BASMAA
Regional Monitoring Strategy (BRMS)

Annual Status Report

FY 1999/2000

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I. Background

Development of the BASMAA Regional Monitoring Strategy (BRMS) was prompted by the Regional Water Quality Control Board's August, 1996 letter[1] requesting that storm water programs

> "…cease your fixed-station, wet weather monitoring… redirect the resources… [and develop a] … new monitoring strategy…. Specific monitoring activities that should be considered within the strategy include characterization of drainage areas (watershed monitoring) including land use characteristics (general, such as open, residential, commercial, or industrial areas, or specific sources) and consideration of physical and biological, as well as chemical indicators to assess the drainage areas. We strongly encourage you to use community-based (volunteer) monitoring as an inexpensive and effective means to conduct this type of monitoring. The strategy should also establish a mechanism or process for effective use of special or pilot studies by your program or those conducted by other programs."

During 1997, the BASMAA Board and Monitoring Committee worked to develop the BRMS. The BASMAA Board adopted a strategy in February 1998, which included four objectives:

1. Evaluate BMP effectiveness.
2. Assess the relative contribution of metals to San Francisco Bay from urban vs. non-urban sources.
3. Investigate the extent and causes of storm water toxicity in the region.
4. Design and initiate a survey of impacts of storm water on beneficial uses.

The BRMS was new in its collaborative intent, as well as in content. Because the agencies needed to develop new modes of cooperation, as well as a new approach to monitoring, the BRMS was adopted with the expectation that adaptive management would be necessary to guide its implementation.

II. Monitoring Committee 1998-99 Accomplishments and Changes

The BASMAA Monitoring Committee met monthly during the 1998-99 fiscal year. All BASMAA member agencies have been represented regularly. Regional Board staff and interested parties also attended.

The following items were brought forward during these discussions:

[1] Loretta K. Barsamian, Executive Officer. August 30, 1996. Similar letters were sent to each of the BASMAA member agencies.

- **Mechanisms for Funding and Coordinating Projects.** Should the BASMAA member agencies jointly fund and implement BRMS projects, or should the BASMAA Monitoring Committee coordinate projects that the agencies implement independently? The result of the discussions is agreement to use a flexible, hybrid approach that meets the needs and preferences of the different member agencies.

- **Decision-Making Process.** BASMAA Monitoring Committee meetings are open to interested parties. Discussions are open and informal. However, decisions by the committee are made by the designated representatives of BASMAA storm water programs. These decisions are usually made by consensus. The committee agreed that consensus decisions should be clearly noted during the meetings and should be reflected in meeting summaries.

- **Watershed Assessment and Watershed Management.** In reviewing preliminary plans for 1999-2000, the agency representatives found that most of their planned projects focused on developing ways to use physical and biological investigations, as well as chemical data, to assess the conditions of their watersheds. In addition, the member agencies are developing ways to involve stakeholders in a watershed management approach.

- **Best Management Practices (BMPs) and Performance Standards.** The Monitoring Committee developed and reviewed a list to determine which BMPs require additional study. The group found that the applicability and effectiveness of most BMPs is well-defined. Only a few BMPs require additional study. The Regional Board has required most municipal storm water permittees to adopt Performance Standards, which specify BMPs and level of implementation.

- **Coordination with Other Monitoring.** BASMAA has improved its coordination with the Regional Board-mandated Regional Monitoring Program for Trace Substances (RMP). The RMP underwent a 5-year program review in 1997 and is currently in a process of redesign. In addition, the BASMAA member agencies are more aware of aquatic monitoring being conducted by USEPA, USGS, California Department of Fish and Game, and others. The BASMAA agencies intend to coordinate protocols and data-sharing with these agencies as they develop strategies for watershed assessment.

- **Compiling Information to Support 303(d) Listing Decisions.** In response to a request from Regional Board staff, BASMAA agencies compiled available data that the Regional Board then used to respond to a Baykeeper letter that challenged the Board's 303(d) list.

- **Regional Monitoring and Assessment Strategy.** Regional Board staff challenged the BASMAA member agencies to become involved in the Regional Board's Regional Monitoring and Assessment Strategy and Implementation Plan (RMAS). A first draft of the RMAS was circulated to BASMAA members in late June and was discussed at the July meeting of the Monitoring Committee. The SCVURPPP is implementing a project to assist Regional Board staff to develop policy and guidance for implementing 305(b)

assessments. An RMAS “Version 1.0” was distributed October 1, 1999. The BASMAA Monitoring Committee will continue to be closely involved with this process.

III. Operational Objectives for 1999-2000

The BASMAA Monitoring Committee will:

1. Work with Regional Board staff to promote an approach to assessment, listing and storm water permitting that:
   a) Is methodologically consistent.
   b) Is supportable under both Federal and state law and policy.
   c) Is scientifically defensible.
   d) Provides for stakeholder involvement.
   e) Makes use of available resources and storm water permittee contributions.
   f) Provides for periodic review.

2. Assist the Regional Board to improve the technical content of regulatory decisions that affect storm water dischargers, by:
   a) Compiling available data to support and assist in Regional Board regulatory decision-making.
   b) Coordinating with other efforts, including those supported and funded by storm water dischargers (such as the Regional Monitoring Program, the Santa Clara Basin Watershed Management Initiative, and the South Bay TMDL).
   c) Implementing studies to obtain additional data and analyses, where needed.

3. Contribute to the assessment of beneficial uses of local waters and to development of a watershed management approach by:
   a) Conducting and supporting field investigations.
   b) Compiling, maintaining and sharing watershed data.
   c) Supporting investigations of the relationships between land use, watershed characteristics, and status and trends of beneficial uses.
   d) Supporting stakeholder involvement.

4. Continuously improve municipal pollution-prevention activities by:
   a) Working toward regional consistency in storm water permitting requirements.
   b) Developing and sharing improvements to Performance Standards and BMPs.

In an October 1999 discussion, the Monitoring Committee diagrammed how it will integrate its annual collaborative review and planning with the individual Programs' schedule for producing reports and work plans. The BASMAA Board recommended refinements to this process, which are incorporated in Figure 1.

