

SECTION C-3

PLAN DEVELOPMENT

**PROGRAM EFFECTIVENESS ASSESSMENT
2011-12**





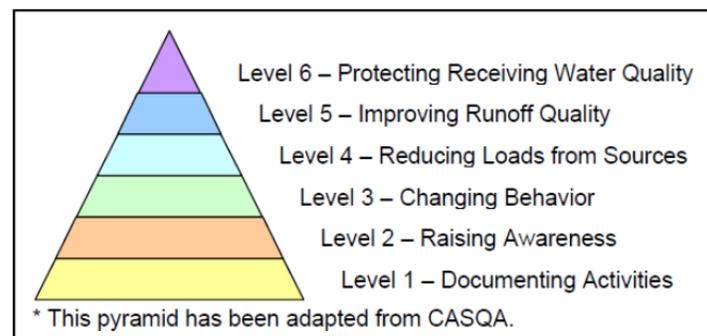
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C-3.0 Plan Development

C-3.1 Introduction (LIP Section A-3.1)

This section provides information on the approach taken by the County in developing and implementing its stormwater program. This section also discusses a number of studies that the County is participating in that will assist in achieving improvements in water quality in the future.

As described in detail in **Section C-2.5** of this PEA, the County utilizes the CASQA method of effectiveness assessment in order to demonstrate if program elements, activities, BMPs, etc., are resulting in desired outcomes. CASQA identifies six Outcome Levels (see pyramid below) and for each measure the County reports, the associated Outcome Level (more than one level may apply) is indicated by a colored triangle with a number.



C-3.2 Plan Development (LIP Section A-3.2)

The complexity of the Third Term Permits (and subsequently the Fourth Term Permits) necessitated the development of the LIP in order to provide a County-specific plan within the broader policy and program framework of the 2003 DAMP. The LIP focuses predominantly on the jurisdictional implementation of the model pollution prevention-oriented programs detailed in the 2003 DAMP. The County LIP is a dynamic document that is evaluated on a continuing basis, at least annually, by the County.

As implementation of pollution prevention programs has taken place and evolved, so too has the LIP. The County's stormwater program management has worked closely with all departments to ensure that the goals of the program are met in concert with the County's overall mission of providing and maintaining valuable resources and services to its residents. As County departments have used stormwater inspection forms, implemented model maintenance procedures and BMPs, completed environmental performance reports, etc., they have provided important feedback which has allowed program management to adjust the plan to refine parts of the program that may not be working optimally while continuing forward with elements that are effective.

C-3.3 BMP Effectiveness Investigations (LIP Section A-3.3)

An important element of the County's LIP is the implementation of additional/enhanced BMPs and/or the refinement of BMPs within the DAMP programs. The tables that follow list the BMP projects and BMP investigations implemented since the issuance of the Third Term MS4 Permits in 2002 and the Fourth Term Permits in 2009.



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Summary of County BMP Projects and Investigations

| BMP/Project | Initiated (Reporting Period) | Completed (Reporting Period) | Projected completion | Watershed | CASQA Outcome Level |
|---|------------------------------|------------------------------|---------------------------------------|--------------------------------|---|
| Structural Source Control/Treatment BMPs | | | | | |
| Ocean Institute BMP | 2001-02 | 2002-03 | Completed (& ongoing) | Dana Point Coastal Streams |  |
| J01P28 Clear Creek System | 2001-02 | 2003-04 | Completed (& ongoing) | Aliso Creek |  |
| J01P01 Munger Media Filter | 2001-02 | 2006-07 | Completed, but needs to be redesigned | Aliso Creek |  |
| Channel Diversion Facilities | 2002-03 | 2002-03 | Completed (& ongoing) | Santa Ana River |  |
| Poche Beach UV Disinfection Facility- Demonstration Facility | 2002-03 | 2003-04 | Completed & retired | San Clemente Coastal Streams |  |
| Poche Beach UV Disinfection Facility - Permanent Facility | 2006-07 | 2009-10 | Completed (& ongoing) | San Clemente Coastal Streams |  |
| Selenium Removal Quick Start BMP | 2004-05 | 2004-05 | Completed | Newport Bay |  |
| Nitrogen and Selenium Management Program BMP Pilot Test of Se and N removal BMPs | 2006-07 | 2008-09 | Completed | Newport Bay |  |
| Baby Beach Storm Drain to Sanitary Sewer Diversion and First Flush Filtration System | 2004-05 | 2005-06 | Completed (& ongoing) | Dana Point Coastal Streams |  |
| Bird Exclusion Fencing Baby Beach Public Pier | 2004-05 | 2005-06 | Completed (& ongoing) | Dana Point Coastal Streams |  |
| Deepening of San Diego Creek Sediment Basin #2 | 2004-05 | 2005-06 | Completed | Newport Bay |  |
| Narco Channel Restoration | 2005-06 | 2007-08 | Plantings established by 2012 | Aliso Creek |  |
| Litter Control BMPs & Investigations (See also the discussion of Drainage Facilities and Infrastructure Maintenance in Section C-5.A.3) | | | | | |
| Trash and Litter Monitoring Research Program | 2007-08 | Ongoing | Ongoing | San Gabriel River/Coyote Creek |  |
| Newport Bay Trash Management Plan | 2010-11 | Ongoing | 2016 | Newport Bay |  |



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| | | | | | |
|--|---------|---------|---------|----------------------------|---|
| Monitoring of Natural Sources from Ambient Geology | 2007-08 | Ongoing | Ongoing | Multiple |  |
| Non-Structural Source Control BMPs | | | | | |
| Countywide Area Spill Control (CASC) Program | 2001-02 | N/A | Ongoing | Multiple Watersheds |  |
| Beach Sweeping at Baby Beach - Bird Feces Control | 2006-07 | N/A | Ongoing | Dana Point Coastal Streams |  |

Summary of BMP Effectiveness Investigations

| Project | Type of BMP | Manufacturer (if applicable) | Type of Analysis | Report Completed |
|--|---|------------------------------|--|---|
| J01P28 Clear Creek System | Media filter; UV disinfection | Clear Creek | Bacterial Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| Ocean Institute BMP | Infiltrative swale; In-line separator | Stormceptor® | Runoff Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| Poche Beach UV Disinfection - Demonstration Facility | Sediment basin; UV disinfection | Suntec Environmental | Bacterial Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| Poche Beach UV Disinfection - Permanent Facility | Sand filter tanks; UV disinfection | Neptune Microfloc; Triogen | Bacterial Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| Warner Channel - Wetland Vegetated Channel | Wetland Vegetated Channel | N/A | Nutrients, Selenium, and Flow Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| J01P01 Munger Media Filter | Media Filter | N/A | Bacteria, Solids, Nutrients, Metals Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| Selenium Removal BMP | Multiple (Physical, chemical, biological) | N/A | Selenium Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| Nitrogen and Selenium Management Program BMP Pilot Test of Se and N removal BMPs | Multiple (Physical, chemical, biological) | N/A | Selenium and Nitrogen Monitoring | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |



BMP Project Updates in the Santa Ana Region:

Newport Bay Watershed

Nitrogen and Selenium Management Program (NSMP)

Selenium and Nitrogen BMP Evaluation

2

The Nitrogen and Selenium Management Program (NSMP) was created in 2004 in response to a general NPDES permit (Order No. R8-2004-0021, which was subsequently replaced by R8-2007-0041 and R8-2009-0045) issued for the Newport Bay watershed to establish waste discharge requirements for certain groundwater-related discharges and to regulate *de minimus* discharges. The NSMP is a collaborative effort of more than 20 stakeholders, including various State, county, and local agencies, environmental groups, and private entities with the goal of developing management strategies and treatment technologies for both selenium and nitrogen for the watershed. The County, as Principal Permittee under the Orange County MS4 Permits, functions as Chair of the NSMP, providing program leadership and ensuring implementation of the work plan and compliance with the terms of the permit. A work plan was developed by the NSMP and approved by the Santa Ana Regional Water Quality Control Board in 2005. The work plan focuses on the development of treatment technologies and BMPs; development of an offset, trading or mitigation program; and development of a tissue-based site-specific water quality objectives (SSO). Participation in the NSMP and implementation of the approved Work Plan constituted compliance with the permit. Since the permit expiration in December 2009, a Time Schedule Order (TSO) R8-2009-0069 has been in place to provide interim coverage for the NSMP stakeholders.

One of the work plan tasks was to evaluate BMPs for removal of selenium and nitrogen from surface water and groundwater discharges in the Newport Bay watershed. During 2005-06, a survey of existing and developing technologies was compiled and an initial assessment of applicability to the Newport Bay watershed was conducted. The field scale pilot testing of these technologies and the final report was completed during the 2006-07 reporting period. The summary report of selenium and nitrogen removal BMPs can be found at www.ocnsmp.com. The information gained from the pilot testing was used to develop a draft BMP Strategic Plan for the Newport Bay watershed during the 2008-09 reporting period. A proposed BMP Strategic Plan was subsequently submitted to the Santa Ana Regional Board in January, 2011 to conform to the requirements of Time Schedule Order 2009-0069.

