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Executive Summary

This “Watershed Chapter”, Appendix D-1 of the Drainage Area Management Plan (DAMP) serves as the Watershed Urban Runoff Management Plan (WURMP) for the **Aliso Creek Watershed** in southern Orange County, California. This document was prepared to meet the requirements of, Section J and L of the municipal NPDES Stormwater Permit - Order R9-2002-0001.

The purpose of this document is to present a planning framework to identify the most significant water quality issues related to urban runoff sources that can be addressed at a multi-jurisdictional watershed-scale, to focus jurisdictional pollution prevention and source control programs on local constituents of concern, to identify treatment control opportunities, to incorporate prior data from planning studies, to identify indicators to track progress, and ultimately to develop an integrated plan of action that results in meaningful water quality improvement in the Aliso Creek Watershed.

The Aliso Creek Watershed is located in southern Orange County, approximately 50 miles south of Los Angeles and 65 miles north of San Diego. Aliso Creek drains a long, narrow coastal canyon with headwaters in the Cleveland National Forest. The creek ultimately discharges into the Pacific Ocean at Aliso Beach. The approximately 36-square-mile watershed includes portions of the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo. Major transportation arteries through the watershed include the San Joaquin Hills Transportation Corridor and Interstate 5. The Aliso Creek Watershed is largely developed, with the exception of the Cleveland National Forest in the upper watershed and the Aliso Wood Canyon Regional Park in the lower watershed. The Watershed Permittees include the County of Orange, the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo and the Orange County Flood Control District

Section 1.0 describes the environmental setting of the watershed, discusses program coordination between the Watershed Permittees, and outlines the approach taken in plan development. Section 2.0 provides an assessment of current water quality conditions and identifies issues and constituents of concern. Section 3.0 provides the plan of action for the watershed, relating specific constituents of concern to pollution prevention and source control BMPs. It also includes the plan of action for watershed-scale collaborative projects, and public education and participation. Section 4.0 describes the program effectiveness assessment and potential future revisions of the Watershed Chapter, including an implementation schedule.

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D-1.0 Introduction

The Aliso Creek Watershed encompasses portions of the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo and unincorporated areas within the County of Orange. More than a decade ago, the Watershed Permittees (the County of Orange, the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo and the Orange County Flood Control District) recognized that Aliso Creek and the beach at the creek mouth were suffering from a variety of water-resource-related problems and began an unprecedented program of collaboration to address these problems. It was realized early on that the management of water resources was more appropriately dealt with within the hydrologic boundaries of the watershed, rather than solely on the jurisdictional basis of political boundaries.

Based on the experience of the Watershed Permittees, this Aliso Creek Watershed Chapter of the Drainage Area Management Plan has been developed to attain the following multiple objectives:

- To meet the requirements for a Watershed Urban Runoff Management Plan (WURMP) contained in the municipal National Pollutant Discharge Elimination System (NPDES) stormwater permit (Order R9-2002-0001, Section J).
- To identify the most significant water quality issues and constituents of concern on a watershed scale and relate these to urban sources.
- To focus the pollution prevention and source control programs implemented at an individual jurisdiction level on the identified constituents of concern and to identify any jurisdiction-specific treatment control opportunities.
- To identify the water quality issues that are most appropriately addressed through a multi-jurisdictional watershed-scale approach.
- To incorporate information obtained from prior planning studies.
- To develop an integrated plan of action that results in meaningful water quality improvement in Aliso Creek at a watershed scale and balances economic, social, and environmental constraints.
- To identify indicators to track progress.

In order to achieve these objectives, the Aliso Creek Watershed Permittees have utilized and built on the considerable work and studies that have been completed collaboratively over a multi-year period in the development of the Aliso Creek Watershed Chapter. These include the following initiatives:

- Since 1990, the Watershed Permittees have developed and implemented common water quality programs within their own jurisdictions in response to the requirements of the municipal National Pollutant Discharge Elimination System (NPDES) stormwater permit.
- In February 2003, an updated version of the Drainage Area Management Plan (2003 DAMP) was provided to the San Diego Regional Water Quality Control Board (Regional Board), including Local Implementation Plans (LIPs – 2003 DAMP Appendix A). The LIPs are detailed plans that focus on specific areas required by the NPDES permits including the legal authority to detect and eliminate pollutant discharges; public education; enhanced standards for new development/significant re-development; implementation of best management practices (BMPs) at municipal facilities, construction sites, and commercial and industrial facilities; and water quality monitoring. The BMPs can, in most cases, be focused on targeted constituents of concern to be identified through the monitoring program.
- In 1999 the San Diego Regional Board issued a Clean-up and Abatement Order. The County, OCFCD and City of Laguna Niguel to address occurring bacteria indicators in storm drain designated J03P02. Watershed Permittees have implemented an extensive program of monitoring and BMPs in this watershed and have reported progress in fourteen quarterly progress reports.
- In 2001, the Regional Board issued a Water Code Section 13225 Directive (Directive) to the Watershed Permittees in response to the elevated levels of bacterial indicators detected in many areas of the Aliso Creek Watershed that were attributed to urban sources. The Directive required the Watershed Permittees to conduct extensive additional monitoring and to detect and eliminate the sources of the bacterial indicators. In response to the Directive, the Watershed Permittees collaborated to address this highly specific water quality problem. This collaboration included developing and implementing one of the most extensive bacterial monitoring programs attempted at a watershed scale and specific plans of action by each of the Watershed Permittees for addressing problem storm drains on a prioritized basis. The plans of action focus on many of the pollution prevention and source control approaches described in the LIPs

but also include a number of collaborative actions between the Watershed Permittees, such as public education and treatment control BMP retrofits.

- Since 1997, a multi-jurisdictional effort has been taking place to develop solutions to the watershed-scale problems in Aliso Creek. The Corps of Engineers' watershed management study process and a Clean Water Act Section 205(j) water quality planning grant were two of the key components of this effort. The result of this effort has been the development of a Watershed Management Plan (COE, 2001a; COE, 2001b) that identified problems, opportunities, and ultimately identified a series of water quality improvement recommendations. Many of these recommendations are being pursued, with the County or, in some cases, individual Watershed Permittees as lead agency.

The Aliso Creek Watershed Chapter borrows much of its organization, structure, and terminology from the 2003 DAMP of which it is an appendix and also from the reports developed in response to the Directive:

- Section D-1.0 describes the watershed and environmental setting, the program management coordination between the Watershed Permittees and other stakeholders, and the approach taken to develop the plan.
- Section D-2.0 assesses the water quality information available and identifies the water quality issues and the constituents of concern.
- Section D-3.0 provides the plan of action relating the constituents of concern to specific pollution prevention and source control BMPs at a jurisdictional level as well as any jurisdiction-specific treatment control BMPs. This section also includes the plan of action for watershed-scale collaborative projects, education and participation. Section D-3.0 meets the permit requirement for the inclusion of recommendations.
- Section D-4.0 describes the program effectiveness assessment to be undertaken and the future revision of the Watershed Chapter. Water quality outcomes may still be some years away from accurate prediction and achievement, as the state of source identification, pursuit, and treatment are still evolving. However, this section lays the foundation for that outcome and includes an implementation schedule. Section D-4.0 meets the permit requirement for the inclusion of conclusions, which will be forthcoming in future assessments.

In developing the Aliso Creek Watershed Chapter, the Watershed Permittees have addressed the specific permit requirements of the Regional Board. These include the expectation of the degree of future land-use changes (illustrated in **Figure D-5.0**); the assessment of, and

identification and prioritization of major water quality problems (**Section D-2.0**); a time schedule of short- and long-term recommended activities (Section D-3.0); short- and long-term effectiveness assessment strategies (**Section D-4.0**); a watershed-based public education effort (discussed in **Sections D-1.3** and **D-3.2**); mechanisms for public participation (discussed in detail in **Sections D-3.2**); and a basis for facilitating collaborative “watershed-based” land use planning, which is discussed in Section D-3.0, and is essentially the purpose of this document.

The Aliso Creek Watershed Chapter is intended as a living document, one capable of being modified as new information becomes available and problems are addressed. It identifies the current state of knowledge on the issues facing the Aliso Creek Watershed and also sets the stage for future activities intended to address water quality issues in various reaches of the Creek and its tributaries. Figures enclosed represent available information in the GIS mapping format and some additional inventory information as supplied by the Watershed Permittees. The plan of action contained in this Watershed Chapter will be reviewed for effectiveness and applicability on a regular basis. As problems are addressed and the state of knowledge about sources and causes becomes better defined, it is expected that the process will become more streamlined and make more efficient use of limited resources.

D-1.1 Watershed Setting

The Aliso Creek Watershed is located in southern Orange County, approximately 50 miles south of Los Angeles and 65 miles north of San Diego (**Figure D-1**). Aliso Creek drains a long, narrow coastal canyon with headwaters in the Cleveland National Forest. The creek ultimately discharges into the Pacific Ocean at Aliso Beach. The approximately 36-square-mile watershed includes portions of the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo (**Figure D-2**).