The process should roughly follow this schedule:

1. July – BASMAA provides guidance/templates to programs on format and content of abstracts for monitoring study reports
2. September – BASMAA receives monitoring portions of annual reports from member agencies including abstracts and lessons learned (as determined by member agencies)

3. October/November - Monitoring Committee reviews abstracts, lessons learned, Regional Board priorities, and project ideas; and develops recommendations for studies.
4. November – BASMAA produces first draft of Annual Status Report
5. December/January – Monitoring Committee coordinates development of next year's projects that relate to BRMS
6. January - BASMAA produces second draft of Annual Status Report
7. February – Member agencies share monitoring pans
8. March – Member agencies submit monitoring plans to Regional Board; BASMAA produces final Annual Status Report

The Board also reviewed and agreed to a restatement of BRMS Strategic Objectives, as shown in the following table:

Original Strategic Objectives	Revised Strategic Objectives
1 – Evaluate BMP effectiveness	1 - Assess watersheds and survey impacts of urban runoff on beneficial uses
2 – Assess relative contribution of metals to San Francisco Bay from urban vs. non-urban sources	2 - Assess loadings of pollutants to San Francisco Bay from urban runoff
3 – Investigate the extent and causes of storm water toxicity in the region	3 - Evaluate BMP effectiveness
4 – Design and initiate a survey of impacts of storm water on beneficial uses	

IV. Implementation

The BRMS' purpose is to help facilitate BASMAA member agencies' efforts to implement the BRMS strategic objectives. This may involve variations on any of the following three mechanisms:

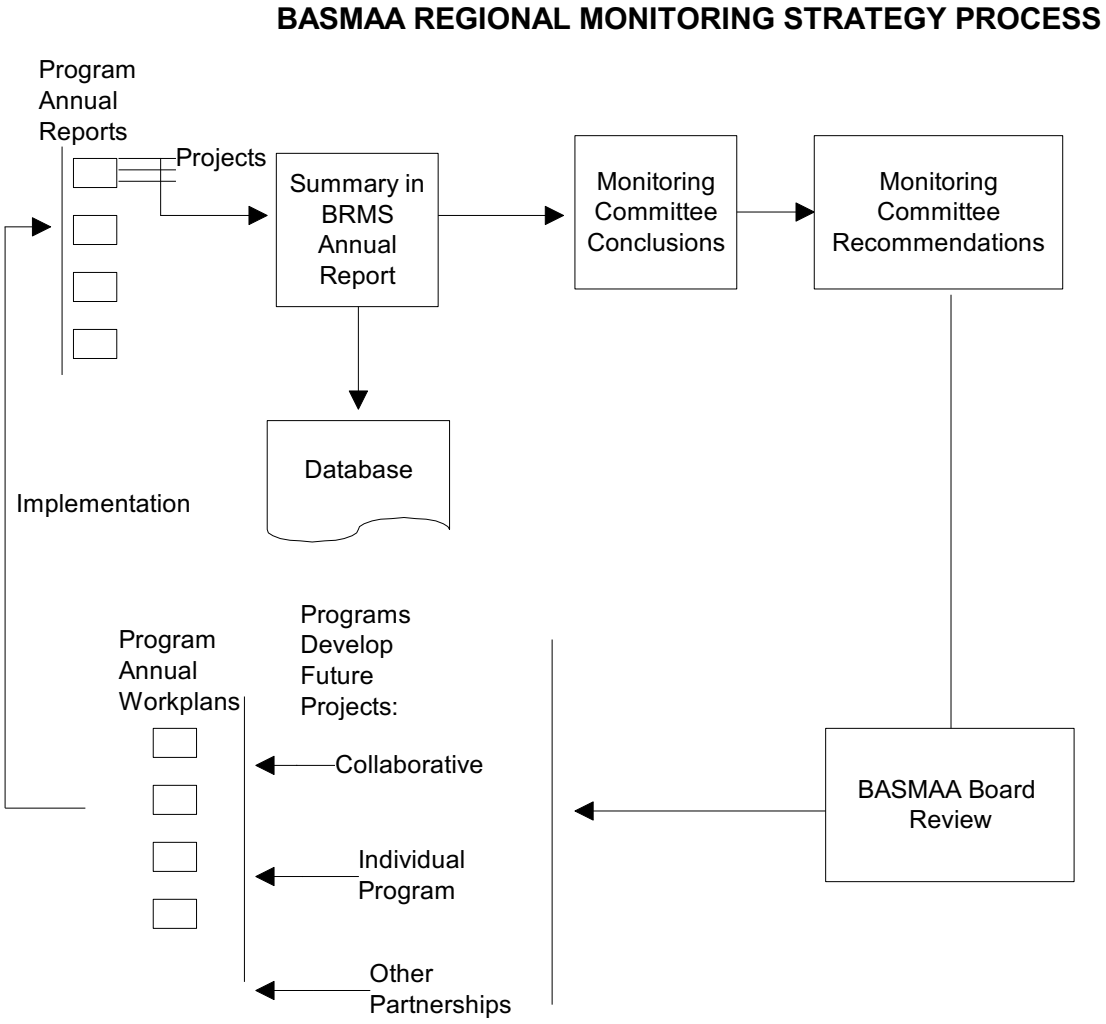
1. Jointly funding and implementing projects.
2. Sharing information about projects that are independently funded and implemented.
3. Coordinating independently funded elements of common projects.

Jointly funded projects may be proposed to the BASMAA Board of Directors. The Board can choose to fund the project from the baseline budget, or may solicit additional contributions from the BASMAA member agencies to fund the project.

For independently implemented projects, a sponsoring agency solicits comment on the project's scope and makes the project's products (e.g. technical reports) available to the member agencies.

Independently funded common projects allow the member agencies the flexibility to contribute resources according to their capabilities and interests. Agencies can agree on a project plan and individually fund specific elements, tasks or personnel that contribute the overall project.

Figure 1


BASMAA REGIONAL MONITORING STRATEGY PROCESS
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V. Storm Water Programs' 1998-99 Products and Accomplishments

Introduction and Summary

The following discussion provides a brief background and summary for each BRMS objective and a short summary or abstract of completed projects that have helped to implement the BRMS objective. The list of projects is not comprehensive of the storm water programs' entire monitoring effort, but rather provides an overview of some specific achievements that illustrate how the programs are pursuing the BRMS.