Additional pilot scale testing of the ABMet® System was conducted by the County from May-July 2009 and additional testing by IRWD in 2010. The ABMet® System is a patented technology owned by General Electric Company (GE). The system is composed of a series of bioreactors that are filled with media consisting of granular activated carbon (GAC). The GAC provides large surface area and an ideal growth environment for strains of bacteria that are capable of removing both nitrogen and selenium effectively. The nitrogen removal is achieved through anaerobic denitrification process, where the nitrogen is removed in the form of nitrogen gas. Selenium removal is through reduction and immobilization of oxidative forms of selenium into reducing forms of selenium, which are insoluble and can then be removed via periodic back flushing. Both nitrogen and selenium removal requires the mediation of bacteria



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in a controlled, strongly reducing environment maintained by feeding of electron donors (molasses). The performance of these pilot tests has confirmed that ABMet® system is one of the viable engineering BMPs for both selenium and nitrate treatment in the watershed.

Since 2009, NSMP stakeholders have proposed three dry weather diversion projects, as listed below:

1. Peters Canyon Wash Groundwater Disposal and Water Reuse Pipeline Project – This project is designed to capture groundwater dewatering or seepage-related discharges from four locations in the lower Peters Canyon Wash. A total of about 250 lbs of selenium loads will be intercepted annually before reaching the receiving water. The diverted water will be sent to Orange County Sanitation District (OCSD) and will subsequently recycled by Orange County Water District. The feasibility studies and report have been completed and a proposal has been submitted to Orange County Transportation Authority (OCTA) for Measure M2 Grant. County/OCFCD, Cities of Irvine, Tustin, Caltrans, and Irvine Ranch Water District are participants of the project.
2. Santa Ana Delhi Channel Diversion Project – similar to Peters Canyon Wash project, this project will divert dry weather base flow from Santa Ana Delhi Channel to OCSD to remove about 40 lbs. of selenium per year, among other pollutants. Cities of Santa Ana, Costa Mesa, and Newport Beach are project participants, County has provided technical support. The project sponsors have completed the feasibility studies/report and also applied for OCTA Measure M2 Grant funding.
3. Big Canyon Wash Comprehensive Selenium Management Program – This program includes many tasks aiming to reduce selenium loads in this small watershed (2 square miles) located entirely within the City of Newport Beach, which funds the program. One of the projects is to divert several storm drains that have very high selenium concentrations in order to reduce the selenium input to the watershed. The expected load reduction is 15-20 lbs. of selenium per year. County has provided technical support to the program.

In addition to the above diversion-focused projects, NSMP is also evaluating a number of emerging selenium treatment technologies. These include proprietary media and processes by American Biofilter, Siemens, CCI, and PureEffect. Currently, NSMP is working with these vendors to conduct bench scale tests of these technologies using water samples collected from the watershed. If these early stage testing yield satisfactory performance data, field pilot tests may be conducted and the best technology (ies) will be selected based on performance, footprint, pricing, and other factors. These treatment technologies are generally more expensive (in terms of cost per pound of selenium removed) than the above diversion projects, however they could become viable option at a discharge point where selenium needs to be removed but diversion is not viable.

The BMP Strategic Plan is intended to be a living document that recognizes BMPs for the treatment of selenium are not yet proven technologies and that better understanding of groundwater in the watershed is needed. Therefore, the Plan uses a phased approach that incorporates adaptive management principles. The phased approach includes Phase 0 Early



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Actions, Phase I Technology Validation and Phase II Full-Scale Implementation. Phase 0 Early Actions include development of a groundwater/surface water budget / balance model, mass balance studies for Peters Canyon Wash and Big Canyon Wash, and other special studies to help understand the sources and cycling of selenium to guide Phase I and Phase II implementation activities. The Plan is also adaptive in that certain promising technologies (such as ABMet® and diversion projects as described above) could potentially be implemented earlier in order to achieve load reduction more quickly and/or to take grant funding opportunities.

Multiple Watersheds (Anaheim Bay/Huntington Harbor, Newport Bay & Santa Ana River)

Countywide Area Spill Control (CASC)

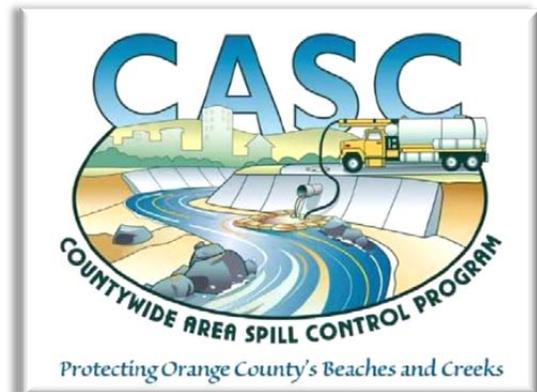
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The CASC program began in 2000 as a pilot project between the County and the Orange County Sanitation District (OCSD) to proactively prevent and respond to sanitary sewer overflows (SSOs) in the unincorporated North Tustin area. During the 2009-10 reporting period, in response to Fourth Term Permit requirements, CASC evolved into a true countywide program.

The main focus of CASC remains the containment and recovery of large Sanitary Sewer Overflows (SSOs) which have the potential to significantly impact receiving waters resulting in beach closures and health advisory postings.

The overall objectives of CASC are to:

- Create broader awareness regarding the causes of SSOs and development of measures that can be implemented in order to prevent them;
- Improve the interagency coordination when responding to SSOs;
- Identify the resources needed when responding and mitigating impacts;
- Develop predictive tools for identifying potential impacts; and
- Protect the beneficial uses of the local water bodies.
- Implement the program throughout the entire Orange County area.





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CASC Response on April 18, 2012, Santa Ana River

Since implementation of the program countywide in 2010, CASC has been activated a total of 6 times, resulting in the diversion of almost 3.4 million gallons of impacted receiving waters to the sanitary sewer system:

| Incident Triggering CASC Activation | Receiving Waters | Date | Type | Volume Diverted to Sanitary Sewer (Gallons) |
|---|---|-----------|----------------------------|---|
| Santa Margarita Water District Force Main Rupture | Tijeras Creek/San Juan Creek/Doheny Beach | 3/23/2010 | SSO (public) | 2,500,000 |
| Prothero Mobile Estates, Lake Forest | Aliso Creek | 6/25/2010 | SSO (private) | 2,400 |
| Irvine Ranch Water District Force Main Rupture, Newport Coast | Buck Gully Creek/Little Corona Beach | 7/2/2010 | SSO (public) | 710,000 |
| Kia Motors USA, Irvine | Peters Canyon Channel | 1/13/2011 | Other (fountain discharge) | 100,000 |
| The Cascades Apartments, Anaheim | Santa Ana River | 4/12/2012 | SSO (private) | 1,900 |
| Gateway Apartments, Anaheim | Santa Ana River | 4/18/2012 | SSO (private) | 77,500 |
| | | | Total: | 3,391,800 |

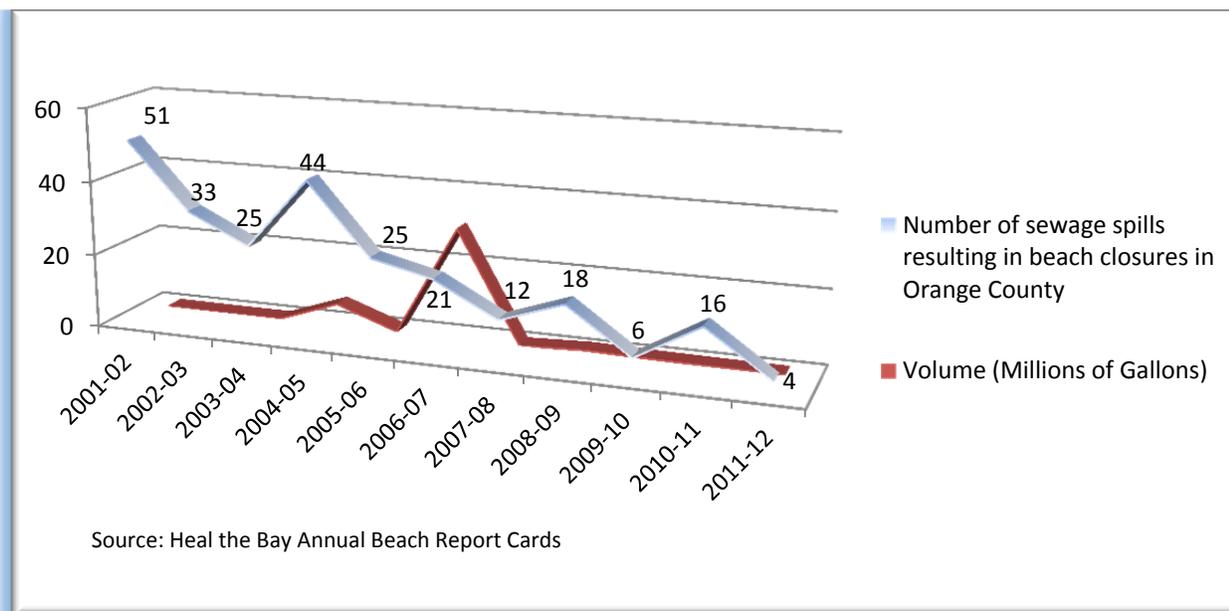
As one of the primary objectives of CASC is to improve interagency coordination when responding to SSOs, it is encouraging to receive endorsement of the program's success from the [2011-2012 Heal the Bay Annual Beach Report Card](#). SSO incident data cited in the report



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indicate that during the 2011-2012 reporting period, Orange County experienced a total of 4 SSOs which resulted in a beach closure. For a ten month period between June 21, 2011 and April 6, 2012, no sewage spill related beach closures were recorded, marking the longest period of time Orange County has gone without one since record keeping began in 1987.