Major transportation arteries through the watershed include the San Joaquin Hills Transportation Corridor and Interstate 5. **Figure D-3** shows the major transportation routes within the watershed.

The Aliso Creek Watershed is largely developed, with the exception of the Cleveland National Forest in the upper watershed and the Aliso Wood Canyon Regional Park in the lower watershed. **Figure D-4** shows the existing land use in the Aliso Creek Watershed and **Figure D-5** shows the future planned land use.

Figure D-1 Location Map

Figure D-2a Unified School Districts

Figure D-2b City Boundaries

Figure D-2c Water Providers

Figure D-2d Parks & Open Space

Figure D-3 Major Transportation Routes

Figure D-4 Land Use - Existing

Figure D-5 Land Use - Future

D-1.2 Water Quality Control Plan for the San Diego Region

Beneficial Uses

The Aliso Creek Watershed is within the jurisdiction of the San Diego Regional Water Quality Control Board (Regional Board). The Regional Board has placed Aliso Creek under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.13). The Water Quality Control Plan (Basin Plan) also lists the English Canyon, Sulphur Creek, and Wood Canyon tributaries to Aliso Creek as receiving waters. The following existing beneficial uses are designated in the Basin Plan for Aliso Creek, Sulphur Creek, Wood Canyon, and English Canyon:

- AGR – agricultural supply
- REC1 – contact water recreation
- REC2 – non-contact water recreation
- WARM – warm freshwater habitat
- WILD – wildlife habitat

The following designations apply to the mouth of Aliso Creek:

- REC1 – contact water recreation
- REC2 – non-contact water recreation
- WILD – wildlife habitat
- RARE – rare, threatened, or endangered species
- MAR – marine habitat

The following is a description of the relevant beneficial use designations:

Agricultural (AGR) – Includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Contact Water Recreation (REC1) – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC2) – Includes uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses include, but are not limited to, picnicking,

sunbathing, hiking, beach combing, camping, boating, tidepool, and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Marine Habitat (MAR) – Includes uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (marine mammals, shorebirds).

Rare, Threatened, or Endangered Species (RARE) – Includes uses of water that support habitat necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered. Among plants or animal species which were used in the designation of specific water bodies with RARE beneficial uses are: least Bell’s vireo (bird), California least tern (bird), light-footed clapper rail (bird), California brown pelican (bird), Belding’s savannah sparrow (bird), willow monardella (plant), humpback and blue whale (mammals), bald eagle (bird), tidewater goby (fish), southwestern willow flycatcher (bird), salt-marsh bird’s beak (plant), Pacific green sea turtle (reptile), and western snowy plover (shore bird). The RARE designation is placed on water bodies where the protection of a threatened or endangered species depends on the water either directly, or to support its habitat.

Warm Freshwater Habitat (WARM) – Includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Wildlife Habitat (WILD) – Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Impaired Waters

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality limited segments. These waters do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water quality impairment on the list and develop action plans, referred to as Total Maximum Daily Loads (TMDL), to improve water quality.

The State Water Resources Control Board (SWRCB) and the Regional Board staff have evaluated each addition, deletion, and change to section 303(d) based on all the data and information available for each water body and pollutant. These recommendations are based upon “all existing and readily available data and information” (40 CFR 130.7(b)(5)). In developing the

recommendations, the SWRCB staff used the recommendations and analysis of the Regional Board as the basis of its analysis and sought public review and comment. Each recommendation to the SWRCB was an independent assessment of each water body and pollutant. SWRCB staff took into account both general considerations (e.g., what factors the SWRCB should consider) and facts relating to individual water bodies and pollutants (e.g., how the Regional Board looked at certain data or the significance of a particular water quality impairment in the region) (SWRCB, 2003).

Some data, for purposes of developing the section 303(d) list, were sufficient by themselves to demonstrate standards attainment. Examples of these listing factors are (1) numeric data exceeding numeric water quality objectives, maximum contaminant levels, or California/National Toxics Rule water quality criteria and (2) use of numeric evaluation values focused on protection of consumption of aquatic species. Other data types required that multiple lines of evidence be used for listing and de-listing. The listing factors that required multiple lines of evidence were (1) toxicity, (2) health advisories, (3) nuisance, (4) beach postings, (5) adverse biological response, and (6) degradation of aquatic life populations or communities.

Activities within this group have a potential effect on the coastal nearshore zone, which has been identified as having bacterial problems. Beach closure due to exceedance of bacterial standards is a cause of concern to jurisdictions within this group, as well as the residents of the watersheds.

Nineteen miles of Aliso Creek is listed as impaired for bacteria indicators, phosphorus, and toxicity on the 2002 303(d) list. In addition, an area of about 0.29 acres of the Aliso Creek mouth is listed as impaired for bacteria indicators as is the Pacific Ocean shoreline at the mouth of Aliso Creek. The listings were based on the following information:

- Bacteria indicators - Cumulative analyses of sampling data collected from 1998 to 1999 along the entire reach of Aliso Creek and in several tributaries indicated elevated enterococci concentrations. Subsequently, the majority of the hydrologic sub-area (HSA 1.13) was determined to be impaired for enterococci, specifically including the tributaries of Aliso Hills Channel, English Canyon Creek, Dairy Fork Creek, Sulphur Creek, and Wood Canyon Creek. The sampling data also indicated concentrations of fecal coliform that exceeded the Basin Plan objective. This resulted in inclusion of the entire reach of Aliso Creek to be listed as impaired due to fecal coliform.
- Phosphorus - Sampling data collected between 1997 and 2000 near the mouth of Aliso Creek (ACJ01) and further upstream at Country Club Road and at Pacific Park

Drive/Oso Parkway showed phosphorus concentrations that exceeded the Basin Plan objective; this resulted in listing of Aliso Creek as impaired for phosphate at the lower four miles.

- Toxicity - Five stations, from the headwaters to the mouth of Aliso Creek, were sampled in 1998 and 1999. All showed toxicity for one or both of the storm event samplings, thereby placing the entire reach on the list as impaired due to toxicity.

The 2002 303(d) list of impaired waters approved by the State Water Resources Control Board, which could potentially be affected by activities occurring within the Aliso Creek Watershed, is shown in **Table D-1**.

Table D-1 2002 303(d) List and TMDL Priority Schedule - Aliso Creek Watershed

Type	Name	Hydro Unit	Pollutant/Stressor	Source	Priority	Estimated Size Affected
R	Aliso Creek	1.13	Bacteria Indicators	Urban Runoff/Storm Sewers Unknown point source Nonpoint/Point Source	Medium	19 Miles
			Phosphorus <i>Impairment located at lower 4 miles</i>	Urban Runoff/Storm Sewers Unknown point source Nonpoint/Point Source	Low	19 Miles
			Toxicity	Urban Runoff/Storm Sewers Unknown point source Nonpoint/Point Source	Low	19 Miles
E	Aliso Creek (mouth)	1.13	Bacteria Indicators	Nonpoint/Point Source	Medium	0.29 Acres
C	Pacific Ocean Shoreline, Aliso HSA	1.13	Bacteria Indicators <i>Impairment located at Aliso Beach</i>	Nonpoint/Point Source	Medium	0.65 Miles

(Note: R – Rivers; E – Estuary; C – Coastal Shoreline/Beaches)

Monitoring List

In addition to the 303(d) list discussed in Section 1.2, a Watch List has been developed by the Regional Water Quality Control Board. This list indicates those waterbodies that are being monitored or investigated for potential pollutants of concern but have not been included on the 303(d) list. The following waterbodies have been included on this list in the Aliso Creek Watershed.

Table D-2 Monitoring List for Aliso Creek Watershed

Type	Name	Hydro Unit	Pollutant/Stressor	Estimated Size Affected
R	Aliso Creek	901.13	Chlordane Dieldrin Heptachlorepoide PCBs	19 miles
C	Orange County Coastline		Trash	

D-1.3 Watershed Program Management

Program management of various water quality improvement programs within the Aliso Creek Watershed occurs at two distinct levels: (1) activities conducted by the Watershed Permittees individually in implementing jurisdictional programs in their LIPs based on the model programs in the DAMP in compliance with the municipal NPDES stormwater permits and (2) activities conducted by the Watershed Permittees and others collectively to address specific water quality issues on a watershed scale identified through the Water Quality Planning Process (see **2003 DAMP Section 3** and **Section D-1.4**), and other planning initiatives.

The Watershed Permittees coordinate the program management of the Aliso Creek Watershed through the program agreements and coordination meetings, which are described below.

NPDES Coordination

The Orange County Stormwater Program is underpinned by an Implementation Agreement between the County of Orange, the Orange County Flood Control District, and the 34 cities of Orange County. The Agreement provides a funding formula and budgeting process for shared countywide costs and monitoring costs by Regional Board area.

The Orange County Stormwater Program also has an extensive committee structure that is described in the DAMP (**2003 DAMP Section 2**) and in the LIPs of the Watershed Permittees (**2003 DAMP Appendix A-2**). Each of the Watershed Permittees participates in the General Permittee meeting and, selectively, in the other oversight and technical committees.