In future years, more thorough implementation of the BRMS process developed in 1998-99 (described in the previous section) will facilitate the compilation of study conclusions and analysis of lessons learned.

Projects Related to BRMS Objective #1: Assess watersheds and survey impacts of urban runoff on beneficial uses

Background and Summary

The BRMS included another objective, "Investigate the extent and causes of storm water toxicity in the region." Consistent with discussions in the Monitoring Committee in early 1999, discussion of projects that address that objective has been consolidated into this section.

The February 1998 BRMS provides the following background on this objective:

> The storm water programs will continue to support the identification and updating of beneficial uses and the assessment of those uses. Working with other regional entities, BASMAA will help facilitate a consistent regional approach to data gathering and presentation. To the extent practical, storm water programs will work with volunteer monitors and watershed management initiatives.

Consistent with initiatives by USEPA and the Regional Board, the storm water programs are seeking to involve stakeholders in updating and assessing beneficial uses of their watersheds. The Regional Board intends that the current watershed management initiatives in the Napa and Santa Clara basins will serve as models for the other watersheds in the region.

In the Santa Clara Basin, the SCVURPPP identified links between its objectives and those of the stakeholder-based SCBWMI. The SCVURPPP identified the following areas (not ranked) where it plans to continue to support the SCBWMI:

a) Investigate Beneficial Uses and Causes of Impairment (including field work).
b) Review and Compile Environmental Data and Make it Accessible.

c) Develop Strategies for Controlling Impacts of Land Use on Beneficial Uses.

d) Facilitate and Support WMI Subgroups (including coordination with other agencies).

At its February 1999 meeting, the BASMAA Monitoring Committee reviewed planned directions for storm water monitoring programs in the coming fiscal year. The great majority of planned projects related to using physical and biological measurements, as well as chemical data, to assess the condition of creeks and watersheds.

The storm water programs identified a need to clarify appropriate methodologies and protocols for assessing watersheds and, in particular, to clarify how watershed assessments would be used in the Regional Board's regulatory decision-making.

Drafts of the Regional Board's Regional Monitoring and Assessment Strategy (RMAS), released in July and August, provided insight into the Regional Board's thinking. The BASMAA Monitoring Committee will participate in implementation of the RMAS.

While that process is underway, the storm water programs continue to implement projects that contribute to the updating and assessment of beneficial uses in their watersheds. The programs were able to complete many projects that involved compilation and analysis of existing data.

Specific Projects Completed in 1998-99

Land Use Data Analysis. The City of San Jose provided an additional discretionary contribution to the SCVURPPP to assist the SCBWMI LUS to prepare sections of the Watershed Assessment that describe the distribution of existing and projected land use in the Basin. Using GIS-based land use data from the Association of Bay Area Governments, SCVURPPP staff prepared maps and tables showing existing and projected distribution of land uses in each of 14 Santa Clara Basin watersheds. The LUS provided comments on the SCVURPPP's report. After revisions, the report was distributed to WMI stakeholders. The SCVURPPP's report will be included in the SCBWMI's Watershed Assessment Report

Wetlands Definitions and Locations. The City of San Jose provided an additional discretionary contribution to the SCVURPPP to assist the SCBWMI to assemble information on existing wetland definitions and locations needed to incorporate wetlands into its watershed assessment. The three main federal wetlands definitions were presented, along with information on regulatory agencies and their jurisdiction over wetlands. Additionally, existing data that describes wetlands locations within the Santa Clara Basin were identified and summarized in a matrix. A technical memorandum was distributed to WMI stakeholders.

Mapping Watershed Imperviousness. The purpose of this project is to demonstrate and assess methodologies for mapping imperviousness, to conduct a detailed assessment of imperviousness in a particular watershed, and to make this data available for evaluation of the relationship between imperviousness and attainment of aquatic habitat beneficial uses

in a semi-arid climate. SCVURPPP staff began with the analysis of land uses by watershed to develop an analysis of the distribution of imperviousness by watershed. SCVURPPP staff prepared a report with maps and tables that will be incorporated into the SCBWMI Watershed Assessment Report (Section 4.3). To complete this project, SCVURPPP staff will conduct additional detailed analyses of imperviousness in the Coyote Creek watershed. This analysis will be incorporated into the final reports for the Stormwater Environmental Indicators Demonstration Project (SEIDP).

Contra Costa County Creeks Inventory. In FY 1998-99, the CCCWP initiated a county creek inventory study aimed at identifying the "health" of local creeks. The study includes the following elements:

1. Map Watersheds
2. Collect and Compile Readily Available Data
3. Establish and Advisory Group
4. Develop an Information Management System

The study's scope was developed to complement the San Francisco Bay RWQCB's Regional Monitoring and Assessment Strategy.

One subtask of the study, Watershed Mapping was initiated in FY 1998-99. The mapping was financially supported by the CCCWP ($20,000), Vallejo Sanitation and Flood Control District ($10,000) and the Fairfield-Suisun Urban Runoff Management Program ($2,000). Watershed maps were developed using readily available data to 1) map watershed boundaries and 2) map significant drainages in watersheds throughout Contra Costa County. Data sources included local agencies digitized storm drain systems (including creeks), the county flood control district's watershed boundary maps and Contra Costa County's base maps. Surface and subsurface watershed boundaries and jurisdictional boundaries were overlaid on base maps greater than 36 inches diameter, were plotted on 24" x 36" sheets on a watershed basis. In FY 1998-99, a draft watershed map was prepared for the Alhambra Creek Watershed.

By identifying and unifying data sources, maps were prepared on a watershed basis in a streamlined manner. Protocols were developed that can be used as a basis for regional maps to be developed cost–effectively. A consistent digital format was developed for easy conversion of the maps into a geographic information system (GIS) when required. Additionally, the maps allow various stakeholders to visualize watershed of interest.