Orange County Sewage Spill Data 2001 - 2012



Implementation of CASC countywide in 2010 has proven successful in helping both municipalities and wastewater agencies of Orange County protect beneficial uses of receiving waters. In incidents where CASC has been implemented, the area and time of closure has been minimized or prevented altogether. In the case of the Santa Margarita Water District force main rupture in March of 2010, the recovery of 1.4 million gallons of sewage from Tijeras Creek through activation of CASC minimized closures at the coast and prevented more significant impact to downstream creeks. This helped reduce the amount of the Administrative Civil Liability assessed by the San Diego Regional Water Quality Control Board from \$1,731,970 to \$890,000.

Plans to enhance CASC implementation in Orange County this year and beyond include finalization of a Memorandum of Understanding (MOU) to be executed by all participating municipalities and agencies, which defines roles and responsibilities, and advanced spill modeling using GIS.

Channel Diversion Facilities



The County operates four urban runoff diversion facilities in north Orange County to intercept dry weather urban runoff before it can impact the quality of ocean beaches. Constructed in 2003-04, these facilities divert runoff to the sanitary sewer collection system for conveyance to the Orange County Sanitation District (OCSD) Reclamation Plant in Fountain Valley, where it is treated before offshore ocean outfall discharge. Sampling and analysis of diverted runoff for



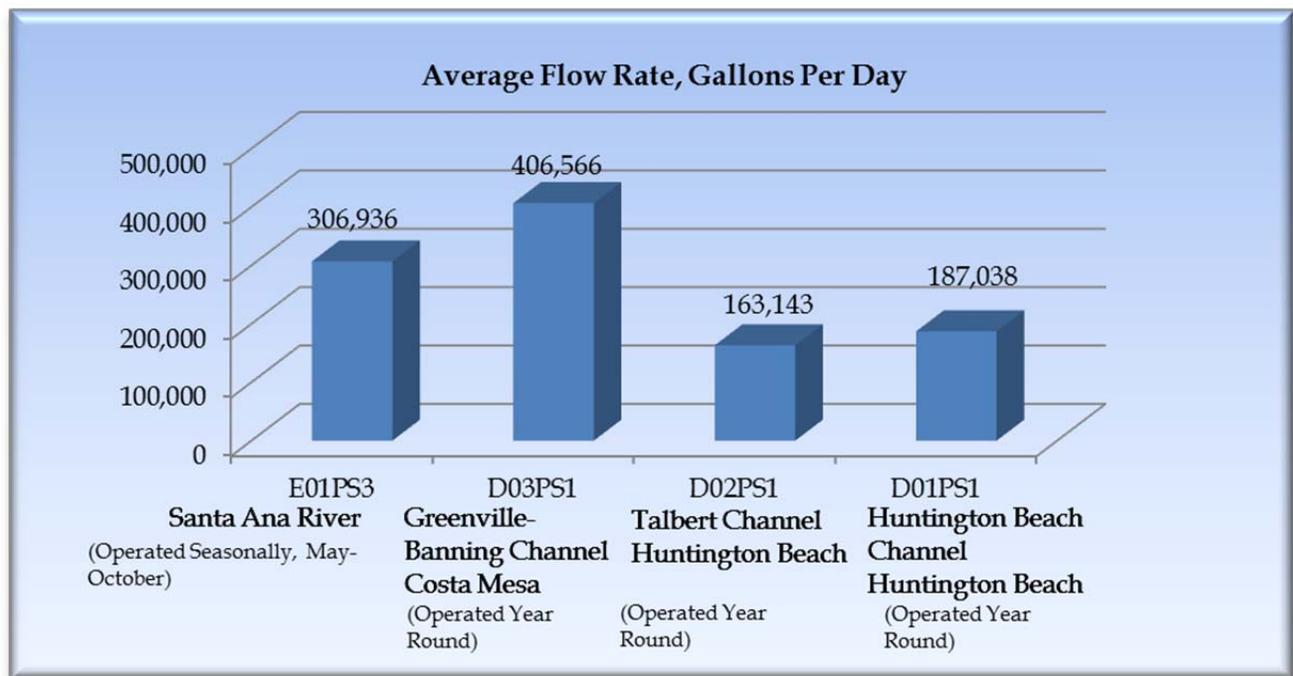
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pesticides and heavy metals is conducted on a semiannual basis at all facilities and results submitted to OCSD as a condition of the County's sanitary discharge permit. Diverted runoff has consistently been in compliance with OCSD maximum allowable concentrations such that it would not disrupt the biological treatment process or materially affect OCSD's own outfall discharge permit.

The Talbert Channel, Greenville Banning Channel, and Huntington Beach pump station diversion facilities were continuously operational throughout the 2011-12 reporting year, excepting periods of rainfall and subsequent storm runoff. The Santa Ana River diversion was generally operated only during the dry season (May - October), as it is extremely cost inefficient to maintain and operate this in-channel facility during the rainy season.

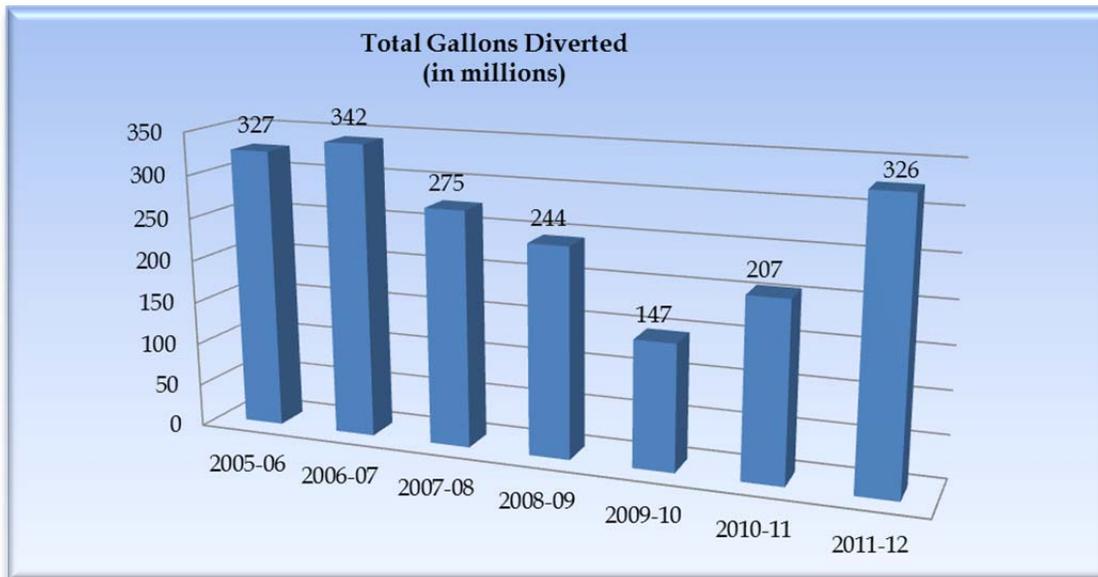
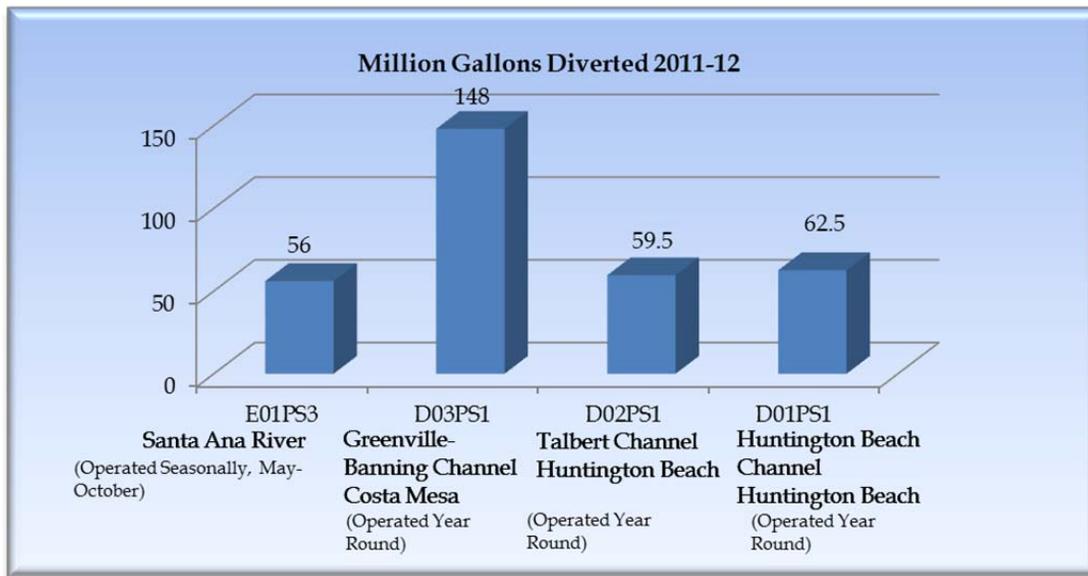
The four facilities diverted 326 million gallons of urban runoff to OCSD in 2011-12. Diversion volumes were substantially more than reported in 2010-11, and were comparable to program highs observed in 2005-06 and 2006-07. High 2011-12 diversion volumes were likely attributable to greater operational dependability, given major reconditioning of all four facilities during the two previous reporting years. The overall percent of operational time for the four facilities in 2011-12 was 85%, compared to 66% in 2010-11 and 56% in 2009-10. The relatively low rainfall experienced in 2011-12 may also have contributed to higher diversion volumes through increased landscape irrigation and corresponding overspray drainage.