The Watershed Permittees also meet separately from the countywide program on a regular basis, typically quarterly, to coordinate activities in response to the Directive. As the intent of the Directive becomes integrated into both the LIP and the Aliso Creek Watershed Chapter, these meetings are anticipated to continue in order to maintain coordination. The Watershed Permittees are currently developing a cost-sharing approach for the additional watershed shared costs to deal with those expenditures not covered by the countywide program.

Corps of Engineers Watershed Management Study

The County of Orange entered into an agreement with the Corps of Engineers in 1998 to conduct a Watershed Management Study. Subsequently, the County entered into individual agreements with each of the Watershed Permittees as well as other agency stakeholders (such as water/sewer districts) to cost-share the multi-year study.

The Watershed Permittees and agency stakeholders held meetings for more than five years in an effort to better define problems, opportunities, and roles and responsibilities within the study process and to follow its completion. During that time, a broad range of problems has been addressed, only one of which is water quality. While the focus of the Corps of Engineers is on broader restoration issues, the focus of many of the members attending the meetings was (and is) on water quality improvement. The Watershed Permittees, in particular, participated from the outset in the active guidance of studies, evaluation of results, and direction of future efforts including securing grant funding under the Clean Water Act Section 205(j) for additional water quality studies. Participation in this group has been voluntary, with numerous individuals donating their time and efforts toward the goal of improving water quality.

An important component of the study management process was participation from the public, many of who attended a number of meetings in an effort to provide input into the direction of study and addressing of problems. While the meetings were announced in a variety of media, continued public participation was also ensured through maintenance of an e-mail list/address list through which many of the participants were contacted on a systematic basis.

The meetings included presentations on a wide variety of issues related to improvement of the entire watershed ecosystem. Subjects include the effects of development on various watershed attributes, ecosystem damage and restoration, water quality assessment and improvement, flood damage reduction, coastal issues, alternative development and selection, the development of the Watershed Management Plan, prioritization and inclusion of alternatives in the Plan, and the progress of the Corps of Engineers study process. Feedback from the participants actively guided the direction of future study efforts and provided valuable input into the issues related to each and every potential outcome. In addition, the presenters were often educated by the public on issues that may not have been anticipated by the technical team.

Watershed Management Framework

With the completion of the Corps of Engineers Watershed Management Study, current County-led efforts are focusing on the establishment of a long-term Watershed Management Framework. The entity is evolving from this Framework will be necessary to take the many plans and projects developed collaboratively by the Corps of Engineers and its watershed stakeholders and bring them to fruition. It could take many forms, among them a Resource Conservation District or a Committee with select powers. Because the process of watershed management is new and differs so much from watershed to watershed, there is no standard structure for this entity. Therefore, its responsibilities, and powers must be carefully worked out before its organization and mandate can be established. Currently, the County of Orange is leading the transition to this new management structure with active input from the watershed stakeholders.

It is expected that the watershed management group will continue to engage the public in a manner similar to that of the Corps of Engineers' Watershed Management Study and that many of those participants will transition to this new format. Given the strong implementation orientation of the management group, it is expected that members of the public may choose to participate on an advisory basis or in sub-committees formed for specific tasks, rather than as regular members of the group. It is also expected that continued media dissemination on the meeting times and locations of the group will be a standard feature.

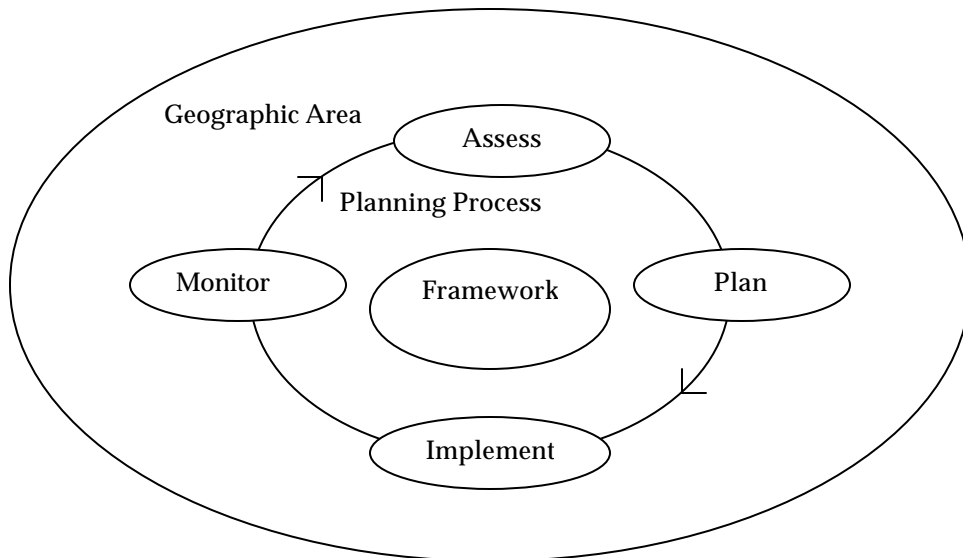
The formation of special task groups or continued participation of individuals in the process is vital to the long-term viability of the water quality improvement process (and by extension, watershed management) in the Aliso Creek Watershed. Protection of environmental resources, and not only water quality issues, needs to be constantly integrated into this process. The interdependency of many resources requires that public understanding of potential issues related to single-purpose projects must be sought and integrated into the planning process.

It is expected that one of the functions of the management group will be continued education of the participants and general public on the progress of water quality improvement efforts. The means by which to disseminate information may take the same form as that established by the Corps of Engineers Watershed Management Study. Depending on the nature of the information, a suitable venue may be in the form of general public education meetings; presentations at the regularly scheduled meetings of the group; or distribution by other means such as newspapers, television, or ad campaigns. This will be up to the group to determine and may change dramatically during the course of future efforts.

D-1.4 Plan Development

The approach taken to develop the Aliso Creek Watershed Chapter recognizes that the Local Implementation Plan and this Watershed Chapter represent the principal planning documents for two separate but nonetheless similar and highly interdependent water quality planning processes targeting the control of pollutants in urban runoff. These iterative processes can be represented in each case as shown in the figure below.

Figure D-6 Water Quality Planning Process



The processes are characterized as indicated below:

Table D-3 Watershed Management Processes

	Local Implementation Plan	Watershed Chapter
Geographic Area Covered by Plan	Defined by political (city/county) boundaries	Defined by hydrologic boundaries
Planning Process	Focused on reducing discharges of pollutants in urban runoff and stormwater pollution on a uniform countywide basis. Directed by DAMP/LIP in conformance with NPDES permits requirements	Focused on improving local receiving water quality where it is adversely impacted by urban runoff and stormwater pollution. Directed by NPDES permit requirements and 303(d) list/TMDLs
Framework	Directed by Orange County Stormwater Program committee structure and Regional Board review. Public consultation principally through CEQA process/Regional Board review	Directed by municipal and public agency stakeholders. Characterized by public participation
Assessment	Based on information from countywide municipal and regional cooperative investigations of stormwater and receiving water quality. Assessments are undertaken on an annual and 5 year basis.	Based on information from watershed specific investigations. Assessments are undertaken on an annual basis
Planning	Broad based approach with emphasis on well established pollution prevention and source control measures	Pollutant specific approach with emphasis on treatment controls and consideration of innovative regional solutions
Implementation	Individually by the Watershed Permittees	Individually and collaboratively by Watershed Permittees and other agencies
Monitoring	Considers pollutant load reduction	Considers beneficial use attainment

Based upon the annual watershed assessment, the Watershed Permittees and other participating jurisdictions will work together to address the priority water quality issues identified through this watershed planning process. It is anticipated that water quality issues that are determined to be specific to a jurisdiction would be referred to that jurisdiction and thereafter be addressed as a jurisdictional program initiative through the LIP. Alternatively, the issue may originate from multiple jurisdictions within the watershed. In this instance, the problem would be addressed as a Watershed Cooperative Program.

Updates to this program will be the subject of annual reporting starting in November 2004, which will include a water quality assessment and revisions to the listed water quality improvement initiatives.

D-2.0 Water Quality Assessment

The NPDES permit includes the requirement to monitor and assess the water quality associated with urban runoff. Within the Aliso Creek Watershed there have been three major initiatives to monitor and assess the water quality:

- The NPDES Program began in 1990 and is anticipated to continue into the foreseeable future.
- The Clean Water Act Section 205(j) Water Quality Planning study began in 1998 and continued through October 2000.
- The bacteria monitoring program in response to the Directive began in April 2001 and is ongoing at present. It is the intention of the Watershed Permittees to integrate a revised Directive monitoring process within the program framework of the NPDES program.

The following section describes provides additional background for each of these programs.

