

Alameda Countywide
Clean Water Program

Contra Costa
Clean Water Program

Fairfield-Suisun
Urban Runoff
Management Program

Marin County
Stormwater Pollution
Prevention Program

Napa County
Stormwater Pollution
Prevention Program

San Mateo Countywide
Water Pollution
Prevention Program

Santa Clara Valley
Urban Runoff Pollution
Prevention Program

Sonoma County
Water Agency

Vallejo Sanitation
and Flood
Control District



B A S M A A

Regional Pollutants of Concern Report for FY2010-2011

and

Monitoring Status Report for January-June 2011

FINAL

September 12, 2011

Bay Area

Stormwater Management

Agencies Association

P.O. Box 2385

Menlo Park, CA 94026

510.622.2326

info@basmaa.org

Table of Contents

| | Page |
|--|-------------|
| Introduction | 1 |
| PART A REGIONAL POLLUTANTS OF CONCERN REPORT | 2 |
| Pollutants of Concern | 3 |
| Pesticides Toxicity Control (C.9) | 3 |
| C.9.e. Track and Participate in Relevant Regulatory Processes | 3 |
| C.9.g. Evaluate Implementation of Source Control Actions Relating to Pesticides | 4 |
| Trash Load Reduction (C.10) | 4 |
| C.10.a.i Model Short-Term Trash Loading Reduction Plan | 5 |
| C.10.a.ii Baseline Trash Loading Rates | 5 |
| C.10.a.ii Trash Load Reduction Tracking Method | 6 |
| Joint Mercury and Polychlorinated Biphenyls (PCBs) Controls | 7 |
| Overview of Mercury and PCB Pilot Projects | 7 |
| Overview of Clean Watersheds for a Clean Bay | 11 |
| C.11/12.c - Pilot Projects To Investigate and Abate Mercury/PCB Sources | 14 |
| C.11/12.d - Pilot Projects to Evaluate and Enhance Municipal Sediment Removal and Management Practices | 20 |
| C.11/12.e. - Conduct Pilot Projects to Evaluate On-Site Stormwater Treatment via Retrofit | 24 |
| C.11/12.i - Development of a Risk Reduction Program Implemented throughout the Region | 25 |
| C.11/12.f Diversion of Dry Weather and First Flush Flows to POTWs | 27 |
| C.11/12.g Monitor Stormwater Pollutant Loads and Loads Reduced | 29 |
| Mercury Controls | 29 |
| C.11.b. Monitor Methylmercury | 30 |
| C.11.h Fate and Transport Study of Mercury in Urban Runoff | 30 |
| C.11.j Develop Allocation Sharing Scheme with Caltrans | 30 |
| PCB Controls | 32 |
| C.12.b Conduct Pilot Projects to Evaluate Managing PCB-Containing Materials and Wastes during Building Demolition and Renovation (e.g., Window Replacement) Activities | 32 |
| C.12.h Fate and Transport Study of PCBs in Urban Runoff | 34 |
| Copper Controls | 34 |
| C.13.c Vehicle Brake Pads | 34 |
| C.13.e Studies to Reduce Copper Pollutant Impact Uncertainties | 35 |
| PBDEs, Legacy Pesticides, and Selenium | 35 |
| C.14.a Control Program for PBDEs, Legacy Pesticides, and Selenium. | 35 |

| | |
|--|----------------------------|
| PART B Monitoring Status Report | 37 |
| WATER QUALITY Monitoring | 38 |
| RMC Multi-Year Work Plan | 38 |
| C.8.a Compliance Options | 39 |
| C.8.b San Francisco Estuary Receiving Water Monitoring Regional Monitoring Program (RMP) | 39 39 |
| C.8.c Creek Status Monitoring Creek Status Monitoring Design Standard Operating and Data Quality Assurance Procedures Creek Status and Trends Information Management System Development | 42 42 45 45 |
| C.8.d Monitoring Projects | 45 |
| C.8.e Pollutants of Concern and Long-Term Trends Monitoring POC Loads Monitoring Long-Term Trends Monitoring Sediment Delivery Estimate/Budget Emerging Pollutants Work Plan | 45 45 48 49 49 |
| C.8.f Citizen Monitoring and Participation | 50 |
| C.8.g Reporting | 50 |
| C.8.h Monitoring Protocols, Data Quality and Data Management | 50 |

List of Figures

Figure B.1. BASMAA Regional Monitoring Coalition (RMC) applicable urban and non-urban areas and associated creeks.

List of Tables

Table A.1. Initial trash control measures selected by BASMAA for trash load reduction tracking method development.

Table A.2. Bay Area PCB/Mercury Pilot Projects

Table A.3. Typical attributes of sites with higher, medium and lower potential for PCB/mercury release to streets and stormwater conveyances.

Table A.4. Pilot Sediment Management Studies

Table B.1. Stormwater Program annual contributions to the Regional Monitoring Program for Water Quality in the San Francisco Bay Estuary in 2010 and 2011.

Table B.2. Summary of RMC creek status indicators, associated monitoring designs and scales of reporting.