2011-12 Summary of Diversions of Dry Weather Flows to Sanitary Sewer





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BMP Project Updates in the San Diego Region:

Aliso Creek Watershed

J01P28 Clear Creek Treatment System



This mechanical urban runoff treatment facility was constructed in Aliso Viejo to treat dry weather urban runoff from the Aliso Viejo Town Center contributory drainage area (pipe J01P28) prior to its discharge to Aliso Creek. The treatment system consists of sand filtration and ultraviolet (UV) light disinfection, and was designed to remove bacteria, suspended solids, and associated particulate pollutants at a maximum rate of 200,000 gallons/day. The facility draws its influent runoff from the J01P28 energy dissipation basin. Facility construction was completed in June 2003, at a total cost of approximately \$750,000.

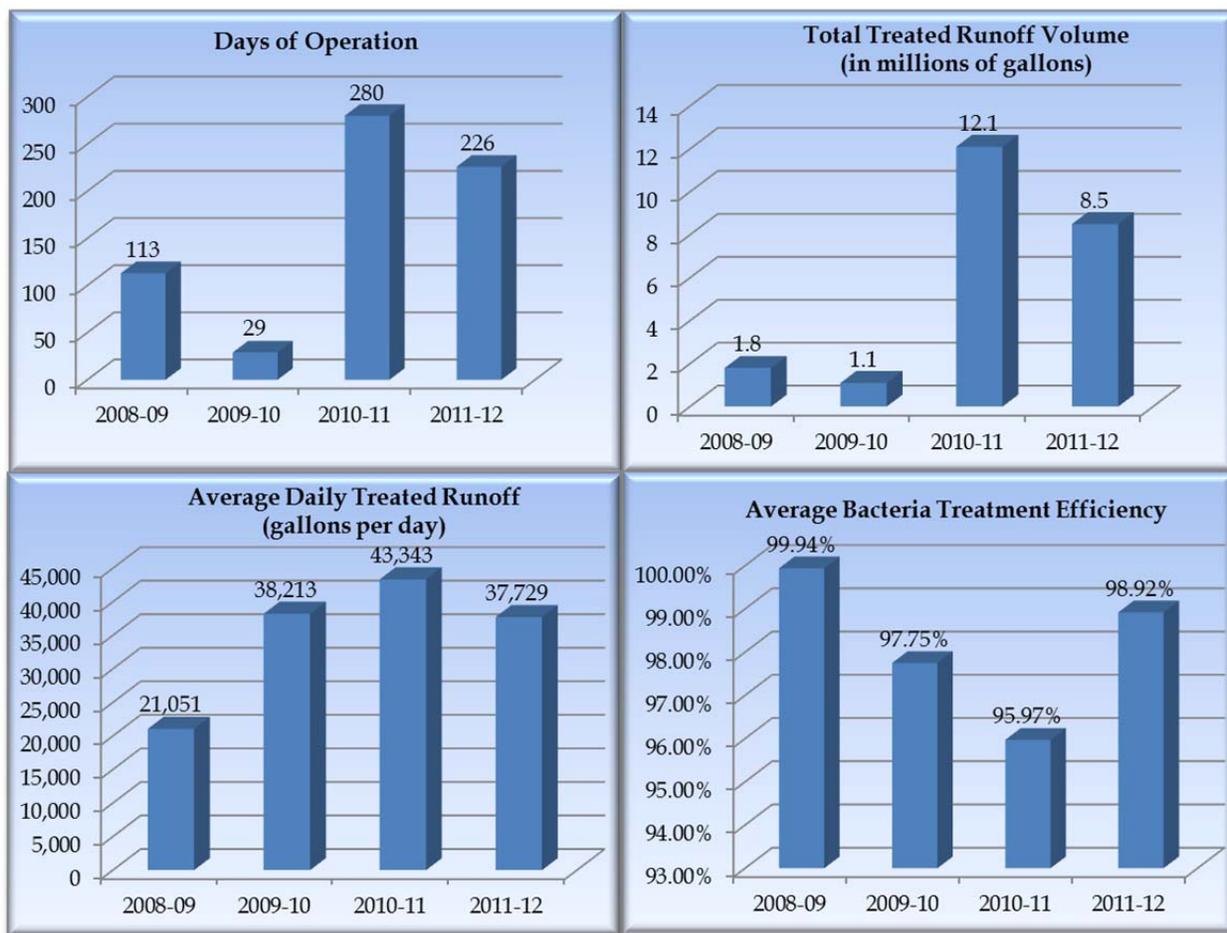


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Facility operation was initiated in July 2003 and operated until August 2005, when operations were suspended due to premature clogging of filter media, excessive backwash frequency, and difficulty in accessing the basin for maintenance. Following construction of a heavy equipment pad adjacent to the basin and securing a higher backwash discharge allowance from the South Orange County Wastewater Authority, the facility restarted in 2007 and operated only intermittently through May 2010 due to sequential failure and replacement of facility components, periodic discharges of very fine sediments to the basin which necessitated facility shutdown for cleaning. However, several process plumbing modifications made during this period reduced maintenance frequency and improved operational dependability. The facility was successfully restarted in early June 2010 and has since provided very effective and reliable service for the past two reporting years.

During the 2011-12 reporting year, the facility provided over 7 months of effective operational service, treating over 8.5 million gallons of runoff at an average flow rate of 37,700 gallons per day and with average bacteria treatment to below practical analytical detection limits at efficiencies of 99%. It is expected that this sustained and effective performance will be continued into the next reporting year.

JO1P28 2011-12 Clear Creek Treatment System Performance Summary





J01P01 Munger Storm Drain Sand/Media Filter



This sand filter was intended to treat dry season urban runoff from the Munger Storm Drain (J01P01) prior to its discharge to Aliso Creek. The system consisted of a pre-sedimentation vault, pump station/wet well and sand filter vault, with discharge to the creek. The system was expected to provide meaningful removal of suspended solids, bacteria, and other pollutants.

The project was constructed in 2005 with funds from a State Water Resources Control Board Proposition 13 grant. However, upon construction it was immediately apparent that the system was substantially undersized to treat the required flow rate, and could not be operated in an effective manner. The system was operated at a much lower flow rate as a pilot facility to evaluate the performance effectiveness of the sand filtration treatment technology. The performance evaluation was completed in January 2007, and demonstrated 90% removal of all three fecal indicator bacteria, with meaningful removal of other particulate pollutants. Results affirmed the treatment effectiveness of the technology for continuous dry weather runoff.

The filter system has been inactive since 2007 pending a redesign and expansion of the treatment system. Prior to initiating redesign, in late 2011 the consultant completed an evaluation of emerging treatment technologies which might be superior to sand filter expansion. The evaluation identified a proprietary biofiltration media product by Filterra/Kristar for bacteria removal from storm runoff which could provide better bacteria removal on a smaller facility footprint and at lower implementation costs; however, its treatment capability has not yet been demonstrated under continuous dry weather runoff conditions prevailing at Munger. The County is presently considering whether to perform a Munger-specific pilot scale evaluation of this promising but unproven treatment technology.

Narco Channel Restoration in Laguna Niguel Regional Park



This project featured the restoration of approximately 1000 feet of Narco Channel immediately adjacent to Laguna Niguel Regional Park. The project involved the transformation of a section of earthen and rock-lined trapezoidal channel devoid of vegetation to a more natural drainage corridor for both water quality improvement and wildlife habitat benefits. Restoration elements included: dredging within the stream channel; bank regrading, widening, and terracing, and planting of native wetland and riparian vegetation within the channel and along the stream banks.

**Pre-restoration****Post-restoration**

The City of Laguna Niguel received a \$1.4 million grant from the State Water Resources Control Board to implement the project. The County administered the design, general construction, and plant establishment phases of the contract on behalf of the City.

Project construction was initiated in 2007, and completed in January 2008 with the planting of native vegetation. Native vegetation should be fully established in 2012.

Dana Point Coastal Streams Watershed

Baby Beach BMPs

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Water quality at Baby Beach in Dana Point Harbor had been historically characterized by persistent exceedances of AB411 bacteria standards, corresponding extended water quality advisory postings by Orange County Health Care Agency (OCHCA), and “F” grades in Heal the Bay’s annual Beach Report Card.

Since 2001 the County and other entities have implemented a number of water quality management practices which have collectively contributed to a dramatic improvement in bacterial water quality at Baby Beach. The Health Care Agency uses Beach Mile Days posted (BMD) as a metric of bacterial quality which reflects both the extent of beach frontage as well as the time period affected. In 2000, Baby Beach cumulative water quality advisory posting activity at Baby Beach was 12.78 BMD posted, out of a maximum 16.61 BMD possible. By 2009 and 2010, cumulative water quality advisory postings had dropped to 0.23 BMD and 0.53 BMD, respectively, with Baby Beach being awarded “A” grades at all four beach stations in the Heal the Bay 2009-10 and 2010-11 Beach Report Cards.

An assessment of current bacterial water quality at Baby Beach is provided in the *Baby Beach Dana Point Harbor Bacterial Indicator TMDL Annual Progress Report*, which can be found as an attachment to the 2011-12 San Diego Region Unified Program Effectiveness Assessment (Unified PEA). Data analysis shows that despite some declines in 2011-12, the TMDL 50% waste load reduction milestone for dry weather has been achieved. Existing and planned future



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BMPs and special studies to address remaining waste load reductions at Baby Beach are described in **Sections C-4** and **C-7** of the Unified PEA.

San Clemente Coastal Streams Watershed

Poche Clean Beach Project



The Poche Clean Beach Project (Poche CBP) is a sand filtration and ultraviolet (UV) light disinfection facility in San Clemente for the treatment of urban runoff from Prima Deshecha Channel prior to discharge to the surf zone at Poche Beach. Poche Beach is chronically posted for exceeding AB 411 bacteria standards by the Orange County Health Care Agency (OCHA).

The Poche CBP is situated on railroad right of way adjacent to the channel, where an inflatable diversion dam directs dry weather runoff into the facility for treatment. Facility construction was completed in 2009 at a cost of approximately \$3 million, with funding support from the State Clean Beaches Initiative, the City of San Clemente, the County, and the public interest group Miocean. South Coast Water District (SCWD) operates the facility on the County's behalf, with City of San Clemente and the County sharing facility operational costs. The facility is intended to operate primarily during the April - October AB411 period. Rainstorm events and major maintenance activities limit operations during the rainy season.

Poche CBP initiated operation in July 2010. Under Coastal Development Permit (CDP) conditions, the facility was required to discharge treated outflow just downstream of the diversion dam within the channel. Facility performance data during August - December 2010 documented treatment rates averaging 0.75 million gallons per day (MGD) and bacterial treatment efficiencies of 93-95% for the three fecal indicator bacteria. However, receiving water response data demonstrated that the water quality benefit of treated runoff was unable to be delivered to the surf zone, due to its passage through the intervening scour pond between the channel and the ocean. Recontamination within the scour pond returned pond outflow bacteria concentrations to untreated channel runoff levels, with no reduction in AB411 bacteria standards exceedance in the surf zone. Potential sources of pond bacteria include large numbers of shorebirds and regrowth of enterococcus within the pond sediments.

During the July 2011-June 2012 reporting period, Poche CBP operated under a temporary CDP approval to discharge closer to the ocean via a pipe extending to the end of wooden bulkhead along the upcoast side of the scour pond. This discharge location was expected to provide greater opportunity for treated runoff to bypass the scour pond and minimize pond outflow, with a correspondingly better quality outflow to the ocean.

Performance data from August - October 2011 and preliminary data from May-June 2012 demonstrated that discharge site relocation and greater runoff treatment efficiency (97-99% for the three indicator bacteria) have measurably improved the overall quality of outflow to the surfzone. However, extended surfzone exceedances of AB411 enterococcus standards continue to persist, due to the extraordinarily large numbers of seagulls congregating along the beach intertidal area.

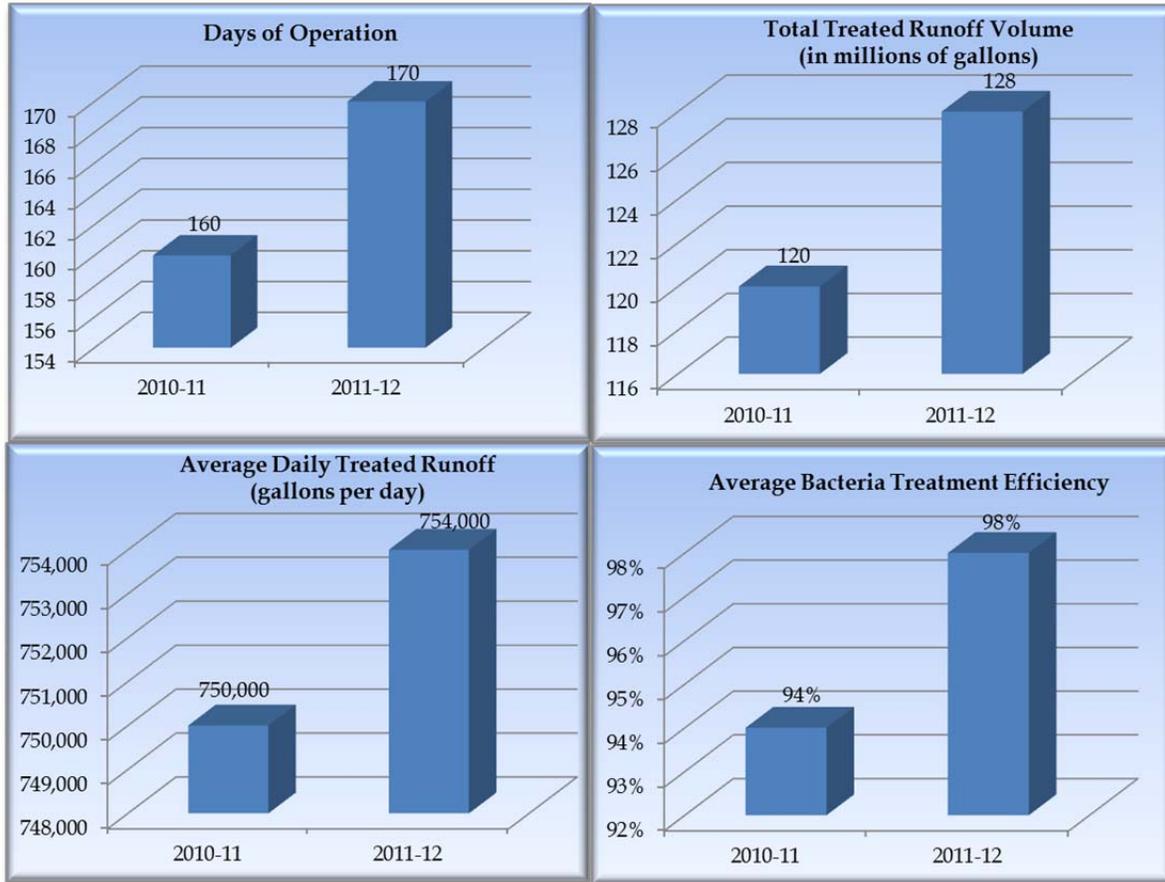
The County and the City of San Clemente intend to improve conditions for a positive water quality outcome at Poche Beach by: 1) seeking permanent Coastal Commission approval for the County of Orange/Orange County Flood Control District Program Effectiveness Assessment (PEA)



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current temporary discharge location; 2) continuing to conduct bacteria source control and runoff reduction efforts in the contributory watershed; and 3) implementing and evaluating innovative pilot programs to discourage shorebird congregation at the beach.

Poche Clean Beach Project Performance Summary



C-3.4 Improvements in Stormwater Science (LIP Section A-3.4)

The County as Principal Permittee continues to conduct and sponsor investigations and special studies that will better characterize the sources of pollutants in urban and stormwater runoff, and the impacts these pollutants exert on beneficial uses in receiving waters. During the reporting period the County participated in the following studies:

Regional Bight '08 Characterization

2

Bight '08 is a collaborative effort of more than 50 organizations to conduct a regional survey to assess the environmental health of coastal waters in the Southern California Bight (the coastal area from Point Conception to the territories of northern Baja Mexico). This survey is the fourth regional survey of its kind, preceded by a Pilot Project in 1994, Bight '98, and Bight '03. Bight '08 consists of six planning committees (Coastal Ecology, Shoreline Microbiology, Offshore Water Quality, Rocky Reef Habitats, Areas of Special Biological Significance, and Coastal Wetlands



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and Estuaries), each of which developed unique study designs. A Steering Committee oversees the efforts of the six planning committees, ensuring that synergy occurs throughout the entire Bight '08 study.