D-2.1 Water Quality Monitoring and Assessment Programs

NPDES Monitoring and Assessment Program

NPDES permits are issued for a five-year term and are issued on an area-wide basis. The first municipal NPDES Stormwater Permit was for the period 1990-1996; the Second Term Permit covered 1996-2002; and the Third Term Permit covers 2002-2007. Each of the permits has required the development and implementation of a monitoring program to support an effective County-wide urban stormwater management program.

First Term Permit

The monitoring program for the First Term consisted of four elements. These elements were Field Screening, Channel Monitoring, Harbor/Bay Monitoring, and Sediment Sampling.

- Field screening was performed to detect the presence of illegal discharges or illicit connections. Physical and chemical analyses were conducted in the field. The annual evaluation of each station included two dry-weather samplings and one storm sampling. Field screening monitoring stations within the Aliso Creek Watershed were:
 1. Aliso Creek Channel at Aliso Creek Road
 2. Aliso Creek Channel at Pacific Coast Highway

3. Sulphur Creek Channel at Laguna Niguel Regional Park
 4. Narco Channel at Laguna Niguel Regional Park
 5. English Canyon Channel at Los Alisos Boulevard
- Channel monitoring focus on specific watercourses with beneficial uses identified in the Basin Plan. Stations were monitored monthly and/or during storms. Samples were collected using automatic samplers. Samples were analyzed for pH, electrical conductivity, turbidity, nutrients, total suspended solids, volatile suspended solids, and total recoverable metals. Aliso Creek in Aliso/Wood Canyon was the station located in the Aliso Creek Watershed.
 - Harbor/Bay sites were monitored semiannually and during storms. The monitoring included sampling for nutrients in the water column and trace metals and organics in the sediment. No Harbor/Bay Monitoring was directly associated with the Aliso Creek Watershed.
 - Sediment sampling was conducted semiannually from designated channels and several bays and harbors. Samples were evaluated for metals, pesticides, herbicides, PCBs, and PAHs.

Second Term Permit

The First Term Permit monitoring program was continued into the second permit term. However, in 1999, the 99-04 Plan was developed and implemented. This plan revised the geographic focus of the monitoring effort by designating “warm spots” (where constituents are substantially above system-wide averages) and “Critical Aquatic Resources” or CARs.

The monitoring objective for the Warm Spot segment of the program was to detect changes in the levels of the identified constituents over the long term. The CARs were prioritized and additional monitoring stations selected to gather data at those sites. A total of seven monitoring stations were established. In the Aliso Creek Watershed, the established station was located at Aliso Creek in Laguna/Wood Canyon Wilderness Park.

This current permit period is the most comprehensive monitoring effort to date. It extends the monitoring program to a broader range of locations and to a wider array of methods for measuring impacts. Investigation of the effects of stormwater plumes on the nearshore marine environment has been added to the program. Inland, the new plan is expanding to include bioassessment of creeks, along with more consistent use of toxicity testing. The bioassessment,

toxicity testing, and measurement of chemical parameters are referred to as the “triad” approach. Three kinds of monitoring are considered for this plan.

- Core Monitoring – routine and related to small-scale or site-specific problems and processes
- Regional Monitoring – periodic, collaborative, and larger-scale surveys
- Special Studies – tightly focused and relatively short-term studies

The following is a list of the four Monitoring Program Elements required in addition to Receiving Waters Monitoring in the Third Term Permit. Each of the three types of monitoring listed above are considered and incorporated as appropriate into each of the program elements.

Urban Stream Bioassessment – includes 12 sites plus 3 reference sites.

Long-Term Mass Loading – includes measurements of key pollutants at 6 sites. Monitoring sites include the sites designated in the 99-04 monitoring program plus additional sites. A total of 6 stations were selected across Orange County. Aliso Creek in Aliso/Wood Canyon is the only station in the Aliso Creek Watershed for this program element.

Coastal Storm Drains – based on a suite of bacterial indicators. There are 36 sites, including the mouth of Aliso Creek.

Coastal Receiving Waters – uses a measure of runoff plume characteristics. Stations include three sites in nearby Dana Point Harbor. Testing will be done semi-annually and during two storms per year.

This monitoring program superceded the 99-04 monitoring programs.

205(j) Water Quality Study

The Aliso Creek 205(j) study was an effort led by the County of Orange to collect information throughout the Aliso Creek Watershed on a wide range of water quality parameters. The initial water quality investigation included chemical, physical, bacteriological, and toxicity sampling. Results of the initial water quality investigation indicated that elevated bacteria and aquatic toxicity were the most critical water quality issues in the watershed. Elevated bacteria were viewed by a Watershed Technical Advisory Committee as requiring immediate attention. Further focused studies were undertaken to collect bacteriological data to determine those subwatersheds that should undergo more focused source identification efforts based on potential sources of the elevated bacteria levels. Efforts undertaken in this study also included

an aquatic life assessment, water temperature profiling, and recreational use analysis. As a result of the water quality findings, several recommendations were made in the Corps study and Watershed Management Plan and have been pursued by the Watershed Permittees within the watershed. The specifics of the Corps Watershed Management Plan are included in the Watershed Cooperative Program section of this document.

13225 Directive Program

Due to preliminary 205(j) Study findings of elevated fecal coliform levels at a particular storm drain (J03P02), the Regional Board issued a Cleanup and Abatement Order that requires Orange County, the Orange County Flood Control District, and the City of Laguna Niguel to conduct additional monitoring and abatement reports in J03P02 storm drain subwatershed. Subsequently, the Regional Board issued a directive pursuant to the California Water Quality Code Section 13225 (Directive 13225) requiring all the Aliso Creek Watershed Permittees to conduct weekly monitoring at all the watershed's major storm drains to help identify subsequently eliminate inputs with elevated bacterial indicator concentrations.

Pre-NPDES Program

Prior to the start of the NPDES Program, a monitoring station was established along Aliso Creek, a quarter mile upstream of the Pacific Coast Highway. The monitored constituents included nutrients, total lead, copper, zinc, cadmium, and chromium. Monitoring was also performed for dissolved oxygen, which is a critical constituent because of the sand blocking that develops at the mouth of the creeks due to currents and tidal action. When dissolved oxygen concentrations dropped below a critical level, the sand berm was breached to allow circulation.

Orange County Health Care Agency

Over the past 40 years, the Health Care Agency (also known as Environmental Health) and local sanitation agencies (Orange County Sanitation District and South Orange County Wastewater Authority) have been testing the coastal waters in Orange County for bacteria that indicate possible presence of human disease-causing organisms. Samples are collected weekly at approximately 150 ocean, bay, and drainage locations throughout coastal Orange County. Within the Aliso Creek Watershed, there are sample locations at the mouth of Aliso Creek and on Aliso Beach **(Figure D-7B)**.

Stream Gage Information

While the collection of data at the stream gages is not precisely a water quality monitoring program, it does provide valuable information in the overall knowledge of the flow history in the watershed and is therefore discussed throughout this section.

Data consisting of periodic discharge measurements (instantaneous discharge in cubic feet per second) was measured at one site on Aliso Creek between the years 1932 and 2002. This information indicated peak discharges for each water year and the average daily baseflow over the period of record. Historically (pre-urbanization), Aliso Creek was an ephemeral creek. However, the Aliso Creek Watershed has yielded a steady increase in baseflow over the period of record. This is believed to be due to irrigation throughout the watershed increasing the water available to infiltrate into subsurface and emerge as baseflow in the creek. This baseflow currently supports vegetation and wildlife in a discontinuous riparian corridor from the headwaters to the ocean.

D-2.2 Water Quality Assessment

NPDES Monitoring and Assessment Program

The monitoring program for the Third Term Permit Period is in its early stages, and no assessment has been made of that data. With a report to the Regional Board in response to the Order No. R9-2002-0001, a report was submitted documenting the new monitoring program. The report discusses trends that have been identified in the data gathered to date.

205(j) Water Quality Study

The water quality analysis of data collected and analyzed as part of the 205(j) study led to the following conclusions:

- Nutrient concentrations in Aliso Creek are low to moderate compared with similar regions in Orange County. Basin Plan objectives were generally met for N:P ratios and for ammonia. Orthophosphates were not analyzed during this study, but total phosphate levels indicate that orthophosphate may exceed Basin Plan objectives.
- The samples collected had low to moderate turbidity levels that generally met the Basin Plan objectives.

- Total recoverable metals were sampled and were shown to be below the California Toxics Rule. The presence of high water hardness suppresses the potential toxic effects of trace metals by limiting the effective bio-availability of the metals.
- The percentage of sodium is within the guideline of 60 percent specified in the Basin Plan for inland surface waters.
- Elevated levels of total dissolved solids, sulfate, iron, and manganese were noted throughout the watershed and may be partly attributable to high saltwater concentrations in the groundwater and/or related to soil types/geologic formations.
- Analysis of dissolved oxygen, pH, and electrical conductivity showed that these parameters generally stayed within the objectives outlined in the Basin Plan.
- Aquatic toxicity was noted in the watershed. Possible sources include trace metals, polynuclear aromatic hydrocarbons, pesticides, herbicides, PCBs, and ammonia. Based on other studies performed in Orange County, it is suspected that organophosphate pesticides may be a significant component of aquatic toxicity in the Aliso Creek storm samples.
- Bacteriological studies show that elevated bacteria occur throughout this watershed. Samples in the watershed showed fecal coliform and *E. coli* levels exceeding 4,000 MPN/100 ml. Important management activities to decrease bacteria include (a) reduction of excess irrigation runoff, (b) additional research-level source investigations, and (c) creek restoration initiatives. This study leads to the conclusion that more investigation efforts are needed to understand the impacts of bacteria to human health within the watershed, as well as the sources of bacteria within the basin.