List of Appendices: Regional Pollutants of Concern Report

- A1 Pesticide Regulation for Water Quality Protection, Annual BASMAA Participation Summary and Outcomes Assessment, 2011
- A2 Sediment Management Practices, CW4CB Task 4 Literature Review
- A3 Candidate Locations and Types of Urban Runoff Treatment Retrofits, CW4CB Task 5
- A4 Candidate Pilot Diversion Projects: Technical Memorandum
- A5 Monitor Stormwater Pollutant Loads and Loads Reduced (C.11/12.g) - Progress Report
- A6 RMP Master Plan: Presentation to Steering Committee Planning Workshop, Feb. 7, 2011,
- A7 Brake Pad Copper Reduction – MRP Section C.13.c. Report 2011, July 18, 2011
- A8 SB 346 Chaptered (final) version
- A9 CASQA Fact Sheet on final SB 346
- A10 BASMAA SB 346 support letter to Assembly Appropriations Committee
- A11 BASMAA SB 346 support letter to Governor
- A12 SB 346 Senate floor analysis showing support letters verified as of 8/31/10

List of Appendices: Monitoring Status Report

- B1 Draft RMC Creek and Trends Monitoring Schedule
- B2 Small Tributaries Loading Strategy Multi-Year Plan Version 2011
- B2a References and Resources for PCBs and Mercury-related Activities by the Regional Monitoring Program and BASMAA
- B2b Regional Watershed Spreadsheet Model Construction and Calibration
- B2c Optimizing sampling methods for pollutant loads and trends in San Francisco Bay urban stormwater monitoring
- B2d Exploratory categorization of watersheds for potential stormwater monitoring in San Francisco Bay.
- B2e Watershed Characterization Field Study
- B2f Sampling and Analysis – Quality Assurance

INTRODUCTION

This document is divided into two main parts, each serving a different purpose. Part A, the **Regional Pollutants of Concern Report** for FY 2010-2011 (Regional POC Report), summarizes the status of regionally-implemented activities that were conducted on behalf of all 76 municipalities and special districts (Permittees) subject to the Municipal Regional Stormwater NPDES Permit (MRP, Order R2009-0074) issued to by the San Francisco Regional Water Quality Control Board (Water Board). The Regional POC Report covers annual reporting requirements for portions of MRP Provisions C.9, C.11, C.12, C.13 and C.14, and also reports on the status of regionally-implemented activities implemented in compliance with Provision C.10.a. The Regional POC Report complements separately submitted Annual Reports prepared by Permittees individually or by their respective countywide stormwater programs.

Part B of this document is a **Monitoring Status Report** that provides an update on activities related to MRP Provision C.8 (Water Quality Monitoring). As described in the introduction to the Status Report, the MRP does not require reporting for C.8 provisions until 2013, but Permittees have agreed to provide the Water Board with brief Monitoring Status Reports in March and September of 2011 and 2012 to demonstrate progress in water quality monitoring planning activities. This Monitoring Status Report covers activities roughly from the time period January through June 2011.

Regionally-implemented activities for Pollutants of Concern (POCs) and water quality monitoring are conducted under the auspices of the Bay Area Stormwater Management Agencies Association (BASMAA), a 501(c)(3) non-profit organization comprised of the municipal stormwater programs in the San Francisco Bay Area. Most of the MRP requirements pertinent to activities discussed in the Regional POC Report and Monitoring Status Report are met entirely by BASMAA regional projects, except where otherwise noted. Scopes, budgets, and contracting or in-kind project implementation mechanisms for BASMAA regional projects follow BASMAA's *Operational Policies and Procedures*, approved by the BASMAA Board of Directors (BOD). MRP Permittees, through their stormwater program representatives on the BOD and its subcommittees, collaboratively authorize and participate in BASMAA regional projects or tasks. Regional project costs are shared by either all BASMAA members or among those Phase I municipal stormwater programs that are subject to the MRP¹.

¹ The BASMAA programs supporting MRP Regional Projects include all MRP Permittees as well as the cities of Antioch, Brentwood, and Oakley which are not named as Permittees under the MRP but have voluntarily elected to participate in MRP-related regional activities.

PART A

REGIONAL POLLUTANTS OF CONCERN REPORT

POLLUTANTS OF CONCERN

Provisions C.9 through C.14 of the MRP address pollutants that are identified as being of regulatory concern for the San Francisco Bay or other local water bodies. For some, regulatory water quality attainment strategies, such as Total Maximum Daily Loads (TMDLs), have been adopted or are currently under development.

For mercury, PCBs and other sediment-bound pollutants, the Water Board has proposed to implement stormwater-related control measures in the following modes:

1. Full-scale implementation throughout the region.
2. Focused implementation in areas where benefits are most likely to accrue.
3. Pilot-testing in a few specific locations.
4. Other: This may refer to experimental control measures, Research and Development, desktop analysis, laboratory studies, and/or literature review.

Many regional tasks reported in this section focus on MRP provisions relating to modes 3 and 4, which require studies or pilot projects intended to reduce uncertainties about the sources, occurrence or effectiveness of control measures for POCs. Other tasks will be implemented through participation in regional or state-wide collaboratives, such as

- The Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP), described in more detail in the Monitoring Status Report below; and
- initiatives to control sources of specific pollutants.

PESTICIDES TOXICITY CONTROL (C.9)

C.9.e. Track and Participate in Relevant Regulatory Processes

The essential requirements of this provision are to track USEPA and DPR actions related to urban-uses of pesticides and actively participate in the shaping of regulatory efforts currently underway. This provision allows for cooperation among Permittees through the California Stormwater Quality Association (CASQA), BASMAA and/or the Urban Pesticide Pollution Prevention Project (UP3 Project). