ANNUAL REPORT 2007-2008

Stormwater Monitoring Coalition
Of Southern California

September 2, 2008

INTRODUCTION

As a result of the increasing regulatory focus and the lack of scientific knowledge base, both stormwater regulators and municipal stormwater management agencies throughout southern California have developed a collaborative working relationship. The goal of this relationship is to develop the technical information necessary to better understand stormwater mechanisms and impacts, and then develop the tools that will effectively and efficiently improve stormwater decision-making. As individuals and agency representatives, there was early recognition that these issues are oftentimes not localized, but typically cross watershed and jurisdictional boundaries. This relationship culminated in a formal letter of agreement, signed in 2000, by all of the Phase I municipal stormwater NPDES lead permittees and the NPDES regulatory agencies in southern California to create the Stormwater Monitoring Coalition (SMC) (Table 1).

Table 1. List of member agencies in the Stormwater Monitoring Coalition.

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
California Department of Transportation, Caltrans
City of Long Beach
City of Los Angeles, Watershed Protection Division
County of Orange, Public Facilities and Resources Dept.
County of San Diego Stormwater Management Program
Los Angeles County Department of Public Works
Riverside County Flood Control and Water Conservation District
San Bernardino County Flood Control District
Southern California Coastal Water Research Project
State Water Resources Control Board
US Environmental Protection Agency, Office of Research and Development
Ventura County Watershed Protection District

The first project supported by the SMC was to develop a five-year Research Agenda. The research agenda, published in 2001, consisted of 15 unique projects that the SMC ranked, prioritized, and then funded on a voluntary basis. The SMC has made tremendous progress implementing the Research Agenda. Ten of the 15 projects have been started and virtually all have been completed.

The value of the SMC to its member agencies is at least four-fold. The first is the ability to share costs for implementing projects. Cost reductions for SMC member agencies can be significant since collaborative projects can reduce costs by more than 90% relative to footing the bill alone. In addition, the majority of projects have nonmember agency cost-matching. Just for the projects described in this report, there has been nearly one million dollars in grant awards, cost-match, or in-kind services. The second value to member agencies is the ability to stretch their agency's skill base. Stormwater management requires a wide variety of knowledge including regulatory policy, engineering, hydrology, biology, chemistry, toxicity, and microbiology, to name a few. Many member

agencies have limited staff and, by working together, garner the additional skills that are not sustainable within each agency. A third asset of membership is the ability to communicate. Discussions among member agencies provide context and a richness of ideas for application to local issues back home. Similarly, discussion between regulatory and regulated agencies in an informal setting leads to more effective implementation of management activities. Finally, projects conducted under the SMC umbrella have nearly always resulted in some management action. Often, it is difficult for a single agency to affect the current course of regulatory management. Because SMC projects are initiated and vetted through all of the regulated and regulatory management agencies, the results are adopted quickly into the management framework including alterations to NPDES permits.

The SMC has been expanding its role beyond just technical projects by emphasizing outreach and communication. This has occurred through three main venues. The first venue is the establishment of an SMC web site [add URL here]. The goal of this web site is to showcase the SMC, but to also provide an outlet for each of the products developed by the agency. The second venue is through the development of project specific Technical Advisory Committees (TACs). The TACs are valuable for involving outside experts, but also for including technical staff of the individual agencies. The third venue for outreach is through training and workshops. These have initiated as a result of project specific needs such as LID technology for City Planners or the Hydromodification Workshop associated with CASQA Annual Meetings.

What perhaps is most telling about the value of the SMC is the renewal of the original letter of agreement during the 2007-08 fiscal year. This recommitment for another five years demonstrates the positive nature of the organization and its ability to provide a service that crosses regulatory-regulated boundaries. Moreover, the organization's appeal has been recognized by others and has resulted in four new member agencies; the California Department of Transportation (Caltrans), the City of Los Angeles, the State Water Resources Control Board, and the US Environmental Protection Agency (Table 1). The SMC welcomes these new members and looks forward to working together.

PROJECT ACCOMPLISHMENTS

Building A Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program

Status: 100% complete
Project budget: $280,000

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 habitat) than chemically-derived water quality objectives.