Local Effects of Land Use. The purpose of this project was to describe the current general understanding of how urbanization and land use affect beneficial uses of creeks and to examine how this understanding can be applied to the Santa Clara Basin. Using the form of a literature review, SCVURPPP staff prepared an introductory section (Section 4.1) for the Land Use chapter of the SCBWMI Watershed Assessment Report.

Land Use Regulation and Watershed Management. The purpose of this project was to summarize Federal and state laws and regulations that enable California municipalities to manage the effects of land use on local watersheds. SCVURPPP staff prepared a draft Section 7.6.1 of the Watershed Assessment Report. Following review by the SCBWMI LUS, and after SCVURPPP staff incorporated recommended revisions, the section was distributed to SCBWMI stakeholders for comment.

Stormwater Environmental Indicators Demonstration Project — Indicators Related to Watershed Assessment. The SCVURPPP's Stormwater Environmental Indicators Demonstration Project (SEIDP) is described under BRMS Objective 3. Of the indicators tested so far, the following relate to watershed assessment:

To identify any relationship between changes in land use and increases in flood frequency (Indicator #10) in the Coyote Creek watershed, flow data in Coyote Creek and historical land use data in the Coyote Creek watershed, were collected and reviewed. Data were available from about the turn of the century to the present. Urbanization proceeded slowly for the first half of the century, but has increased rapidly in the last half. By 1950 the urbanized area was only about 10 mi^2 and the population about 100,000 people. By 1960 the population and urbanized area had doubled, and doubled again by 1970. Today the population is almost 900,000 and the urbanized area covers almost 100 mi^2 Anderson Reservoir was constructed in 1950. As a consequence, the number of flow events that exceed present channel capacities in the upper portions of the urbanized Coyote Creek watershed have decreased by about 80% compared to early in the century. Data on reported flood events from early in the century to present were compiled. Flow per unit area for an undeveloped and the entire watershed were compared for large storm events. For flows greater than about 1000 cubic feet per second, the un-urbanized areas contributed about the same unit flows as the entire watershed (which included urbanized portions). No relationship between urbanization and increases in flood frequency was identified.

Indicator #19, "Public Involvement and Monitoring," is one of four "social" indicators. To apply this indicator, SCVURPPP annual reports, work plans and other documents were reviewed. Efforts to involve the public in monitoring and other activities, and to encourage public participation, are documented. Involving and educating residents is a relatively simple and cost-effective way to increase public awareness and gain community support for storm water programs. These efforts have the potential to modify polluting behaviors and to enhance pollution prevention by increasing residents' appreciation of local watersheds. Application of the indicator can help Programs determine which types of activities would be the most successful in a given community and can help in planning future outreach. However, the arbitrary use of quantitative measures does not necessarily improve the indicator's usefulness. Sheer numbers of activities say nothing about how well they were organized, what they accomplished, or what *percent* of the community actually participated. For most activities, there is little follow-up to determine if public attitudes and values actually changed.

Permanente Creek Demographics. SCVURPPP contracted with CCRS to identify sources of relevant demographic and jurisdictional information concerning the Permanente Creek watershed and to include demographic and jurisdictional information into a GIS for the watershed. CCRS delivered GIS files and a summary report, available through the SCVURPPP.

Streamwatch. SCVURPPP contracted with the Coyote Creek Riparian Station (CCRS) to complete this project. The purposes of this project were (1) to collect data to support the Stormwater Environmental Indicators Pilot Demonstration Project (SEIDP) in Coyote Creek (see description of the SEIDP, below), and (2) to collect data to support the Bay Area Watersheds Science Plan Demonstration Project in Permanente Creek and

demonstrate techniques and protocols for using volunteers to collect quality-assured stream data for use in assessing watersheds. The project was scheduled to continue into fiscal year 1998-99. CCRS partially completed the work in Permanente Creek and submitted a report describing the work done and including water-quality data (D.O., conductivity, turbidity, etc.) for four stations in the Permanente Creek watershed. One data set was for 10 successive weeks, one for 8 weeks, and two for 2 weeks. They also submitted continuous temperature data for 6 weeks from each station.. The report, available from SCVURPPP, also includes a detailed report on surveys for red-legged frog in Permanente Creek. Program staff is completing the work to evaluate the indicators for the Stormwater Environmental Indicators Demonstration Project in Coyote Creek.

Bay Area Stream Fisheries Data Compilation – Leidy Fish Survey 1992-1998. CCCWP compiled fisheries habitat data collected at several hundred sites in 79 urban and rural Bay Area creeks in all nine counties by Robert A. Leidy into a relational database and GIS coverage of sample sites. This study supports a regional database, currently available at the SFEI Internet website (http://www.sfei.org), that contains 37 species of fish observed at 263 stations surveyed in the Bay Area, including the nineteen fish species identified in eleven creeks in Contra Costa County. These data also suggest that several macroinvertebrate species do exist in county creeks.

Volunteer Monitoring Support. ACCWP provided on-call assistance to the Friends of San Leandro Creek volunteer monitors and support of volunteer monitoring associated with other program activities. Program staff presented summaries of water quality and habitat conditions to the Friends and led them in visual observations of resting steelhead above I-580. Resource materials and consultation were provided to the City of Fremont for their design of a high school monitoring program in the Laguna Creek watershed. A review of organizational needs of existing volunteer monitoring groups in Alameda County was performed in support of a separate study of volunteer monitoring in watershed management, which is in working draft stage.

Macroinvertebrate Bioassessment Using Volunteer Monitors. ACCWP is integrating volunteer monitoring into a coordinated program to apply macroinvertebrate bioassessment for preliminary watershed assessment. While “streamside” bioassessment assessment procedures that are easily accessible to volunteers are often considered too imprecise or variable for assessment, they are valuable educational tools and provide preliminary screening if properly interpreted. Program staff assisted a regular monitoring teams from Friends of Sausal Creek in QA/QC, verification of taxonomic identification and data interpretation using comparisons with data from more rigorously controlled sampling on other Bay Area streams. Training methods developed from this experience and tested with the Friends of Five Creeks in spring 1999 include introductory discussions about the group’s monitoring objectives, recruitment of a volunteer scientific mentor to work with the group in the field, and field data sheets appropriate for urbanized creeks in the East Bay. Data analysis and outreach to additional volunteer advisers will continue during FY 99-00, with the additional objective of promoting information-sharing among groups and their advisers.