13225 Directive Program

Quarterly progress reports have been submitted to the Regional Board since July 2001. Comparisons were made in this report on bacteriological and water quality between quarters and between years. The following assessments of the data are presented:

- Fecal coliform concentrations are variable at any given storm drain and were not correlated with flow.
- Fecal coliform levels are lower in the winter than in the summer, probably due to the flushing influence of storm events.

- In nearly all storm drains, fecal coliform levels for the winter of 2003 have declined from the same period in 2002. The reason for this has not been fully determined, but is likely to be a combination of BMP improvements and differences in annual rainfall.
- Over the period July 2002 – July 2003, 76% of samples of the surfzone near the mouth of Aliso Creek met the State ocean water contact standards.

Each quarter, the Watershed Permittees have continued to implement and maintain BMPs that are intended to improve bacteriological water quality.

Source identification studies with University of California in Irvine researchers are being continued to identify bacteria sources in the watershed.

Based on two years of monitoring data a revised water quality monitoring plan a monitoring plan has been developed. This plan will be submitted to the Regional Board to be considered as an update to the existing NPDES monitoring plan. The revised plan makes adjustments to the number and spatial distribution of bacterial monitoring stations as well as the sampling frequency.

EPA TMDL Efforts

Bacteria TMDL is currently under development for the Aliso Beach and watershed (Hydrologic Units 901.13). It is expected to be available for review in late 2003 – early 2004.

Constituents of Concern

A study is currently underway that is being led by the County to further define the constituents of concern within the Laguna Coastal Streams watershed. The existing data produced through the NPDES monitoring program is currently under assessment. As additional constituents of concern are identified, the Watershed Permittees will address those concerns.

Figure D-7A includes a GIS map that shows the 303(d) listed receiving waters or mainstem channel segments within the Aliso Creek Watershed, color coded by constituent of concern as well as the identified receiving waters. **Figure D-7B** shows the subwatersheds and the monitoring locations within the Aliso Creek Watershed.

Figure D-7a Receiving Waterbodies

Figure D-7b Subwatersheds & Monitoring Locations

D-2.3 Identification and Prioritization of Major Water Quality Problems

The nature of water quality problems in the Aliso Creek Watershed was established during water quality testing efforts begun in the 1980's and on-going today. This testing resulted in the development of the 303(d) list of impaired water bodies by the State Water Resources Control Board. This section discusses the programs and studies established to identify the problems, their extent, and magnitude. It also discusses the general findings of these studies, and the prioritization of water quality problems.

Bacteria

Bacteria continue to be a major identified water quality problem with a high priority for the Watershed Permittees due to the impact on beneficial uses. The revised bacteria water quality monitoring plan described in Section D-2.2 will continue to provide the data necessary to investigate bacteriological trends. There are also several ongoing studies related to understanding bacteriological data and the sources. These studies are being undertaken as part of the Watershed Cooperative Program.

Countywide Source Tracking Studies

One such study being conducted jointly by the County of Orange and the City of Laguna Niguel will serve all the watersheds as local information in the agenda to identify indicator bacteria sources. The source tracking study is located in an urban subwatershed in the Aliso Creek Watershed and is focusing on the question of the actual contribution of wildlife to the bacterial problem. The results generated by Dr. Sunny Jiang during the Aliso Creek 13225 Directive indicate few, if any, human sources of bacteria. However, elimination of wildlife sources of bacteria is simply not possible. It is recommended that the development of the source tracking program to establish "background" bacterial levels due to wildlife and those due to human sources provide the means to direct resources to the appropriate and achievable areas of bacterial reduction, rather than directing funds at a program that yields little real reduction. If continued source tracking and monitoring indicates a human source, appropriate resources can be directed to that individual problem area. The results from this study within the Aliso Creek Watershed may have a broader application to other watersheds, such as the San Juan Creek Watershed.

The science behind source tracking is still evolving and the best methods for field application and study have yet to be decided. Seven organizations (Southern California Coastal Water Research Project [SCCWRP], National Water Research Institute, State of California Water Resources Control Board, USEPA, Southern California Stormwater Monitoring Coalition [which

includes the Orange County Stormwater Program], Orange County Sanitation District, and City of Santa Barbara) are cooperating to conduct a comparative evaluation of microbiological source tracking methods. A recent study conducted by a collaboration of 22 researchers investigated the accuracy and effectiveness of adapting several microbiological methods to characterize bacteria and their sources from the water column. Publication of the final report is anticipated in the *Journal of Water and Health* in December 2003.

Scientists at SCCWRP are currently conducting two further studies into the development of new source tracking methods. The first study is in the first of three years. Researchers are working on method development in three target areas: immunomagnetic separation, polymerase chain reaction (PCR) segment amplification, and chromatogenic signal detection. Method development is expected to continue through the end of 2003. The second study is a comparative evaluation of molecular biological techniques. The goal is to develop source tracking methods able to differentiate between sources of enterococcus and researchers are collaborating with researchers at two major academic institutions to develop methods to detect and quantify human pathogenic viruses in recreational waters. This project is in the first of four years. Efforts at this point are being focused on developing and testing appropriate PCR primers and restriction enzymes to analyze the samples for different genetic fragments that are specific to human pathogenic viruses and to an array of sources for the enterococcus bacteria.

The source tracking studies performed to date also indicate that there remains a significant contribution from bovine (steer) sources. There are few livestock sources within the Aliso Creek Watershed, those remaining being primarily equine. The Watershed Permittees believe that the source of this constituent may be steer manure applied by landscapers and homeowners. This is an obvious area for future pursuit during the coming permit term. Education of the public and landscaping firms on this issue of eliminating the source of bacteria and would be an achievable and relatively inexpensive goal in the short term.

Additional Monitoring

In addition to the Dry Weather Monitoring Program (DWMP) and other programs described in **Section 11** of the **2003 DAMP** and summarized above, the County (on behalf of all the Permittees) will supplement the DWMP (which occurs on a limited basis during warm weather) within the Aliso Creek Watershed with a Cold-Weather Water Quality Monitoring Program at two High-Priority sites selected by each of the Permittees. Supplemental Warm-Weather Monitoring and Cold-Weather Monitoring will consist of 5 samples taken at each High-Priority site in July/August 2003 and December 2003 (not during rain). This will be a special 2003 trial program that may be continued or revised through the Permit term depending on interim

findings. The purpose of this program will be to identify whether there are significant seasonal differences in constituents of concern and what the “normal” ranges are compared to the warm-weather DWMP. These data may be useful in source identification and pinpointing ID/ICs through follow-up investigations by the Watershed Permittees in January 2004 if unusual pipe-to-pipe differences are seen and/or may be useful in future TMDL development. Two years of monitoring data under the Aliso 13225 Directive showed that fecal bacteria, for example, are typically substantially lower in cold weather than in warm; so elevated bacteria during cold weather may signify an ID/IC. Bacteria sources in cold weather may actually be different from warm weather sources. Very low bacteria concentrations during warm weather may suggest possible toxicity problems. High-priority Supplemental Warm and Cold Weather Monitoring Program sites are presented in **Table D-3**.

Table D-4 High Priority Supplemental Warm and Cold Weather Monitoring Program Sites

Jurisdiction	Monitoring Location
Aliso Viejo	J02P05
Aliso Viejo	J01P28
Laguna Beach	Not Selected
Laguna Hills	J04P02
Laguna Hills	J04@J03
Laguna Hills	J04P04
Laguna Niguel	J04@J03
Laguna Niguel	J03P01
Laguna Woods	Not Selected
Mission Viejo	J07P01
Mission Viejo	J07P02
Mission Viejo	J01P03
Lake Forest	J01P08
Lake Forest	J01P01

D-3.0 Plan of Action

The Watershed Permittees have developed and are in the process of implementing pollution prevention and source control programs within their jurisdictions. However, beyond the programs implemented at the jurisdictional level, the Watershed Permittees that certain issues need to be addressed at a watershed scale using a cross-jurisdictional approach. The following describes the plan of action at both levels.

D-3.1 Jurisdictional Program

Each LIP provides details of the implementation of the local jurisdictional plan. This section focuses on those activities specific to the Aliso Creek Watershed. The following figures are provided:

- **Figure D-8** – a map displaying the inventoried commercial and industrial sites
- **Figure D-9** – a map displaying the inventoried municipal sites and construction areas

Existing Development Program

Each Watershed Permittee LIP contains an inventory of municipal, commercial, industrial, and residential sites subject to program directives. In the Aliso Creek Watershed, municipal sites largely consist of storm drains, parks, open space, and beach access. The main activities that would be expected at each of these sites include recreational use including walking, picnicking, and bike riding.

