm water samples from Ballona Creek and water and sediment samples collected from Santa Monica Bay. Toxicity tests were performed on sea urchin fertilization to determine the impact storm water discharges from a developed (Ballona Creek) and non-developed watersheds (Malibu Creek) were having on the receiving environment in Santa Monica Bay. The study was conducted from 1995 to 1998.

1.4.2 River Toxicity Tests

During 1997-1998 and 1998-1999, samples collected from the Los Angeles and San Gabriel Rivers during dry and wet weather were analyzed for toxicity in order to fulfill NPDES monitoring requirements. The testing was performed by the Southern California Coastal Waters Research Project (SCCWRP). Toxicity was measured as impairment to sea urchin fertilization.

1.4.3 Aerial Deposition

A three year study began in 1998-1999 to estimate annual pollutant loads deposited into the Santa Monica Bay watershed from atmospheric sources, both directly and indirectly by depositing onto land surfaces and then washing off into the Bay during storm events. The study examined the types of sources that contribute disproportionately large percentages of pollutants that end up depositing in the Santa Monica Bay watershed and further examined the linkage between aerial deposition and its contribution to urban runoff.

The sampling program included measurements of aerosol particles from the atmosphere as well as of wet and dry deposition. Sampling was conducted during dry and wet weather to determine the pollutant load during rain events. Measurements were also taken from sea surface microlayer and bulk seawater to estimate direct deposition into the Bay. The program also included an atmospheric, transport and deposition modeling project.

1.4.4 El Niño

In anticipation of an extreme winter season and increased rainfall in 1997-1998, studies were conducted to determine the effect of El Niño on urban stormwater. The objective of this research was to determine whether the unusual oceanographic conditions and storm events produced by El Niño conditions had an influence on the toxicity of Ballona Creek stormwater or on the characteristics of the stormwater discharge plume in Santa Monica Bay. The major goals of the study were to examine the magnitude of stormwater toxicity, the spatial extent of the toxic portion of the plume, and the characteristics of the toxicants. The physical and optical characteristics of the Ballona Creek stormwater discharge plume and its toxicity were measured for three storm events occurring in 1998. Selected samples of the runoff plume were also analyzed for chemical constituents.

1.4.5 Wide Channel

The Wide Channel Pilot Study was designed to determine the accuracy of a single point water intake in representing the water quality in wide channels. The primary focus was the comparison of a series of surface water grab samples collected across the width of a representative channel to investigate horizontal variations in water quality within wide channels. The secondary focus was to compare the surface grab samples with water samples collected near the bottom of the channel by an automated sampling station to evaluate the vertical variability in water quality. The Ballona Creek mass emission monitoring station was utilized because it provided the most suitable conditions for conducting the pilot study.

In order to characterize the lateral variability in water quality, sampling was conducted at five stations across the channel. Four stations were spaced equidistant from each other and the fifth station was the existing automated sampling station. Surface water was collected from all stations and bottom water was collected from the automated sampler. Each station was sampled three times during each of three events. The complete study plan is included in *Monitoring Plan for 1996-1997 Wide Channel Pilot Study* (Woodward–Clyde and Camp, Dresser and McKee Inc, 1996b).

1.4.6 Low Flow Channel

The Low Flow Pilot Study was designed to assess the effectiveness of automated samplers to monitor storms as small as 0.1 inches of rainfall. The samplers have historically been designed to capture events with 0.25 or greater inches of rainfall. To conduct the assessment the equipment at a single monitoring station was modified to capture events as small as 0.1 inches. Three criteria were used to assess the effectiveness of the 0.1 inch setting, which were (1) the operational effectiveness of the sampler at low storm volumes; (2) the feasibility and effectiveness of sample retrieval and transport; and (3) the ability to reprogram and maintain this setting at other samplers. The complete study plan is included in *Monitoring Plan for 1996-1997 Low Flow Pilot Study* (Woodward-Clyde and Larry Walker Associates, 1996).