A guidance document has been written on general design considerations for volunteer groups or agencies interested in sampling macroinvertebrates with either of the two protocols that have been promulgated by state agencies. The final draft has been

reviewed by other bioassessment workers and will complement an anticipated manual for the California Stream Bioassessment Procedure (CDFG protocol) and also a final revision of the California Streamside Biosurvey by the SWRCB.

Website for Volunteer Monitors in Watershed Management. The purpose of ACCWP's website is to provide general information and referrals to existing volunteer monitoring groups and interested members of the public. Many governmental and non-profit organizations World Wide Web provide free information and downloadable documents concerning volunteer monitoring and watershed management; the increasing use of the Web by Bay Area residents allows them to acquire appropriate resource materials at their own pace and eliminates the need to stock or mail hard copies. The initial portion of the site is hosted on the ACPWA server at http://www.co.alameda.ca.us/pwa/watervol.htm.

These pages include contact information and website links from local volunteer or creek groups, and links to regional agencies or non-profit organizations that are involved in water and watershed issues. There are also brief overviews of volunteer monitoring and watershed management. Web pages have also been provided to some groups that lack their own websites. After initial posting in spring 1999 many of the local groups emailed positive reactions and have established links to the site, as well as several state and regional volunteer monitoring coordinators. A hardcopy brochure containing contact information and sample of articles from this site has been produced for mail response to phone inquiries. Future expansion of this site in FY 99-00 will be part of the development of an independent ACCWP site, and will include a section on Frequently Asked Questions, displays of selected watershed maps and data for Alameda County creeks and possibly calendar listings for trainings and workshops.

Inventory of Santa Clara Basin Stream Studies. In a report to the SCBWMI, SCVURPPP staff inventoried and summarized past and current stream studies within the Santa Clara Basin. The *Inventory of Santa Clara Basin Stream Studies* is being updated.

Literature Search on the Relationship Between Watershed Impervious Cover and Creek Water Quality. The primary objectives of this literature search by SMSTOPPP were: (1) Determine whether there is a relationship between watershed percent impervious cover and pollutant concentrations in creeks; (2) Determine whether there is a drainage basin percent impervious cover threshold beyond which pollutant concentrations rapidly increase in creeks; (3) Potentially help municipalities to decide which types of BMPs to require based on the percent impervious cover of a watershed or subwatershed where a project is located. Only two studies were found that directly addressed the relationship between watershed impervious cover and water quality in creeks. One of the studies results suggested that there may be a percent impervious cover threshold for a watershed at around the 40 to 50 percent level above which pollutant concentrations rise rapidly with further increases in imperviousness. The other study found that pollutant concentrations increased with increases in the amount of impervious cover in a watershed, but there did not appear to be a threshold amount of impervious cover where the increase was more marked. This study only evaluated drainage basins with 42 percent or lesser amounts of impervious cover so it is possible that a threshold exists at higher amounts of imperviousness. SMSTOPPP concluded that limited data available suggests that it may

make sense to not treat storm water runoff in watersheds that have less than 40 percent imperviousness.

Impervious Cover Estimates for Five Watersheds in San Mateo County. In FY 1997/98 SMSTOPPP developed estimates of the amount of impervious cover for six watersheds within the urbanized portion of the county. Last year, estimates on the amount of impervious cover were prepared for five additional watersheds. The primary objectives of this study were: (1) Develop new relationships between land use and impervious cover and refine relationships developed previously; (2) Estimate impervious cover in five new watersheds in San Mateo County, including three coastside watersheds; and (3) Further demonstrate and evaluate the use of impervious cover as a tool for urban watershed management. Five watersheds were divided into different land uses and the percent impervious cover for each land use was estimated using aerial photographic prints or digitized aerial photographs and a desktop geographic information system application. Three coastside watersheds would be designated as sensitive (zero to 10% impervious cover). A sensitive watershed would support aquatic life and be susceptible to small increases in the amount of impervious surface cover. The two bayside watersheds (Belmont and Redwood Creek) would be designated as non-supporting of beneficial uses.

Creek Channel Conditions for Five Watersheds in San Mateo County. The term "channel condition" in this study referred to whether a creek channel appears to be in a natural state or whether flood control, erosion control or other modifications have been made such as placing the creek in a culvert or concrete channel. Three watersheds with low amounts of impervious cover had creek channels that were all or almost all natural appearing. Two bayside creek watersheds had almost the same amount of impervious cover and the same amount of natural appearing channel (26 – 30%).

Projects Related to BRMS Objective #2: Assess loadings of pollutants to San Francisco Bay from urban runoff

Background and Summary

As noted in the BRMS:

> Many of the BMPs being implemented by local storm water programs are focused on reducing the loads of metals from urban areas to San Francisco Bay. It would be helpful to know the relative contribution of metals from urban vs. non-urban sources to determine the impact these BMPs will have on protecting or enhancing beneficial uses in the Bay.
>
> This issue may be addressed through the South Bay Watershed Initiative and other watershed initiatives. BASMAA will coordinate with this effort to prevent duplication of effort.

During 1998-99, Santa Clara Basin Watershed Management Initiative (SCBWMI) stakeholders, including the SCVURPPP and the Regional Board, worked to develop a sound technical understanding of the links between copper and nickel inputs, ambient water quality, and effects on beneficial uses. As the work of the SCBWMI's Bay Monitoring and Modeling Subgroup (and its TMDL Work Group) progressed, it became clear that, to provide a result useful to regulatory decision-making, it would be necessary to couple an understanding of pollutant inputs with a conceptual model of pollutant fate, transport, and effects, and with an assessment of impacts on beneficial uses of the estuary. The City of San Jose has allocated $3.5 million for this 4-year effort. The results of the SCBWMI effort (the "copper and nickel TMDL") have been distributed within the stakeholder group.

Coincident with the South Bay work, the Regional Monitoring Program (with participation by Regional Board staff) was also developing new approaches to understanding the fate, transport and effects of pollutants in the estuary.