As Principal Permittee, the County has taken an active role in three planning committee study designs (Shoreline Microbiology, Offshore Water Quality, and Areas of Special Biological Significance) in addition to serving on the Steering Committee (the SCCWRP CTAG). The Orange County Stormwater Program is further supporting the efforts of the Bight '08 program through in-kind contributions of analytical monitoring equipment for the Coastal Wetlands and Estuaries component. Bight '08 study findings for the Water Quality and Shoreline Microbiology have not been finalized yet as and will be available in the next reporting period.

Regional Bight '13 Characterization



In October 2012, the Southern California Bight Regional Monitoring Program started the next round of regional surveys. Bight '13 will be the fifth regional survey and the copermittees are planning to participate in the planning committee study designs for Marine Debris, Coastal Ecology, and potentially Shoreline Microbiology.

The Bight Marine Debris survey is working to connect with the Stormwater Monitoring Coalition on a regional trash survey to better understand the implications of trash in the environment and the downstream effects on receiving waters. The Bight Marine Debris study is providing a first time opportunity to connect efforts from the SMC with another large scale regional monitoring program. As Principal Permittee, the County has taken an active role in the planning of this study design in anticipation that the results from this effort will serve to better guide the development of a Newport Bay Trash Management Plan.

Regional Research Monitoring Program (Stormwater Monitoring Coalition "SMC")



The County continues to participate with other southern California Phase I municipal stormwater programs, Caltrans, NPDES regulatory agencies and SCCWRP in the SMC. The goal of the SMC is to identify region-specific research needs to better understand stormwater mechanisms and impacts, and to collectively sponsor the development of assessment techniques and methodologies that will enable more informed and consistent stormwater management decision-making across the region. The SMC relationship was formalized in an agreement signed in 2000, and extended in 2007. The current member agencies are:

- California Regional Water Quality Control Board, Los Angeles Region
- California Regional Water Quality Control Board, San Diego Region
- California Regional Water Quality Control Board, Santa Ana Region
- City of Long Beach
- County of Orange, OC Public Works
- County of San Diego
- Los Angeles County Department of Public Works (LACDPW)
- Riverside County Flood Control and Water Conservation District
- San Bernardino County Flood Control District



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- Ventura County Watershed Protection District
- Southern California Coastal Water Research Project (SCCWRP)
- Caltrans
- State Water Resources Control Board
- City of Los Angeles
- US Environmental Protection Agency (through a separate MOU)

The multi-agency collaboration has demonstrated its effectiveness in identifying common needs and using public funds in coordinating regional stormwater research efforts. To date, the SMC has initiated a dozen research projects identified in the research agenda. A summary of project accomplishments during the 2011-12 reporting period are as follows (information taken from the 2011-12 SMC Annual Report):

Stormwater Data Compilation Study
Status: 90% complete

Assessment and prioritization for mitigating water quality requires context. Knowledge of mean concentrations across watersheds, counties, and regulatory jurisdictions provides the perspective needed for managers to rank water bodies for management action. Regional reference condition, frequency of water quality objective exceedances, extent and distribution of parameter concentrations all play a part in determining where a manager's worst problem occur.

To help managers gain the necessary perspective, the SMC described a project in its research agenda that compiles water quality monitoring information region wide. For several years, the SMC has been building the necessary infrastructure to support such an effort. Data sharing protocols, interlaboratory calibrations, and web-enabled interfaces all enhance the SMC's ability to share data. The goal of this project is to compile the existing water quality monitoring information. Initially starting with nutrients, the objective will be to make annual estimates of concentrations and mass emissions from 25 watersheds between Ventura and San Diego.

To date, more than 600,000 data records have been compiled among all SMC agencies. Initial assessments indicate that there is tremendous variation in completeness among the data submittals. However, the greatest hindrance towards achieving the project goal is not the lack of concentration data, but the lack of flow data. Ultimately, this has impacted the ability to estimate annual loads. The data set is currently being augmented with modeling based information to compile final load estimates.

Implementing a Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program
Status: 80% complete

Assessment of freshwater biological communities represents a potentially powerful tool for evaluating the effects of discharges in southern California creeks and streams. Bioassessments integrate the effects of multiple stressors, including chemical pollutants and physical alterations in receiving waters. The value of biological assessments is that they are closer to many of the defined beneficial uses of receiving waters (i.e. aquatic life, warm water habitat, cold water



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habitat) than chemically-derived water quality objectives. As a result, virtually every SMC member agency has biological community monitoring in their respective NPDES permits.

The goal of this study is to implement a coordinated, integrated regional bioassessment monitoring program. Previously, the SMC had worked together to design an optimal monitoring program that satisfied both local needs, but simultaneously provided information that could be combined to make region wide assessments. Monitoring questions included: 1) What is the extent of impact in streams of southern California? 2) What are the stressors that impact southern California streams? and 3) Is the extent of stream impacts changing over time?

Calendar year 2012 was the fourth year of a five-year project. In each year of the project to date, over 90 sites have been sampled between Ventura and San Diego counties for biological communities, water quality, physical habitat, and riparian condition. Preliminary results indicated that roughly 50% of the stream miles in southern California have healthy biological communities. In addition, the extent of chemical contamination appears lower than previously thought. For example, less than 3% of the stream miles exceeded the chronic water quality criterion for copper. Sampling for the fourth year is now finished and samples are at the laboratory for analysis. A report of the first year findings, along with a fact sheet, was published in 2011.

- RD Mazor, DJ Gillett, K Schiff, K Ritter, E Stein. 2011. [Ecological Condition of Watersheds in Coastal Southern California: Progress Report of the Stormwater Monitoring Coalition's Stream Monitoring Program First Year \(2009\)](#). Technical Report 639. Prepared for the Stormwater Monitoring Coalition Bioassessment Workgroup. Southern California Coastal Water Research Project. Costa Mesa, CA.

The SMC regional watershed monitoring program is now serving as a model for other parts of the state. Regional watershed programs in the San Francisco Bay and the Central Valley are planning to use the SMC as a model for their design and implementation. Perhaps the biggest value of the SMC regional watershed monitoring, however, is its connection to the SWRCB's development of biological objectives. This new policy will set narrative and numeric limits on biological condition in streams statewide. Because of the unique collaboration in southern California, approximately one-third of the data used to develop the biological objectives will come from the SMC region.

The main collaborator on this project is the California Department of Fish and Game (CDF&G) and SWRCB. The project is 50% funded by the SWRCB, whose main desire is to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP).

Hydromodification Study
Status: 100% complete

The process of urbanization has the potential to affect stream courses by altering watershed hydrology. Development and redevelopment can increase the amount of impervious surfaces on formerly undeveloped landscapes. This reduces the capacity of remaining pervious surfaces to capture and infiltrate rainfall and, as a result, a larger percentage of rainfall becomes runoff



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during any given storm. In addition, runoff reaches the stream channel much more efficiently, so peak discharge rates post-development are higher compared to predevelopment for an equivalent rainfall event. This process has been termed hydromodification.

Hydromodification can result in adverse effects to stream habitat, surface water quality, and water supply. The stream erosion that results from the increased peak flow can threaten infrastructure, homes, and businesses. Intermittent and ephemeral streams that possess riparian and wetland habitat are at particular risk from effects of hydromodification. Streams in semi-arid regions are especially vulnerable to urbanization due to a prevalence of sand bed channels, lack of vegetative reinforcement, and relatively large net changes in water and sediment supply associated with stormwater runoff. Recent studies by the SMC have indicated that intermittent and ephemeral streams in southern California degrade at lower levels of watershed urbanization than streams in the eastern US.

In response to the effects of hydromodification, state and local agencies are developing standards and management approaches to control and/or mitigate the effects of hydromodification on natural and semi-natural stream courses. Successful implementation of these regulatory programs requires development of tools to better assess hydromodification effects and develop appropriate mitigation and management strategies.

The goal of this project is to develop a series of tools supporting implementation of hydromodification management measures that could be used to better protect the physical, chemical, and biological integrity of streams and their associated beneficial uses. This project will provide tools to answer the following questions: 1) Which streams are at the greatest risk from the effects of hydromodification? 2) What are the anticipated effects in terms of increased erosion, sedimentation, or habitat loss, associated with increases in impervious cover? 3) What are some potential management measures that could be implemented to offset hydromodification effects and how effective are they likely to be?

This project is being conducted in collaboration with researchers from Colorado State University, Fort Collins. Several major elements have been completed this year. Building off the previously completed literature review and field work, GIS-based and field-based hydromodification screening tools were completed that can be used to evaluate susceptibility of channels to hydromodification effects. The tools were published in a series of three technical reports:

- Bledsoe B.P, R.J. Hawley, E.D. Stein, D.B. Booth. 2010. [Hydromodification Screening Tools: Technical basis for development of a field screening tool for assessing channel susceptibility to hydromodification.](#) Southern California Coastal Water Research Project Technical Report #607.
- Bledsoe B.P, R.J. Hawley, E.D. Stein, D.B. Booth. 2010. [Hydromodification Screening Tools: Field manual for assessing channel susceptibility.](#) Southern California Coastal Water Research Project Technical Report #606.
- Booth D.B., S.R. Dusterhoff, E.D. Stein, B.P. Bledsoe. 2010. [Hydromodification Screening Tools: GIS-based catchment analyses of potential changes in runoff and](#)



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[sediment discharge](#). Southern California Coastal Water Research Project Technical Report #605.