1.4.7 Critical Source/BMP Monitoring Study

The Critical Source/BMP Monitoring study was designed to analyze baseline stormwater quality and assess the effectiveness of BMP implementation for critical industries and businesses. A number of critical source industries were identified and ranked by their potential significance to stormwater quality (Woodward-Clyde, 1997) and include, wholesale trade, automotive repair/ parking, fabricated metal products, motor freight, chemical manufacturing facilities, automotive dealers/gas stations, electric/gas/sanitary, and miscellaneous manufacturing.

Monitoring started in 1996-1997 and continued through 2001-2002. Each critical source industry monitoring plan involved a multi-year study of stormwater runoff from six sites (three test sites and three control sites). During the first year of each study, runoff was sampled and analyzed from five storms to establish background levels. During subsequent years, BMPs were installed at three of the six sites (test sites). BMP effectiveness was estimated from monitoring data gathered from the pooled test sites and pooled control sites during ten additional storms. A complete study plan is included in *Critical Source Selection and Monitoring Plan* (Woodward-Clyde, 1997).

1.4.8 Land Use Program

The major objectives of this monitoring program are to evaluate how certain land uses affect storm water quality and to identify the relative contribution of specific land uses to pollutant loads in storm water.

There were 14 land use monitoring stations under the 1990 Municipal Permit. Five of these stations were equipped with automated samplers to collect composite samples during storms. The 1996 NPDES permit required the re-evaluation of the location of land use specific monitoring stations. The land use monitoring program under the 1996 NPDES permit is a result of a site selection study entitled *Evaluation of Land Use Monitoring Stations* (Woodward-Clyde and Psomas and Associates, 1996). The study identified the most significant land use categories within the permit area regarding stormwater quality. The selection study yielded eight land use stations. These eight land use categories represent over 86% of all the land use within the permit area. These stations monitor flow and have automated samplers to collect flow weighted composite stormwater samples during storm events.

The Santa Monica Pier station was down during the 1999-2000 storm season due to construction.

1.5 Report Organization

This report has been reorganized from previous reports to represent a watershed approach to reviewing the results rather than a program specific approach. This approach provides for integration of water quality data, toxicity, bioassessment and other data to support the development of a watershed management strategy of resource protection, enhancement, and restoration while balancing economic and environmental impacts within the drainage basin. The watershed sections (Sections 4 through 9) emphasize the results of the Core Monitoring Program, but also include results of other studies that provide further data for development of conclusions that address the stated objectives. A regional perspective is presented in Section 10, which includes a regional assessment of the Core Monitoring Program over the last 10 years and an assessment of inter-relationships of this monitoring with regional and special studies. Pollutant loading estimates are also presented in this Section. Special studies and intra-regional monitoring are summarized in Section 11. The results of these studies are highlighted in the watershed sections where they provide supplemental data to the conclusions in these sections. Conclusions and recommendations are then presented in Sections 12 and 13. Table 1-2 provides a brief layout of the report's organization.

Table 1-2. Report Organization.

Section	Description
2	**Regional Study Area** - Describes the physical characteristics of Los Angeles County and displays the locations of historical and current sampling stations.
3	**Methods** - Covers the methods of storm water monitoring, including laboratory analyses, and the statistical analysis used in this report. The section is organized to present the field and analytical methods for the each of the three Monitoring Programs – Core Monitoring Methods (3.1), Regional Monitoring Methods (3.2), and Special Studies (3.3).
4	**San Gabriel River Watershed** – Provides a description of the watershed, flow monitoring data, and results of the Core Monitoring Program. The Core Monitoring Program for this watershed includes mass emissions (wet and dry weather sampling) at two monitoring sites and water column toxicity monitoring. No tributary, shoreline or trash sampling as part of the Core Monitoring was performed in association with this watershed. This section also includes a summary of Regional Monitoring and the analysis of these results with regard to relationships with the Core Monitoring on a watershed basis. This Regional Monitoring includes the Bioassessment and Estuary Sampling Programs.
5	**Los Angeles River Watershed** - Provides a description of the watershed, flow monitoring data, and results of the Core Monitoring Program. The Core Monitoring Program includes mass emissions (wet and dry weather sampling), water column toxicity monitoring and tributary monitoring (wet and dry weather). The discussion of Core Monitoring results for this watershed also includes Trash monitoring. This section also includes a summary of Regional Monitoring and the analysis of these results with regard to relationships with the Core Monitoring on a watershed basis. This Regional Monitoring includes the Bioassessment and Estuary Sampling Programs.
6	**Dominguez Channel Watershed** - Provides a description of the watershed, flow monitoring data, and results of the Core Monitoring Program. The Core Monitoring Program for this watershed includes mass emissions (wet and dry weather sampling) and water column toxicity monitoring. No tributary, shoreline or trash sampling was performed as part of the Core Monitoring in association with this watershed. This section also includes a summary of Regional Monitoring and the analysis of these results with regard to relationships with the Core Monitoring on a watershed basis. This Regional Monitoring includes the Bioassessment and Estuary Sampling Programs.