Because each Common Interest Area (CIA) contained within the Aliso Creek Watershed is also contained within a single jurisdictional boundary, measures directed at management of CIAs and HOAs are contained within each LIP.

Future revisions of the Watershed Permittees' LIPs will contain a description of the Designated Minimum BMPs that apply to each of these sites, as well as the inspection and public education program that relates to the sites. Significant focus will be placed on those BMPs identified in the LIP that target the specific constituents of concern for the Aliso Creek Watershed notably at this time bacterial indicators, phosphorous and toxicity. For each BMP listed, the training and public education associated with that BMP would also have a likelihood of contributing significantly to the reduction of the constituents of concern.

Figure D-8 Commercial and Industrial Sites

Figure D-9 Municipal Sites and Priority Construction Sites

New Development and Construction Areas

Each Watershed Permittees LIP contains information related to new development and construction areas. This information includes a review of the General Plan; to include the requirement for a Water Quality Management Plan (WQMP); revision of the CEQA Environmental Review Process; and an update of the Review, Approval, and Permitting Process. A map (**Figure D-9**) showing the priority construction sites for the entire watershed was included in the previous section. The LIP discusses the inclusion of routine non-structural and structural source control BMPs, site design BMPs that focus on pollution prevention, and treatment control BMPs in the WQMP. At least one treatment control BMP is required at all priority projects. There will be a significant focus on those BMPs that target the constituents of concern in the watershed, if, and as, those are identified.

Hydro-Modification

There is a need to protect natural channels from hydro-modification and losses of beach sand replenishment. Urban development of a landscape increases the percentage of impervious area. Studies have shown that starting with at least 5% impervious area, the hydrograph for urban streams begins to change. Typical changes in the hydrology include sharper runoff peaks and higher sustained volumes. This may impact stream structure, causing bank erosion and scouring. As the percentage of impervious area increases, the storm water washes across pavement and ceases to carry the sediment load that replenishes the beach sand. The storm event runoff carries pollutants from the washed surfaces to the stream channel, often impacting the stream ecology, wildlife habitat, and downstream human recreation opportunities.

Within the Aliso Creek Watershed, the streams are showing erosion behavior. Hydro-modification investigations are being performed as part of the U.S. Army Corps of Engineers Watershed Management Study.

Peak Discharge Impact Study

SCCWRP is conducting a Peak Discharge Impact Study to assess the potential cause and effect relationships between stream erosion in natural ephemeral drainage systems and urbanization in watersheds in Los Angeles County, California. The results of the Los Angeles County analysis will be incorporated and related to other watersheds in Southern California. This study is in the initial stages where representative sites are being selected. As of July 2003, three sites have been tentatively selected in the northern portion of Orange County. Once site selection is complete, reconnaissance surveys will be completed to assess the existing conditions of each site.

Illicit Discharge/Illegal Connection (ID/IC) Investigation

A study on illicit discharges and illegal connections is currently underway. Illicit discharges and illegal connections to city storm drains are being dealt with by individual jurisdictions, and information on this program is contained within each LIP. If a property crosses jurisdictional boundaries it will be collaborated on between Watershed Permittees.

Watershed-Wide Land Use Planning

One of the most important responsibilities of local government is to provide a decision making and approval processing framework for the new development and re-development that occurs within its boundaries. This primacy in land use planning enables jurisdictions to control the types and intensities of particular activities that may be allowed within specified geographic areas and consequently land use decisions can play an important role in addressing *point and nonpoint sources* of pollution.

State law requires that each jurisdiction adopt a comprehensive, long-term general plan to guide the physical development of its community. The General Plan is the official document that outlines the long term plans and policies regarding the location of housing, business, industry, roads, parks, and other land uses. Additionally, the General Plan addresses broad issues such as provision of infrastructure and conservation of natural resources. It reflects the community's long-term vision and the community's needs.

The Watershed Permittees are required by the areawide NPDES permit to minimize short and long-term impacts on receiving water quality from new development and redevelopment. Further, with regard to their general plans specifically, the Watershed Permittees must at a minimum review and update their general plans as necessary to ensure watershed and stormwater quality and quantity are considered (see Section 7.4 DAMP).

Upon completion of the necessary general plan updates, the Watershed Permittees will have common plan elements addressing urban and stormwater runoff management and water quality protection. These common elements will provide the basis for collaborative watershed-based land use planning. The schedule for the process of plan update is discussed in Section A-7.0 of each jurisdiction's LIP.

The mechanisms used to facilitate watershed-based land use planning relate to the use of the water quality assessment findings to inform decision making and the dissemination of this information.

The annual watershed-based water quality assessment will provide a major part of the informational basis for all watershed activities initiated by the Watershed Permittees, including land use planning. On an annual basis, or as key findings are developed, information, and/or recommendations will developed during the water quality assessment process and distributed to each jurisdiction's planning department for consideration by land use decision makers to ensure that water quality issues are addressed.

The Watershed Permittees will establish mechanisms, such as meetings and internet based resources, as they determine necessary to ensure effective communication with staff both jurisdictionally and on an inter-jurisdictional basis. In both instances, the purpose of the meetings will be to facilitate the exchange of watershed-specific information and to explore the collaborative development of water quality management and protection initiatives.

BMP Effectiveness Investigations

The Watershed Permittees together with the Permittees County-wide are currently coordinating with one another on a BMP effectiveness study. In addition, there are several other studies underway that are testing the efficacy and cost-effectiveness of various water quality improvement measures. It is anticipated that these studies will result in proposed modifications to the list of recommended BMPs and other measures contained in the 2003 DAMP and later incorporated into the Watershed Permittees LIPs. Studies directed at all jurisdictions within the watershed that are currently underway include the following:

- BMP Effectiveness Study/Orange County
- Trash and Debris BMP Evaluation
- Erosion Control BMP Effectiveness Evaluation
- Septic System Assessment on Stormwater Quality Evaluation
- Portable Toilet Oversight Program Evaluation
- Fats, Oils, and Grease (FOG) Program for Restaurants Evaluation
- Bacterial "Warm Spot" Elimination for City Storm Drains Evaluation

Ongoing BMP evaluation of a non-traditional nature includes:

- Conducting surveys to determine if public outreach efforts hare having the desired effect of increasing household awareness of water quality issues.

- Monitoring oil delivery to household hazardous waste collection centers.
- Monitoring materials removed from catch basins, retarding structures, and the like.

In addition to these countywide studies, a number of the Watershed Permittees are undertaking direct investigation of BMP effectiveness within their own jurisdictions at the sub-watershed level. BMP effectiveness evaluations are generally directed toward High-Priority sub-watersheds as determined by each Permittee based on the results of two years of monitoring under the Aliso Creek 13225 Directive.

Table D-5 Watershed BMP Short-Term Effectiveness Studies

Measure	Site	Performance Measures
City of Laguna Hills		
Catch Basin Inserts	Sub-watersheds J04P02, J04P03, J04P04	Trash, Organics, TSS
Laguna Hills Wetlands	Sub-watershed J01P04 Alicia & Moulton	Bacteria, Nutrients, TSS
City of Laguna Niguel		
Catch Basin Grate Screens	Sub-watershed J04/J03P01*	Trash, Nutrients
Catch Basin Insert Retrofits	Sub-watershed J04/J03P01*	Trash, Nutrients, Bacteria
Street Sweeping Frequency	Sub-watershed J04/J03P05*	Trash, Nutrients
Treatment Wetlands	Sub-watershed J03P02	Bacteria, Nutrients, TSS
Stream Restoration	J03TBN1*	Bacteria, Nutrients, TSS, Flow
Stream Restoration	Sub-watershed area in upper J03*	Habitat, Bacteria, Nutrients
Irrigation Control	Sub-watershed J03P05*	Nutrients, Flow Rate Reduction

* Indicates projects in High-Priority Sub-watersheds as determined by individual Watershed Permittees during two-Year Aliso Creek 13225 Directive monitoring program.

Restoration Projects

Sulphur Creek Rehabilitation within the Laguna Niguel Regional Park

The County of Orange Public Facilities and Resources Department completed a creek rehabilitation project along 3,000 feet of Sulphur Creek within the Laguna Niguel Regional Park. The project included (1) the removal of a low-flow concrete liner that carried water from

Sulphur Creek reservoir downstream through the Regional Park and replacement with a more natural channel constructed of gravel, buried riprap, and boulders; (2) regrading of the site; and (3) revegetation of the corridor with native riparian species. The project was completed in 1998 and has satisfied the performance criteria for the project established during the planning and design phase.

Middle Sulphur Creek within the City of Laguna Niguel

The City of Laguna Niguel is pursuing restoration projects anticipated to have a positive effect on water quality in Sulphur Creek, one of the tributaries identified for improvement in previous studies. A joint effort with the Corps of Engineers, using funds available under Section 206 of the Continuing Authorities Program (CAP), is slated for funding in 2003, with potential construction in the November 2003 through February 2004 timeframe. Performance criteria include habitat expansion and quality.

Upper Sulphur Creek within the City of Laguna Niguel

The Upper Sulphur Creek ecosystem restoration awaits State of California funding through Proposition 13, with construction expected to begin in 2004. Performance criteria include habitat expansion and quality and water quality parameters.

Wood Canyon

Restoration efforts in Wood Canyon would also be funded under Section 206 of the Corps of Engineers' CAP. This restoration is undergoing final design, but has no funding available this fiscal year. It may be funded in FY2004. Performance criteria include habitat quality and water quality parameters.

Narco Channel Aquatic Ecosystem Restoration

A conceptual proposal was developed for approximately a 400-foot length Narco Channel/Lower Sulphur Creek Restoration Project in conjunction with the City of Laguna Niguel. Performance measures include habitat and water quality.

Mitigation Projects

Mitigation is typically required as compensation for impacts to biological resources regulated under the CDFG 1601-1603 Streambank Alteration Program or the U.S. Army Corps of

Engineers' Clean Water Act Section 404 program. These mitigation projects are listed on **Table D-6**.

Table D-6 Mitigation Projects in the Aliso Creek Watershed

Project	City/Sub-Watershed	Status	Performance Measures
La Paz Park on-site wetlands	Laguna Niguel	Constructed 01-02	Habitat
Sulphur Creek Park enhancement	Laguna Niguel	Constructed 02	Habitat
Sulphur Creation @ Crown Valley Pk	Laguna Niguel	Constructed 02	Habitat
J03P01 restoration @ Crown Valley Pk	Laguna Niguel/J03P01	Constructed 02	Habitat
East Wetland @ J03P02	Laguna Niguel/J03P02	Constructed 02	Habitat, Water Quality
Munger Storm Drain Infiltration Basin	J01P01	Pending Approval	Bacteria
Laguna Hills Wetlands	Laguna Hills/J01P04	Construction Complete	Bacteria
Aliso Viejo Wetlands	Aliso Viejo/J02P08	Conceptual	Bacteria
ACHWEP	County of Orange/J01	Constructed	Habitat

Retrofitting

The following table indicates the retrofitting opportunities that have been taken or are underway within the Aliso Creek Watershed. Those projects that are underway can reasonably be expected to be completed within the Third Term Permit period.

Table D-7 Retrofit Projects in the Aliso Creek Watershed

Project	City/Sub-Watershed	Status	Performance Measures
North & West Wetlands	Laguna Niguel/J03P02	Constructed Spring 03	Flow, O&G, TSS, Bacteria, N/P
Trial C. B. retrofits	Laguna Niguel/J04/J03P01	Construct Fall 03	Bacteria, N/P
Catch Basin retrofits	Laguna Niguel/J04/J03P01	Pending Prop 13 Funding	
Turfgrass conversions	Laguna Niguel/J04/J03P01	Pending Prop 13 Funding	Flow, N/P, Bacteria

Further retrofit opportunities will be assessed based on the results of the Retrofit Opportunities Assessment study that is currently underway. This assessment will be performed over the next 12 months.

D-3.2 Watershed Cooperative Efforts

Watershed-Wide Public Education

The goal of watershed-wide public education is to spread knowledge of water quality protection practices to municipalities, agencies, businesses owners and employees, individuals, and other interest groups within the Aliso Creek Watershed. Education is intended to both pass on knowledge of the issues facing Aliso Creek and its watershed and to encourage activities that will promote improvement of water quality.

Water quality education will occur at three distinct geographic scales: Countywide, watershed-scale, and jurisdictional. Watershed-scale efforts would, and as, these are identified, focus on the constituents of concern within the Aliso Creek Watershed. While continuing public education efforts reflect the evolving state of knowledge by residents and visitors, the primary goal of watershed-wide public education is to provide the larger environmental picture and enhance the sense of land and water stewardship by adding to the knowledge base of individuals. The ultimate goal of education is to encourage action and changes in the habits and behavior of those that work and live within the watershed.

Environmental education efforts at the watershed scale are novel and should be organized to include participation from many broad groups within the watershed such as municipal agencies, military, hospitals, schools, city and federal government, businesses, and residences. Watershed-wide efforts will focus on education at all these levels.

Additional public education materials will continue to be developed by the County. These will be used to support outreach strategies for local efforts that watershed groups are best positioned to implement, such as at festivals, markets, and fairs.

Public education through school activities is an additional source of education of all residents. School children take home the messages they learn and educate other members of the household. Volunteer or mandated school curricula that include activities and scientific investigations that lead to sound environmental behaviors will be encouraged at all levels of school education. Currently volunteer efforts by educators within several cities have introduced environmentally oriented classroom and field activities that promote environmental stewardship and further public participation. Public involvement in the pursuit of funding for

these programs is a long-term effort, and is being encouraged at schools throughout the Aliso Creek Watershed.

Adult environmental education through courses and public events has led to positive outcomes on the constituents of concern in the Aliso Creek Watershed. The Master Gardener program and the University of California's Agricultural Extension Integrated Pest Management programs provide classes and distribute information to the public, municipal employees, and landscape firms on biologically effective and appropriate pest management and fertilization techniques.

Environmental Education Survey

One outcome of the recognition of the role of public education in water quality improvement efforts was the formation of the Orange County Stormwater Public Education Committee, composed of the County of Orange and its 34 cities. In 2003, a survey designed to serve as a "baseline" upon which changes in public knowledge, behaviors, and public opinion can be periodically measured was conducted.

The survey results indicate the need for further public education on water quality issues. While many respondents understand the connection between pollution and beach closures, few make the connection between local urban runoff and beach closures. Furthermore, most believe that urban runoff flows into sewer systems, and not necessarily down storm drains that lead into natural channels or the beach. Public focus seems to be more on oil and grease than on activities such as sweeping, gardening, landscaping, car washing, or other everyday activities. When asked about information dissemination, the public believes that biologists and scientists are the most credible people for spreading messages about the effects of urban runoff pollution on the environment.

Focused education in communities such as the Aliso Creek Watershed should incorporate experts and agencies to explain new information and answer questions. The focus of continuing public education efforts within the Aliso Creek Watershed will reflect the changing state of knowledge of residents and visitors. Based on the findings of the 2003 survey, public education initiatives will have the following areas of emphasis:

- Explanation of the link between urban runoff and stream pollution and beach closures.
- Explanation of the separate function of the storm drain and sanitary sewer systems.
- Identification of the principal causes of stream and ocean pollution.

- Explanation of the potential link between urban runoff and the environment.
- Explanation that all residents and visitors to the watershed affect water quality through their actions.
- Explanation of the value of carefully selecting and applying fertilizer and pesticides.
- Explanation of the importance of pet waste clean-up.
- Expansion of the range of “message sources” from storm drain stenciling and newspaper articles to other types of media.

Watershed-Wide Public Participation

A “watershed” scale education effort is not only to impart important environmental information but also to engage individuals, groups, businesses, and agencies in pollution prevention programs and clean up activities that promote water quality improvement and watershed health. While initial participation may occur at organized events, the goal is to empower individuals to identify and change their activities that could result in detrimental impacts on the Aliso Creek Watershed, with a focus on the watershed's constituents of concern; bacteria, phosphorus, and toxin (resulting from pesticide and fertilizer over-application or misuse) contamination.

Public participation on watershed planning has been sought by inquiry at public events, notably watershed workshops, and at the regularly scheduled meetings of the Aliso Creek Watershed Group sponsored by the County of Orange's Public Facilities and Resources Department. Public participation in the Group has been voluntary and influential on policy, funding, and project implementation in the Aliso Creek Watershed.

City-based participation in events at the watershed scale, such as sponsorship of the “Trails for All” event and others, encourages attendees to learn about water quality issues and further fosters participation by individuals and groups in events with a similar outcome. Collaboration has the effect of changing passive acceptance of messages to community or individual action. Direct public participation in the improvement of the creek and its watershed is encouraged by the organization of annual or bi-annual “Clean Up” days. Typically, volunteers collect thousands of pounds of debris that would otherwise make its way into watercourses and eventually the ocean, and properly dispose of the waste.

Participation by businesses in local partnerships may also yield positive effects at the watershed scale. Business participation and potential sponsorship of local events may have a positive effect on both the business and also the individual participants. For instance, the sponsorship of a home improvement center in education on integrated pest management techniques may encourage both smaller landscaping firms and individuals to carry forward that education and apply it within their service area or at home. A future Business Education Awards Program is another venue for business participation.

Participation in the clean up of animal wastes, discarded organic materials, yard and landscaping waste, and unused fertilizer and pesticides contributes to improvement of individual pollutant impairments, as well as overall water quality in the Aliso Creek Watershed. Even clean up of materials that do not constitute designated impairments contributes to the general aesthetic quality of the environment and fosters the development of an environmental ethic on the part of individuals that leads to consistent behaviors that positively contribute to the improvement of water quality over the entire spectrum of constituents.