Use of these tools has been incorporated into several municipal stormwater permits. SCCWRP staff has held training sessions on use of this tool and are working with the Water Board training academy on establishing an ongoing training program.

Over the past year, analysis was completed of forty-three regional U. S. Geological Survey gauges with records greater than ~20 yrs located in watersheds ranging from 1.3 - 272 km² to develop regionally calibrated, empirically derived models that can be used to estimate flow from ungauged streams throughout southern California. These models can be used to supplement the USGS regional regression equations with more local data. Retrospective analysis of these flow gauges also showed that large increases were observed in instantaneous-peak flows of more frequent return periods (e.g., 1.5 and 2 year storms), with greater than a 5-fold increase in 2-year events (Q2) observed in a watershed with 20% imperviousness relative to ≤ 1% imperviousness. Effects of urbanization decreased for larger, less frequent storms. The results of these analyses are provided in the following technical report:

- Hawley, R.J., B.P. Bledsoe and E.D. Stein 2011. [Hydromodification Effects on Flow Peaks and Durations in Southern California Urbanizing Watersheds](#). Southern California Coastal Water Research Project Technical Report # 654.

Finally, progress was made over the last year on the final two deliverables of this project; guidance on model application and a framework for hydromodification monitoring. Drafts of both documents were developed in coordination with a technical workgroup and will be ready for review in late 2012.

Low Impact Development Study

Status: 80% complete

The Low Impact Development Guidance (LID) Study is being conducted with funding from the State Water Resource Control Board's Consolidated Grants Program, under the Urban Runoff Program of Proposition 40 and with funding from SMC members and CASQA. The LID Project will develop a comprehensive program to incorporate LID strategies and techniques into the planning and design of public and private sector projects. The LID Project will develop a model program for localities in California that are interested in adopting LID strategies and techniques.

This project has been successful in attaining these goals:

- *Develop interim guidance and training for LID implementation.* Four training sessions were held throughout the Southern California region from 2007 through 2008.
- *Determine effectiveness of LID for reduction of pollutant loads and hydrologic changes in Southern California.* Monitoring results were used to assess the volume and concentration benefits to discharges, the percentage of runoff from various BMPs and LID systems



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measured, and a review of the soil type. There are ongoing LID monitoring programs that will provide additional results regarding the effectiveness of LID in Southern California.

- *Develop guidelines on specifications and standards for Project design and review.* The SMC finalized the LID Guidance Manual in April 2010. It is now located on the SMC and CASQA web sites.
- *Develop final guidance and training materials using field data.* This goal is ongoing. The project lead, San Bernardino Flood Control District (District) and the SMC have developed final guidance and training materials using the feedback from interim trainings, the literature review, and using the final LID Guidance Manual. However, field data collected as part of this project has yet to be incorporated into the LID Guidance Manual.
- *Conduct training workshops in Southern California.* In addition to the interim training workshops, final training was provided by online web access to the LID Guidance Manual and presentations that provided manual content and access information.

The District coordinated with various regional and statewide efforts that involved LID training, including San Diego County, the California Water and Land Use Partnership, the California Coastal Commission, the Local Government Commission, and the Chino Basin Landscape Alliance. The collaborative regional effort was a critical networking tool that provided additional funding, technical support, and LID monitoring opportunities. Partner agencies included the County of Orange, County of San Diego, Riverside County, Ventura County Watershed Protection District, and CASQA, all of whom helped support the project when grant funding was frozen mid-project by the State of California. Approximately \$260,000 was leveraged for activities during the 2010-2011 and 2011-2012 fiscal years.

The SMC plans to continue updating the LID Guidance Manual and provide training sessions. Monitoring continued through spring of 2012. Monitoring reports are expected to be provided upon completion of data analysis and reporting.

Barriers to Low Impact Development (LID) Study

Status: 75% complete

While many communities understand the benefits of low impact development (LID), getting LID projects built has been difficult. In an effort to address the difficulties in LID implementation, the SMC has commissioned the Local Government Commission (LGC) to investigate the barriers its members are facing, and to prioritize strategies to remove those barriers. Of particular interest are external barriers at the state level over which local jurisdictions do not have control.

To date, a literature review focusing on the site design and approval processes and associated codes, processes and perceptions has been completed. Barriers gleaned from the literature review were then compiled and shared with SMC members for review and comment. A comprehensive list of barriers taken from the literature review and from SMC member comments were then incorporated into an online survey that was distributed to local, regional,



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and state agencies where they were asked to rank the significance of each barrier as it applied to their jurisdiction. Another online survey was created for and distributed to the development community to gather feedback from the private sector. Phone interviews and three small focus groups occurred in late October and early November 2011, which will allow a more in-depth investigation of barriers for implementing LID in Southern California. The project will be completed in 2012.

Effects of Wildfires on Contaminant Runoff and Emissions

Status: 100% complete

Fire is a natural component of Mediterranean ecosystems, such as those found in southern California. Due to loss of plant cover, severe burns have been shown to increase runoff and sediment generation to downstream areas. Constituents associated with the increased runoff have the potential to affect water quality in downstream receiving waters and the near-shore coastal environment. This may be especially problematic for streams that are already impaired. Most research on post-fire water quality has focused on nutrient and sediment enrichment in relatively natural areas. However, post-fire runoff also has the potential to increase loadings of carbon, organic compounds such as PAHs, and trace metals. Constituent loadings may occur by several mechanisms over a range of spatial and temporal scales. Potential loading mechanisms include direct runoff, debris flows, or atmospheric deposition of ash followed by storm runoff. Investigating the magnitude and duration of fire effects in downstream and/or adjacent watersheds is critical to accounting for its influence on cumulative water quality impacts and attaining water quality standards.

The goal of this project was to investigate the fate of water quality constituents resulting from southern California wildfires in order to quantify the effects of post-fire runoff on downstream metals and organic constituent concentrations and loads. Contaminant loading and effects on in stream biota were investigated as part of this project.

A regional post-fire monitoring strategy was completed in 2009 that describes an agreed-upon approach for post-fire sampling.

- ED Stein, J Brown. 2009. [Effects of post-fire runoff on surface water quality: Development of a southern California regional monitoring program with management questions and implementation recommendations.](#) Technical Report 598. Southern California Coastal Water Research Project. Costa Mesa, CA.

This plan was implemented for the first time following the 2010 Station Fire, which burned portions of the Los Angeles and San Gabriel River watersheds. Two sites were sampled for solids, metals, and PAHs over six storms following the 2010 fires; Tujunga Wash and Arroyo Seco. Results showed dramatic increases in concentrations and loads of all constituents sampled following storms, but returning to near pre-fire levels by the end of the storm season. The results of this analysis have been written up for submittal to a journal and for inclusion in this year's SCCWRP Annual Report. Additional analysis of post-fire pollutant concentration data has been compiled for storms dating back to 2003. This data has been analyzed for regional patterns and to investigate factors that may influence pollutant loading (e.g. burn



intensity, pre-fire vegetation, watershed size). In addition, post-fire bioassessment data from both the 2003 San Diego County fires and the 2009 Los Angeles County Station fire have been compiled and are being analyzed to assess fire effects on benthic indices typically used as part of regional bioassessment monitoring.

Newport Bay Fecal Coliform TMDL Source Identification and Management Plan

2

The fecal coliform TMDL for Newport Bay was adopted in 1999 to improve bacterial quality, reduce public health risks, and improve water contact recreational activities. The TMDL requires an updated TMDL report based upon findings from a Source Identification Project¹ and recommendations in the Source Management Plan². The final draft of *Recommended Revisions to the Newport Bay Fecal Coliform TMDL* is expected to be provided to the Santa Ana Regional Board during the 2012-13 reporting period.

Source Management of fecal coliform, as required by the fecal coliform TMDL, is difficult due to the many different urban and natural sources of fecal indicator bacteria in the Bay, the apparently episodic and diffuse nature of these sources, and the fact that bacteria are intrinsically non-conservative (i.e., they die-off and grow in the environment). In February 2005, the County received a Proposition 13 grant from the State Water Resources Control Board for the Source Investigation Project and the Source Management Plan. A goal of source investigation was to identify and quantify the contribution of urban and natural sources of fecal indicator bacterial (FIB) impairment in Newport Bay and to define the relative contribution of FIB and viruses to water quality impairment of the Bay. The Fecal Coliform TMDL Source Management Plan evaluates and prioritizes sources of fecal coliform bacteria and BMPs. BMPs are recommended at priority sites for dry and wet weather separately. For the source investigation project, data collection was initiated in December 2005 and continued through February 2007. Data collection efforts included:

- 46 Bay-to-Ocean (BTO) transects were completed and an intensive survey of the upper basin of Upper Newport Bay (BTO4) was conducted to assess the impact of a large macro algae bloom on FIB concentrations.
- An inventory of storm drains within the City of Newport Beach was completed. Dry weather sampling of irrigation water run-off at curbside on the PCH side of the Bay, Balboa Peninsula, Balboa Island and Lido Island, as well as sampling of water from beach trenches was conducted in the early morning hours on November 16, 2006. Twenty-one drains were surveyed and 5 trenches were sampled. The wet weather storm drain survey was conducted on January 31, 2007 and sampled twenty one drains from the dry weather study. Drains were sampled at the end of the pipe at low tide. In addition, irrigation water from the curbside was collected at street-level for each of the storm drains during both dry and wet weather.
- Two synoptic studies of water quality conducted along the perimeter of the Lower Newport Bay at most of the storm drain outlets (those that could be identified from the Bay side) in August 2007. Measurements of FIB, pH, and salinity were taken at each storm drain outfall

¹ Grant, Stanley B, S. Jiang, B. Sanders, K. McLaughlin, J. Ahn, R. Litton, and L. Ho. Newport Bay Fecal Indicator Bacteria Source Identification Project, July 26, 2009.