The goal of this study is to build a regionally consistent bioassessment monitoring program. This project will be completed in three phases including: 1) building a monitoring infrastructure; 2) calibrating and validating a regional assessment tool; and 3) designing an integrated, coordinated regional monitoring program. The first phase focuses on creating a monitoring infrastructure so that multiple agencies are properly trained, data are collected in comparable manners, and data can be efficiently shared. The second phase focuses on developing an assessment tool that is robust enough to be used by all agencies across the region. This will enable a consistent approach for evaluating the status of freshwater biological communities and provide the answers regarding community impacts to managers in meaningful and understandable terms. The third phase focuses on creating a study design that most efficiently answers specific questions of interest at large regional scales. Addressing some questions at regional scales can provide cost efficiency for addressing reference condition, cumulative impacts, and when nested within a local sampling design, provides unparalleled information for providing context to local monitoring data.

Our main collaborator on this project is the California Department of Fish and Game (CDF&G). The project is 50% funded by the SWRCB, whose main desire is to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP). This will provide further value to SMC member agencies. To help accomplish this project, an SMC Technical Subcommittee was formed.

All three phases have been implemented by the SMC. The first goal towards monitoring infrastructure is complete. SMC member agencies have used training, workshops, field audits, enhanced laboratory quality assurance activities, and written or collated information management and field protocol documents. Of particular note, SMC member agencies have helped to create a network of laboratory taxonomists called the Southwestern Association of Freshwater Invertebrate Taxonomists that will be important in standardizing and ensuring the quality of laboratory identifications. The second task to evaluate an assessment tool is complete. The southern California index of biological integrity (SC IBI) was tested in 15 low gradient streams of varying levels of impact. It was clear from this study that the IBI is not the best assessment tool for describing impact in these habitats. The low gradient project was so successful that the Working Group helped SCCWRP and CDFG to prepare a State Consolidated Grant proposal to test the SC IBI in another important habitat; non-perennial streams. Finally, the Working Group has designed an integrated, collaborative Regional Watershed Monitoring program. The goal of the Regional Watershed Monitoring program is to increase the effectiveness of existing NPDES monitoring programs by integrating among permittees and SWAMP to achieve a large-scale assessment of watershed condition. The cost of implementing this program would be negligible because the Working Group identified significant redundancies and inefficiencies in existing monitoring programs that could be reprogrammed towards a regional design. Finally, the Working Group has found additional partners to help contribute to the regional monitoring program including the Wetland Recovery Project (WRP), other RWQCBs, and other NPDES permittees.

This project is now complete including a written workplan <ftp://ftp.sccwrp.org/pub/download/PDFs/539_SMCworkplan.pdf>. The SMC is creating a new agreement to implement the regional watershed monitoring program.

Laboratory Intercalibration Study
Status: 100% complete
Project budget: $17,000

One goal of the southern California Stormwater Monitoring Coalition (SMC) is to compile monitoring data from separate monitoring programs to make regionwide assessments. The SMC has begun integrating their monitoring programs by agreeing on goals, objectives, and study designs as part of their development of a southern California Model Monitoring Program ftp://ftp.sccwrp.org/pub/download/PDFs/419_smc_mm.pdf . As part of the model monitoring program, 11 analytical laboratories that perform chemical analysis of runoff samples for SMC member agencies conducted an intercalibration study to assess interlaboratory variability and enhance comparability.

The laboratory intercalibration study quantified the range of variability both within and among laboratories that SMC member agencies can expect when examining their own data, or combining data with other agencies. It was successful because the laboratories worked together to minimize interlaboratory variability through the use of performance-based limits for accuracy, precision, and sensitivity. The intercalibration study also defined a series of protocols for specific analytical techniques where performance-based guidelines needed to be enhanced with methodological consistency to ensure comparability. Finally, the intercalibration and resulting guidelines/protocols were documented in a Laboratory Guidance Manual for SMC member agency laboratories <ftp://ftp.sccwrp.org/pub/download/PDFs/420_smc_chem.pdf>.