The storm water programs provided over $550,000 in funding for the RMP during 1998-99. The studies that the storm water programs helped fund include:

1. An air deposition pilot study.
2. An analysis of seafood consumption and pollutants found in seafood.
3. Development of a conceptual model of sediment pollutant fate and transport.
4. Development of a conceptual model of animal exposure to pollutants and effects.
5. A pilot study of macrobenthic assemblages, including consideration of the potential effects of pollutants found in sediments.
6. Continuation of the RMP redesign, in progress since 1997.

Updates on the status of these projects are available in various reports published by the San Francisco Estuary Institute, including the Spring 1999 *Regional Monitoring News,* and in RMP meeting summaries.

Additional 1998-99 Products and Accomplishments

In addition to this substantial funding for, and participation in, regional efforts to understand loading, fate, transport, and effects of pollutants in the estuary, the storm water programs also funded specifically targeted studies in their respective jurisdictions.

Estimation of Soils Erosion Contribution to Storm Water Metals Loading. FSSD developed estimates of the theoretical contribution of naturally occurring minerals to the concentration of heavy metals found in storm water. The study concluded that silver and selenium found in storm water samples appears to be essentially 100% from anthropogenic sources. Only about 10% of arsenic and zinc can be accounted for through natural sources, and between 20 and 30% of cadmium, copper, and lead is from natural sources. Nearly 40% of mercury and more than 60% of chromium and nickel are from naturally occurring sources. Based on these results and a comparison with water quality objectives, FSSD concluded that zinc was a strong candidate for source control and that copper, lead and mercury were marginal candidates for source control. Source control efforts would probably have limited effect on chromium and nickel concentrations.

Methyl Mercury. FSSD funded methyl mercury work conducted by the USGS in the Sacramento River watershed.

RMP Estuary Interface Pilot Project. The SCVURPPP funded an SFEI project to determine how pollutant patterns observed at a transitional site within tidal influence (at the terminus of the Coyote Creek watershed) differ from those in the South Bay and nearby local effects monitoring stations. SFEI completed its analysis and published the results in the RMP newsletter.

Dry Weather Monitoring of Five Creeks in the Fairfield-Suisun Watershed. FSSD conducted dry-weather monitoring of five creeks within the Fairfield-Suisun watershed near the point where each creek discharges to Suisun Marsh. All metals concentrations were very low, except a high reading for arsenic in one creek. Suspended solids were also low, but fecal coliform were higher than acceptable. Diazinon and chlorpyrifos were below the Department of Fish and Game levels of concern with the exception of one sample. FSSD concluded that water quality in base stream flows appears “very good considering the urban environment through which the streams flow.”

SCVURPPP’s Industrial Metals Control Investigation. See the description of this project under BRMS Objective 3.

Projects Related to BRMS Objective #3: Evaluate BMP Effectiveness

Background and Summary

As noted in the BASMAA Regional Monitoring Strategy:

> Many BMP effectiveness studies have been conducted in the past. Two aspects of BMP effectiveness can be evaluated. The first is the effectiveness of a BMP at removing a constituent from or changing a characteristic of a storm water discharge. The second is the effect removing a constituent or changing a characteristic has on protecting or enhancing beneficial uses. Additional studies should be conducted only when a credible hypothesis exists that a significant source of pollutants could be controlled through the implementation of a practical and affordable BMP.

Consistent with this policy, during 1998-99 the BASMAA Monitoring Committee developed and reviewed a list to determine which BMPs require additional study. As shown on the list (Appendix A), the Committee found that few BMPs required additional study to be incorporated in Performance Standards and successfully implemented by storm water NPDES permittees.

BMP-related technical investigations in 1998-99 focused on finding ways to improve and broaden the implementation of BMPs within the context of existing Performance Standards. SMSTOPPP studied 725 businesses to identify patterns in BMP implementation and documented improvements in the number of BMPs implemented and declines in the number of non-storm water discharges. The CCCWP initiated a "Pool and Spa Discharge" special study to evaluate discharges from pools and spas within Contra Costa County to determine if such discharges are a source of pollution to surface waters. The SCVURPPP, testing a proposed indicator titled "Number of BMPs Installed, Inspected and Maintained" found that businesses in their study area had substantially increased implementation of BMPs over six years, and more businesses were in compliance. Summarizing the results of testing several programmatic indicators, the SCVURPPP noted the need to collect and analyze data more systematically. The SCVURPPP strengthened the data-collection-and-analysis features of three of its model Performance Standards. Similarly, a data-driven approach to targeting BMP implementation is reflected in the SCVURPPP's Industrial Metals Control Investigation.

Two studies sought to determine the feasibility of enhancing the removal of pollutants at storm drain inlets: The ACCWP conducted an Inlet Insert Effectiveness Literature Review and the SCVURPPP conducted a catch basin retrofit study. The ACCWP literature review concluded that [summarize results]; the SCVURPPP study found that side-entry pit traps, or catch basins, might have limited application in high-litter areas. In-line deflection separator units might be practical if planned in conjunction with new or upgraded pump stations.

BMPs to reduce the long-term impacts of development (e.g. swales, basins, and other devices to promote infiltration) are well-developed technically. The storm water programs are focused on overcoming institutional barriers to implementing these BMPs. SCVURPPP staff worked with Regional Board staff and staff from the Santa Clara Valley

Water District to incorporate a statement concerning infiltration and the risk of groundwater contamination into the *Start at the Source: Design Guidance Manual for Stormwater Quality Protection (1999 Edition).* The success of this effort will enhance the ability of the programs to use *Start at the Source* in their outreach to planners and public officials.

Specific 1998-99 Products and Accomplishments

Industrial Metals Control Investigation. The City of Sunnyvale, City of San Jose, and SCVURPPP staff completed an extensive field investigation to determine if runoff from certain categories of industrial facilities had elevated concentrations of copper and nickel. The project implemented task Industrial-1 in the Program's Metals Control Measures Plan (February 1997, incorporated into the 1997 URMP). Results from the investigation demonstrated that both copper and nickel concentrations in storm water runoff were significantly higher at the participating electroplating facilities than in commercial/industrial parking lots. Observed copper and nickel concentrations at participating semiconductor manufacturing facilities and metal finishing facilities were not significantly different than in the parking lots. Levels of copper in storm water runoff from this investigation were similar to those reported in the 1997 Metals Control Measure Plan (MCMP) for all types of facilities investigated. Nickel levels reported were lower than MCMP results by factors ranging from 2 to 5. A follow-up task (Industrial–2), to identify sources and potential control measures for industrial facilities that may have elevated levels of copper and nickel (and to coordinate and initiate related Public Information and Participation efforts) will be implemented during 1999-2000.

Develop/Revise Performance Standards. The project was developed to implement Continuous Improvement Task #8 in the SCVURPPP's March 1, 1998 Workplan submittal: "Investigate approaches to improve the process whereby Co-permittees collect, analyze and summarize data and internally use the results to target pollution-prevention efforts. Examples include storm drain cleaning, industrial inspections, and illicit discharge control." SCVURPPP staff worked with an Ad-hoc Task Group (AHTG) of Co-permittee staff, including industrial inspectors, municipal maintenance workers, and public works engineers. Based on the AHTG's recommendation, the Management Committee adopted revisions to the Illicit Connection & Illegal Dumping Elimination Activities (ICID), Industrial/Commercial Discharger Control Program (IND), and Storm Drain System Operation and Maintenance Performance Standards. The revisions were submitted with the SCVURPPP's March 1, 1999 Work Plan.

Environmental Risk of Infiltrating Storm water. The purpose of this project was to encourage pollutant reduction and to mitigate increases in peak flow and total volume of runoff by promoting storm water infiltration consistent with Santa Clara Valley Water District policies. SCVURPPP staff worked with an ad-hoc task group of Co-permittee industrial inspectors, and met and corresponded with District staff. SCVURPPP staff also participated in a review committee for BASMAA's *Start at the Source: Design Guidance Manual for Stormwater Quality Protection (1999 Edition).* Three products were produced:

- A page in *Start at the Source,* titled "infiltration and the risk of groundwater contamination." The statement describes how risks associated with groundwater infiltration can be managed through design and by taking precautions against spills and illegal dumping.

- A memo from the SCVURPPP to accompany *Start at the Source* when it is distributed to municipal planners. The memo clarifies that most infiltration techniques and drainage features described in *Start at the Source* do not require a Storm Water Infiltration Device (SWID) permit from the District.
- Revisions to the Industrial Inspection (IND) Model Performance Standard. The revisions state that Co-Permittees will report to the District any SWIDs they find during their industrial inspections.

Stormwater Inlet Insert Devices Literature Review. ACCWP conducted a review of the 4 main types of available inlet inserts, including details of construction, cost and evaluation of supporting evidence for manufacturers claims. The commonest target pollutants were sediment and/or petroleum hydrocarbons, although others may also be captured by the devices. Manufacturer claims ranged from vague to specific, but specific claims were not adequately substantiated by reports provided by manufacturers. Results of the four independent studies that were found suggest that while some inlet insert devices may reduce petroleum hydrocarbon concentrations, they have high maintenance requirements. Improper maintenance will at best lead to diminished performance and at worst will reintroduce previously captured pollutants into storm water. The review concluded that capital costs of proposed inlet insert units must be compared on a site-specific basis and can range from $50 to $5,000. However, more scientifically defensible information is needed to make meaningful recommendations about use of the devices covered by the review.

Catch Basin Retrofit Study. The purpose of this project was to evaluate the potential benefits of catch basins or similar devices to intercept litter and floating debris and to hold pollutants that enter during dry weather (wash waters, dumped liquids) for later removal and disposal. The SCVURPPP also considered maintenance costs and marginal costs to ongoing capital improvement programs. A technical memorandum concluded that side-entry pit traps or catch-basins should be considered in newly constructed or reconstructed areas where high pedestrian traffic and litter are anticipated. For existing high-use areas, trash insert screens may be feasible where there is already a commitment to intensive maintenance for aesthetic reasons. In-line deflection separator units may provide feasible and cost effective (per-unit-area) debris removal. The units require hydraulic head, but could be practical if planned in conjunction with new or upgraded storm water pump stations. The technical memo recommended that SCVURPPP staff work with a Co-permittee ad-hoc task group to develop additional information and standards for these technologies and that SCVURPPP staff work with one Co-permittee to investigate specific situations where the recommended devices might be implemented on a pilot basis.

Pool and Spa Discharge Special Study: The purpose of the study is to develop the technical data needed to support a practical resolution of where, and under what conditions, pool and spa water, and filter backwash water (and solids) can be discharged. In FY 1998-99, a draft sampling plan was developed. The plan included results of surveys of public and private pool owners and managers and professional contractors to evaluate discharge practices. These survey results indicated:

1. Pools are typically discharged only when mechanical repairs, such as re-plastering is required;

2. Because of their limited volume and use, spa discharges are not considered to be a pollution threat. Spas are typically discharged to the sanitary sewer system;

3. Maintenance contractors performing water quality maintenance do not drain pools;

4. Public access pools have their filter water discharged very frequently – daily to weekly during the peak use seasons. Water is drained to both storm drain and sanitary sewer; and,

5. Potable water used to fill pools may not be a source of pollution unless un-ionized ammonia is formed by dechlorination of chloramine, a disinfectant.

Effectiveness of Business Inspections. The purpose of this study was to evaluate what is being accomplished by these inspections and identify areas that need improvement. SMSTOPPP focused on the approximately 725 businesses that had been inspected two or more times during the three-year period from FY 1995/96 through FY 1997/98. The report documents overall improvements in the number of BMPs implemented and declines in the number of non-storm water discharges found comparing the first and last inspections at these businesses. For businesses that had an activity area that was judged to have a high potential to pollute, there was an increase in the number of effective or fairly/almost effective BMPs from 50 to 73, comparing the first inspection to the last one. There was also a drop in the number of non-storm water discharges from 101 during the first inspection to 84 during the last inspection. Virtually all of the decrease in the number of non-storm water discharges occurred in outdoor wash areas where the number was almost halved. Disappointingly, about one-fifth of the businesses (24 businesses) that had a non-storm water discharge, had this discharge during both the first and last inspections. The report recommends that future outreach efforts focus on auto repair shops and restaurants since these types of businesses had the most non-storm water discharges and the highest potential for pollutant exposure to rainfall without any BMPs being used.