Finally, participation by individuals, such as scientists, biologists, and others knowledgeable on watershed planning, in public speaking programs such as the “Speaker’s Bureau” encourages the dissemination of knowledge of watershed issues. The speakers can be specifically chosen for their knowledge of how behaviors and activities impact water quality and what the attendees may do to promote improvement.

U.S. Army Corps of Engineers Watershed Studies

The U.S. Army Corps of Engineers, Los Angeles District, completed a reconnaissance study of the Aliso Creek Watershed in February 1997. The study reviewed and assessed past and current activities and conditions in the watershed to help identify management opportunities from a basin-wide perspective. Issues addressed in the reconnaissance study included geomorphology, geology and soils, land use, environmental resources, hydrology, hydraulics, sedimentation, groundwater, water quality, and economics. The findings from this study supported the identification and refinement of watershed problems and opportunities, involvement of key stakeholders, and conceptual watershed solutions.

Following completion of the reconnaissance study, a feasibility study, a more detailed study, was initiated in 1998. This phase of the watershed study built upon the findings of the reconnaissance study and developed more detailed technical data across a range of study categories. As part of the watershed study, a preliminary array of measures was developed to meet the established planning objectives. After screening of the measures, a final array of

alternative plans was proposed as components of a Watershed Management Plan (WMP). The WMP addressed recommended management actions that could be pursued within the watershed, both by the Federal government and non-Federal agencies. The components of the WMP, as shown in **Table D-7**, included ecosystem restoration projects, water quality projects, streambank erosion control, floodproofing plans, and comprehensive plans.

Table D-8 Components of the Aliso Creek Watershed Management Plan

Measure	Component	Description	
Ecosystem Restoration Alternatives			
Aliso Creek Mainstem Ecosystem Restoration	1A	Lower Aliso Creek Stabilization Plan	Construct riffle structures; regrade side slopes riparian; vegetation
	1B	Middle Aliso Creek Stabilization Plan	Construct riffle structures; floodplain modifications; riparian vegetation
	1C	Floodplain and Riparian Habitat	Floodplain and riparian habitat upstream of ACWHEP
	1D	Off-channel Aquatic Habitat and Riparian Restoration	Off-channel fish spawning and riparian habitat in abandoned horseshoe bend below Wood Canyon confluence
Sulphur Creek Ecosystem Restoration	2A	Sulphur Creek along Crown Valley Parkway from treatment plant to community center access road	Modify flow control structure and small basins at upstream and downstream end to restore natural hydrologic regime; re-establish riparian vegetation
	2B	Sulphur Creek upstream of La Paz Road long Crown Valley Parkway between La Plata Drive and Moulton Parkway	Remove concrete V-ditch and non-native species; restore riparian habitat
Wood Canyon Ecosystem Restoration	3A	Restoration of upstream-most detention basin	Modify basin to retain water longer; reduce downstream erosion and revegetation
	3B	Tributary from northeast side canyon (current gabion structure)	Remove gabion structure, bioengineer slope with grading and revegetation
	3C	Localized stream restoration	Replacement of washed-out road crossings; removal of pipe in stream; placement of invert stabilizers, placement of water diversion bars
English Canyon Ecosystem Restoration	-	Restoration of English Canyon immediately upstream of Aliso confluence	Remove exotic vegetation; remove riprap and regrade streambanks; restore native riparian; excavate and create emergent marsh just stream of confluence

Measure	Component	Description
Pacific Park Basin Ecosystem Restoration	- Wetland/Riparian habitat restoration	Removal of exotic vegetation; limited excavation and regrading of basin; covering riprap with soil and vegetation; restore native riparian vegetation
Water Quality Improvement Projects		
BMPs	- Best Management Practices	Review and development of BMPs for Orange County and associated cities
Water Quality Wetlands	7A Dairy Fork	Wetlands to reduce nutrients and bacteria in low-flows
	7B English Canyon	Wetlands to reduce nutrients and bacteria in low-flows
Streambank Erosion Control		
SOCWA Treatment Plant Bridge	SCTP Invert Stabilization	Stream stabilization at the SOCWA Treatment Plant Bridge
English Canyon Erosion Control Sites	9A Limited bank protection	Limited bank protection between Los Alisos Boulevard and Trabuco Road
	9B Spot fixes	Repair scour holes below Via Noveno, Vista del Lago, and Entidad; protect short section of streambank
Floodproofing Plans		
Floodproofing	- Floodproofing/Relocation of Aliso Creek Inn	Floodproofing, relocation, and removal alternatives for the Aliso Creek Inn
Comprehensive Plans		
Watershed Education	- Watershed Education Plan Non-Point Source Public Awareness	Education plan for K-12 to teach watershed stewardship; public education on residential and/or commercial practices that affect the watershed
Water Quality Monitoring Plan	- Water Quality Monitoring Plan	Monitor effectiveness of education program and BMPs
Watershed-Wide Exotic Species Eradication	- Watershed-wide removal of exotic species	Removal of <i>Arundo donax</i> and several other non-native species

The feasibility study recommended that additional cooperative steps be taken by local, state, and Federal agencies, along with local citizens, to implement the identified measures.

A number of Corps recommendations are believed to have positive impacts on water quality, notably the ecosystem restoration projects, monitoring and evaluation of BMPs, water quality wetlands implementation, watershed education, and the development of a water quality monitoring plan. While the ecosystem restoration plans are not directed primarily at water quality improvement, but at larger-scale ecosystem improvement, they would be expected to have a positive impact on water temperature, turbidity, and oxygen content and potentially on bacteria reduction through the creation of vegetative buffering from urban landscaping.

The Aliso Creek Watershed Management Study is currently under evaluation for possible COE funding for feasibility studies for the Mainstem Restoration. The Aliso Creek Mainstem Ecosystem Restoration, which is the most expensive of all the recommended actions, is currently in the phase of preparation of a Project Management Plan. This study may be funded for initiation in 2004.

A number of projects recommended in the Watershed Management Study have been pursued by the Watershed Permittees. Several elements of the Sulphur Creek and Wood Canyon Ecosystem Restoration efforts have been implemented or are undergoing final design.

D-4.0 Program Effectiveness Assessment

A principle objective of the Watershed Chapter is to present an integrated plan of action that results in meaningful water quality improvement in the Aliso Creek Watershed while balancing economic, social and environmental constraints. The program effectiveness assessment strategy requires the identification and thereafter annual consideration of measures that indicate whether progress is being made toward attainment of this objective and the other program objectives discussed in Section D-1.0. In considering program approaches to program assessment, it is recognized that both short- and long-term strategies are needed to assess the effectiveness of the Watershed Chapter.

D-4.1 Short-Term Strategy

The short-term strategy initially focuses on the implementation of the watershed planning framework and the outcomes that are expected to be achieved within the first 5-year Permit period (2002-2007). The programmatic activity to be discussed in the first annual report will therefore specifically relate to:

- The meetings of a Watershed Management Group and the actions arising from its deliberations;
- The extent of public participation in watershed issues, through Permittee and public interaction at watershed events, annual/semi-annual “Clean Up Days”, and other activities;
- Education of the public regarding water quality issues;
- Modification of jurisdictional plans and policies to reflect potential impacts to water quality at watershed-scale.

In addition, annual results from the water quality assessment will be integrated into the evaluation of program effectiveness in successive years. It is anticipated that this information will, towards the end of the permit term, start to inform the Watershed Permittees as to whether specific programmatic initiatives are contributing or are capable of contributing towards the attainment of the Watershed Chapter’s objectives. Direct methods (water quality data) of assessment to be considered in the short term strategy will include relevant findings from the monitoring initiatives and any individual investigations of BMP performance. The findings from evaluations of non-structural BMP initiatives (indirect measures i.e. non-water quality indicators of BMP performance), documented in the Watershed Permittees Annual Progress

Reports, will be presented in the watershed annual report where appropriate. It is anticipated that the emphasis of the short-term strategy will be on jurisdictional programs

D-4.2 Long-Term Strategy

Long term strategies for assessing effectiveness apply to programs and activities conducted with the expectation that outcomes will occur outside of the 5-year Permit period (2007 on). Long-term assessment strategies focus on direct measures of performance that will validate the long-term progress of the Watershed Chapter towards achieving protection of existing water quality or improvements in receiving water quality impacted by urban runoff and urban stormwater discharges. The long-term strategy includes consideration of the findings from the water quality monitoring initiatives principally related to the detection of improvements in receiving water quality and reductions in pollutant loading. The emphasis of the long-term strategy will be on watershed cooperative efforts and the overall success of the Watershed Chapter in realizing its objectives.

D-4.3 Review of Management Program

In each future year the short-term and long-term effectiveness assessment strategies will be used to verify and ultimately validate the implementation of the watershed program. It is expected that the program objective and supporting management actions will be revised as the program evolves. Specifically, the annual assessment of effectiveness will be used to inform and direct the watershed planning process to ensure cost effective water quality improvement.