Section	Description
7	**Ballona Creek Watershed** - Provides a description of the watershed, flow monitoring data, and results of the Core Monitoring Program. The Core Monitoring Program includes mass emissions (wet and dry weather sampling), water column toxicity monitoring and tributary monitoring (wet and dry weather). The discussion of Core Monitoring results for this watershed also includes Shoreline (Santa Monica Bay) and Trash monitoring. This section also includes a summary of Regional Monitoring and the analysis of these results with regard to relationships with the Core Monitoring on a watershed basis. This Regional Monitoring includes the Bioassessment and Estuary Sampling Programs.
8	**Malibu Creek Watershed** - Provides a description of the watershed, flow monitoring data, and results of the Core Monitoring Program. The Core Monitoring Program includes mass emissions (wet and dry weather sampling) and water column toxicity monitoring. No tributary or trash sampling was performed as part of the Core Monitoring in association with this watershed. The discussion of Core Monitoring results for this watershed also includes Shoreline (Santa Monica Bay). This section also includes a summary of Regional Monitoring and the analysis of these results with regard to relationships with the Core Monitoring on a watershed basis. This Regional Monitoring includes the Bioassessment and Estuary Sampling Programs.
9	**Santa Clara River Watershed** - Provides a description of the watershed, flow monitoring data, and results of the Core Monitoring Program. The Core Monitoring Program for this watershed includes mass emissions (wet and dry weather sampling) and water column toxicity monitoring. No tributary, shoreline or trash sampling was performed as part of the Core Monitoring in association with this watershed. This section also includes a summary of the Regional Bioassessment Study and the analysis of these results with regard to relationships with the Core Monitoring on a watershed basis.
10	**Regional Assessment** – Presents a regional assessment of storm water impact on receiving waters. A regional assessment of the Core Monitoring program results from 1995 to 2005 is first presented, which included a cross watershed statistical comparison and trend analysis. An assessment of the inter-relationships of the results from the Core Monitoring, Regional Monitoring, and Special Studies on a regional basis is then presented. This includes an evaluation of the correlation between constituents of concern and TSS loadings. Pollutant loading estimates are then presented.
11	**Regional Monitoring and Special Studies** – Presents a summary of Regional Monitoring that includes the Bioassessment and Estuary Sampling Programs. This section will provide a more detailed discussion of the overall program and results compared to the summaries provided in the watershed sections. The summaries in the watershed sections focus on the inter-relationships of the regional results to the core monitoring results on a watershed basis. The Special Studies summary includes the New Development Impacts and the Peak Discharge Impact Studies in the Santa Clara River Watershed. It also includes a summary of the BMP Effectiveness Study.
12	**Conclusions and Recommendations** – The overall conclusions are presented in this section. The conclusions of the Core Monitoring Program for each watershed are first presented, followed by the conclusions from the Regional and Special Studies. A program review will be presented with regard to attainment of the MRP objectives. Finally, future monitoring recommendations will be presented, including estimated budget summary.