² EOA, Inc. Newport Bay Fecal Coliform Source Management Plan, December 31, 2009.



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and 50-100 feet away from the outfalls at low-tide and high tide in the night-time hours when FIB concentrations were estimated to be highest. These results were used to generate a map of FIB exceedances from storm drain outfalls in Lower Newport Bay.

- Four diurnal intertidal sediment studies (wet season and dry) were completed. Wet weather surveys occurred during storms on March 1-2 and March 18-19, 2006. Dry weather studies were completed on October 19 and October 26, 2006.
- Microcosm studies were conducted assessing the die-off and re-growth of FIB from runoff in Newport Bay, bird feces, macro algae, sediment, and runoff. In total, 70 separate microcosms were conducted:
 - 28 microcosm studies were conducted assessing die-off and/or re-growth of FIB associated with macro algae and bird feces;
 - 14 microcosm studies were conducted assessing die-off and/or re-growth of FIB associated with sediments of various grain sizes;
 - 27 microcosm studies were conducted assessing die-off and/or re-growth over a range of salinities, creek sources, and bay sources;
 - 4 microcosms were conducted to assess the influence of wrack line debris;
 - 3 microcosms were conducted to assess FIB in runoff.
- *E. coli* and *Enterococcus* isolates were obtained from the Newport Bay BTO study and the microcosm studies. Biochemical identification for both *Enterococcus* and *E. coli* was conducted. Approximately 200 *Enterococcus* isolates were identified and approximately 200 *E. coli* isolates were characterized. *E. coli* gene expression patterns were analyzed to distinguish environmentally adapted strains from those of fecal origin.

Preliminary data results were presented to the Newport Bay Fecal Coliform TMDL Technical Advisory Committee on July 21, 2006 and April 13, 2007. The final Newport Bay Fecal Indicator Bacteria Source Identification Project Report was submitted to the Regional Board in July 2009.

Information from this report, as well as all previous TMDL studies and stakeholder efforts, were used to formulate the Fecal Coliform Source Management Plan, the second task of the project. The final Source Management Plan was submitted to the Regional Board in November 2009. The grant award amount for the studies was \$780,000 with a \$50,000 match provided by the Watershed Permittees and other stakeholders. Both the Newport Bay Fecal Indicator Bacteria Source Identification Project report and Fecal Coliform Source Management Plan were accepted by Regional Board staff and the grant project is complete.

Trash and Litter Monitoring Research Program/Newport Bay Trash Management Plan



Trash and litter in surface waters is a major concern for environmental management. It can cause significant water quality, biological and aesthetic problems. Specifically, trash and debris may inhibit the growth of aquatic vegetation, harm aquatic organisms by ingestion or entanglement, convey other pollutants such as toxic substances, and cause visual blight on shorelines. A major source of trash in the environment is litter that is intentionally or accidentally discarded in watershed drainage areas. This material can then be transported in storm drains to the creeks, rivers and ocean during and after rainstorms. Each year the Orange



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County Permittees make significant efforts to minimize trash and litter levels at significant expense.

Stormwater agencies throughout southern California share many similar issues regarding trash and debris monitoring and management but to date there have been no coordinated effort to develop a consistent method of estimating loadings, understanding pathways into the environment and identifying and prioritizing sources for remediation at a watershed scale. A collaborative project with the SMC, led by the County, will seek to develop some of these regional tools and apply them in a case example for management controls in the Newport Bay watershed. The project is anticipated to start in 2013 and seek to address the following questions:

1. What is the current state of knowledge including defining common terminology?
2. Do hotspots for trash and debris exist?
 - a. What categories of land use represent the most significant input of trash and debris into storm channel/stream reaches?
 - b. How do you determine the relative contribution of various sources such as storm drain outfalls, fugitive trash, illegal dumping, recreational areas, homeless encampments, fast food outlets/convenience stores, etc.?
3. Are existing management programs working or are additional controls required?
 - a. Are the levels of trash and debris in decline?
 - b. What are the relationships between the land area coverage for trash control and waterway conditions?
4. What are the appropriate trash and debris management controls?
5. How can trash and debris controls be applied most efficiently spatially and by land use to reduce levels in storm channels/stream reaches?

The project will coordinate with a broader grant-funded project being initiated by CASQA.

Monitoring of Natural Sources from Ambient Geology

2

Naturally derived pollutants in surface waters can often exceed water quality criteria both in undeveloped catchments as well as developed watersheds. In recent years, efforts led by the County to characterize natural sources from ambient geology have demonstrated that natural sources in specific areas are the primary contributor for many constituents of concern such as cadmium, nickel, total dissolved solids, chloride, and sulfate.

Efforts during the 2011-12 reporting period focused on sampling new monitoring parameters that provide a better approach for assessing natural contributions from anthropogenic, or human based activities. This work focused on collecting samples from natural streams, groundwater springs, domestic water sources, and urban channels to compare and contrast differences between the various water body types. The 2011-12 effort is providing a more robust approach to measure pollutant concentrations against natural thresholds as well as determine loading contributions from natural and anthropogenic inputs.



In the 2011-12 reporting period a study was completed assessing geologic contributions to dissolved solids in the Oso Creek Watershed. Additionally, this work has led to new opportunities to connect with subject experts and share this work with other stormwater agencies outside of Orange County that are studying similar issues.

C-3.5 Regulatory Directives

13225 Directive for Aliso Creek

On March 2, 2001 the San Diego Board issued a written directive pursuant to California Water Code Section 13225 to the County of Orange, Orange County Flood Control District and the Aliso Creek watershed cities (Watershed Permittees). The directive found that the Watershed Permittees may be discharging waste with high bacteria concentrations from municipal storm drain outfalls into Aliso Creek and its tributaries. As a result the Watershed Permittees were directed to conduct an evaluation of the relative contribution of the urban stormwater discharges to the impairment of beneficial uses or the exceedances of water quality objectives and, where necessary, take appropriate measures to eliminate the sources of pollution.

The County is responsible for implementing elements of its LIP in unincorporated areas of the County. The County's unincorporated areas within the Aliso Creek watershed contain one storm drain outfall that meets the initial directive minimum size criteria of 39 inches, but otherwise does not contain drainage areas with significant urban land use. Therefore, the County's main responsibilities pursuant to the Regional Board's Directive (now incorporated in Fourth Term Permit requirements) include coordinating the Watershed Permittees' activities, conducting the monitoring program, compiling Watershed Permittee information and monitoring data, and developing prototype bacteria BMP projects (see prior discussion on J01P28 Clear Creek System and J01P01 Munger Storm Drain Sand/Media Filter). The County on behalf of the Watershed Permittees submits an annual Aliso Creek water quality data assessment monitoring report on March 1st of each year (Aliso Creek Watershed Runoff Management Plan Water Quality Data Assessment Annual Report). Findings from the 2011 annual report again indicate that bacteria concentrations at status and trends sites near the bottom of the watershed continue to improve to new lows with data suggesting that flow reductions at pipes is a key factor.

In February 2010 the San Diego Regional Board adopted TMDLs for indicator bacteria to address impaired beaches and creeks in the San Diego region including Aliso Creek and its tributaries, the Aliso Creek mouth, and Aliso Beach. On April 4, 2011, the Beaches and Creeks Indicator Bacteria TMDLs received final approval from the State Office of Administrative Law. As a first step to fulfilling the future requirements of the TMDLs, the County and Watershed Permittees completed development of a Comprehensive Load Reduction Plan (CLRP) to address bacteria impaired segments and other 303(d) listings within the Aliso Creek Watershed. This plan was submitted to the San Diego Regional Board on October 4, 2012. In addition to detailing existing and planned BMPs within the watershed the CLRP describes a series of proposed special studies to better define and optimize future watershed efforts.



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C-3.6 Plan Development Modifications

As the last step in the effectiveness assessment process, the County has evaluated the outcomes for this program element to determine if any program modifications are necessary. During the 2010-11 reporting period, the County continued to increase its knowledge and awareness while achieving notable improvements in water quality through the various BMP projects, studies and investigations discussed in this section. Based on the assessment of this program element, no major modifications are planned. Involvement in one or more projects associated with Bight 13 will be assessed during the 2012-13 reporting period.