The laboratory Guidance Manual and intercalibration effort, however, was incomplete in three areas. The first area was the need to repeat the intercalibration periodically as new laboratories, or new personnel at existing laboratories, come along. The second area was the need to intercalibrate on additional constituents. The original laboratory calibration focused on suspended solids (TSS), nutrients, and trace metals. Organic constituents such as chlorinated hydrocarbons (CHC), organophosphorus pesticides (OP), and polycyclic aromatic hydrocarbons (PAH) were not included. Third, the integration of the laboratory performance-based guidelines was insufficiently integrated into monitoring programs. While the Laboratory Manual could be used as citation for monitoring agencies or regulatory compliance, no specific permitting or contractual language was provided for SMC member agencies.

The goal of this project is to complete the three areas of missing information to make the Laboratory Guidance Manual an ongoing and effective document. It will involve three steps: 1) repeat the laboratory intercalibration for TSS, nutrients, and trace metals; 2) initiate an intercalibration for organic constituents and toxicity; and 3) create draft contract language for integration into stormwater monitoring programs. A technical

Working Group consisting mostly of laboratory managers has been formed to assist in the study.

The SMC has successfully finished the first task of the study. The intercalibration of TSS, nutrients, and trace metals was based on customized certified reference materials just for our project and runoff samples from different land use types. Gratifyingly, most of the laboratories that participated previously successfully completed the second iteration. An objective laboratory scoring system, which consists of letter scores for each laboratory, has been developed and was used for the contract language in task 3.

Pending formal agreement signatures, the working group is prepared to implement further constituents and the addition of toxicity testing to the intercalibration.

Bacterial Reference Watershed Study
Status: 100% complete
Project budget: $165,000 + in-kind services

High fecal indicator bacteria levels are one of the most common surface water impairments in southern California. Frequent exceedences of bacterial water quality standards have resulted in development of Total Maximum Daily Loads (TMDL) as a regulatory mechanism to address bacterial contamination in several southern California watersheds.

Current water quality standards for freshwater use fecal coliforms or E. coli as an indicator of fecal contamination because their presence is well correlated with the many waterborne disease-causing organisms or pathogens. However, fecal coliforms and E. coli are naturally present in the intestines of warm-blooded. Consequently, fecal contamination of surface waters can result from numerous sources of fecal pollution, including human sewage, manure from livestock operations, indigenous wildlife and urban runoff. In undeveloped areas wildlife, such as small and large mammals and birds, has the potential to be a significant source of fecal bacteria to surface waters.

In recognition of the potential for natural sources to affect bacteria levels in surface waters, several TMDLs either allow or require development of numeric targets that account for natural bacteria levels. For example, the Malibu Creek Bacteria TMDL requires responsible jurisdictions to monitor unimpaired streams in the local watershed during dry weather, dry winter weather, and wet weather for at least one full year in order to develop a representative numeric target for allowable bacteria exceedence days. Several similar studies are currently being considered or proposed in Ventura, Los Angeles, Orange, and San Diego counties; however, there is currently no coordination between these proposed studies.

The objective of this project is to assess natural bacteria levels in numerous streams throughout southern California in order to provide a regional characterization of background bacteria concentrations. Bacterial indicators were measured from

unimpaired streams in 12 southern California watersheds weekly for one full year. These data were used to investigate background levels, frequency of exceedences of relevant water quality standards, and spatial and temporal patterns.

This project is a partnership of numerous SMC agencies who are participating via in-kind contributions. Three regional water quality control boards, six storm water agencies, and several cities cooperated on field data collection and laboratory analysis. Following laboratory and field intercalibration, samples were collected weekly between May 2006 and May 2007. Overall, the 30-day geometric mean exceedences of freshwater standards were 2% for *E. coli* and 14% for *enterococci*. There were clear seasonal patterns with exceedences being most common during July and August. The project report ftp://ftp.sccwrp.org/pub/download/PDFs/542_FIB_ReferenceBacti.pdf was completed in January 2008.

Hydromodification Study
Status: 35% complete
Project budget: $1,137,440 ($1,137,440 State Prop 50 Grant)

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 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 milestones have been reached over the past year. First we completed a review of mapping and classification literature that will serve as the foundation for the classification system developed by this project ftp://ftp.sccwrp.org/pub/download/PDFs/562_Hydromod_LitReview.pdf. Second, we completed an extensive field campaign that has resulted in a database containing detailed information on channel condition, hydraulics, sedimentary characteristics and other attributes of over 30 stream segments across a gradient of urbanization and landscape settings. Drainage basins have been delineated for all sites and we have quantified several essential watershed metrics for each stream (e.g. watershed area, % impervious, annual rainfall, % burned within last few years, and NRCS soil types vs. rock). Several tools were developed to support processing of the field data, including automated spreadsheets for combining sieve and pebble count sediment samples, as well as for performing numerous hydraulic analyses and generating stream stability metrics. We have also made progress in developing tools for classification and extrapolation flow duration curves from gaged to ungaged sites in regional hydrologic analyses and have populated a database with pre-development flood estimates for each field site. Third, we have begun development on a hierarchical, multi-scale structure for the screening tool. The screening tool includes office/GIS and field assessment levels at watershed, valley and reach scales. Based on extensive field reconnaissance we have identified descriptors of the key physical processes influencing channel responses to hydromodification. For the watershed scale component of the screening tool, there has also been progress on developing a simple classification basin types in terms of the spatial arrangement of channel forms and prevalence of relatively susceptible channel segments. Fourth, we have continued work on developing the modeling tools, focusing on two fronts. We have continued testing several existing mobile boundary sediment transport models for potential use in developing simplified tools (nomographs/regressions) of probable channel responses to hydromodification. Towards this end, we have identified a range of hydrologic-geomorphic scenarios for testing the models for their applicability to streams in the study region. We have also developed phase diagram/regime relationships based on sediment transport theory to examine their consistency with results from the more complex mobile boundary models in terms of the extent of channel changes initiated by varying degrees of altered water and sediment regimes. Fifth, we have taken advantage of several opportunities for outreach and education. Outreach activities over the past quarter included meeting with the Orange County stormwater copermittees, participating with the San Diego County hydromodification Technical Advisory Committee, attending a

meeting on the Stormwater Monitoring Coalitions's LID/hydromodifcation workgroup, meeting with the Los Angeles Regional Water Quality Control Board and Ventura County on hydromodification management, and participating with the California Association of Stormwater Quality Agencies (CASQA) hydromodification workgroup.

Our second Technical Advisory Committee meeting was held on August 12, 2008 and attended by approximately 30 representatives from academia, consulting, and agencies. The TAC endorsed the direction of the study and provided suggestions on refinement of the draft tools.

Low Impact Development Study
Status: 10% complete
Project budget: $1,000,000 ($400,000 SMC plus $600,000 State Prop 40 Grant)

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. A proposal was submitted by the County of San Bernardino on behalf of the SMC for the LID Project known as "LID Guidance and Training for Southern California."

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 will include determining the key technical and institutional issues that must be addressed for successful implementation, pilot projects that demonstrate the effectiveness of LID, and training and outreach to help solidify an implementation strategy to ensure large-scale and long-term success.

The grant funded portion of the project must be completed by September 2008. This will require a two-year work effort that is organized into the following funding areas:

1. **Pilot Project Planning and Design**. *Establish design criteria and site selection*
2. **Monitoring.** *Implementation and demonstration of technology*
3. **Outreach and Training.** *Reporting and facilitation of wide-spread programmatic implementation*

The SMC will provide the required 25% matching funds ($200,000) for the grant funded tasks. These tasks include preparing a literature review, conducting a series of training workshops, and developing a field monitoring program for LID features. The Literature Review has been completed and the final report will be made available through the California Stormwater Quality Association Website and the SMC website when operational.

A Technical Advisory Committee has been established and they reviewed the Literature Review and provided guidance on the initial tasks for the project. The TAC will meet as needed to advise the project as it proceeds.

Training workshops are in preparation. Several potential field monitoring sites have been identified, and Stantec Consulting has been hired to develop the monitoring program and select monitoring sites.

Once the grant-funded tasks are completed, the SMC will continue to fund (approximately $200,000) and manage the project for three additional years that will primarily require field monitoring and analysis of LID features.