Stormwater Environmental Indicators Demonstration Project — Indicators Related to BMPs. The SCVURPPP applied to the Water Environment Research Foundation in 1996 for funding to conduct a Stormwater Environmental Indicators Demonstration Project (SEIDP). The Program received notification of award in late 1997 and held a kickoff meeting in June 1998.

The SEIDP is part of USEPA's Environmental Indicators/Measures of Success Project, funded under Clean Water Act Section 104(B)(3). The first phase of the larger project consisted of a literature review and publication of an annotated bibliography of environmental indicator resources. In the second phase, stakeholders helped select appropriate indicators and helped develop a flexible methodology for using indicators.

The first two phases of the Environmental Indicators/Measures of Success Project resulted in publication of the Center for Watershed Protection's *Environmental Indicators to Assess Stormwater Control Programs and Practices.*[2] That report includes "indicator profiles", or

[2] Claytor and Brown (1996*), Environmental Indicators to Assess Stormwater Control Programs and Practices*. Center for Watershed Protection, Silver Spring, MD.

fact sheets, describing 26 storm water environmental indicators. The authors also outline a methodology, and illustrate scenarios, for applying the indicators.

The SEIDP is part of the third phase, which focuses on local demonstration projects and testing of the indicators. The SEIDP's objectives are to:

1. Evaluate the usefulness of Level I and especially the effectiveness of Level II Stormwater Indicator Methodology under semi-arid conditions.
2. Evaluate the applicability of environmental indicators under semi-arid conditions in two different situations: at a watershed level that includes a variety of chemical, physical and biological indicators and at an industrial watershed that emphasizes programmatic indicators.
3. Select, test, and refine protocols for monitoring environmental indicators in semi-arid conditions.
4. Develop guidance on selection and use of environmental indicators, and disseminate guidance to other storm water programs in California, Oregon and the west to assist in validation of environmental indicators throughout the west.

The Center for Watershed Protection's storm water indicator methodology is applied at two distinct geographic scales: the 310-square-mile watershed of Coyote Creek (which includes the eastern portion of the City of San Jose) and a 28-acre industrial catchment along Walsh Avenue in the City of Santa Clara. The semi-arid climate is typical of California's coast from the San Francisco Bay area southward.

The project also includes a review and assessment of the existing urban runoff pollution prevention program, analysis of existing data, and field collection of new data. Existing data, and new data, are used to evaluate the applicability of 20 of the Center for Watershed Protection's 26 indicators. Table C-3 shows the indicators that will be evaluated in each of the two study areas. Extensive data already exist for each study area. The study areas are representative of conditions elsewhere in the Bay Area. Different environmental indicators will be evaluated at each scale.

In the Coyote Creek watershed, environmental indicators will be used to conduct three types of comparisons:

1. Temporal comparisons in the upstream reference areas, where land uses have not changed recently.
2. Temporal comparisons at the stations in Coyote Creek that have transitioned from rural to urban.
3. Spatial comparisons between the upstream reference stations and the downstream urban stations.

In the Walsh Avenue catchment, water quality indicators, programmatic indicators, social indicators, and site indicators will be used to gauge success of Program implementation. Results from water quality monitoring will be used to evaluate if changes in water quality can be correlated to the Program's efforts.

Following up a 1993 pilot industrial inspection project, Program staff applied three indicators in the Walsh Avenue Catchment. Working with City inspectors, staff surveyed pollution prevention efforts at 29 of 32 businesses, cataloged BMPs, and evaluated past and present compliance with storm water pollution-prevention regulations. Businesses had

substantially increased implementation of BMPs over six years, and more businesses were in compliance. Site managers associated "housekeeping" BMPs with efficient operation, but were generally unaware of Program objectives. Repeated violations and inconsistent compliance showed a need to target follow-up outreach and inspections. The interviews with site managers and compliance monitoring were useful indicator techniques. To use the number of BMPs implemented as an indicator of effectiveness, better inspection records would be needed.

To implement the "Permitting and Compliance" indicator, SCVURPPP staff georeferenced California State Water Resources Control Board (SWRCB) records of storm water NPDES-permitted industrial businesses and construction sites in the 310-square-mile Coyote Creek watershed. Staff also examined records and participated in site inspections within a 28-acre industrial catchment in the City of Santa Clara.

Georeferencing locations of permitted sites made it possible to link potential runoff pollutants with specific stream outfalls. However, inconsistent use of Standard Industrial Classification (SIC) codes made it impossible to use other databases (e.g. business licenses) to estimate the number of businesses that operated without required storm water NPDES permits. The SWRCB does not track whether permitted sites file required annual reports or semiannual monitoring data, and does not keep information that is submitted in an accessible format. Examination of two permitted sites at the catchment scale showed relatively poor compliance with SWRCB monitoring and reporting requirements.

SCVURPPP staff applied Indicator #21 (Number of Illicit Connections/Discharges Identified and Corrected) to the watershed of Coyote Creek, which flows to South San Francisco Bay. SCVURPPP staff reviewed urban runoff pollution prevention annual reports for the cities of San Jose and Milpitas. Where possible, records of illicit discharges and illegal dumping (ICID) were entered into a relational database and georeferenced. Trends were reviewed in light of rapidly increasing population, employment, and daily commute trips in the same area. A 70-fold decrease in illicit connections reported 1993-1998 suggests the cities' surveys and monitoring have effectively eliminated illicit connections to storm drains. A 1993-1998 trend toward fewer illegal dumping reports (for most categories) suggest that the Co-permittees' outreach, industrial/commercial inspections, response to dumping incidents, and enforcement have had an effect. Increased staff and public awareness, and a construction boom, may have contributed to the rising number of reports for other categories. Accurate categorization and incident reporting, use of a relational database, and georeferencing were recommended to enhance the utility of this indicator.

Appendix A

Best Management Practices List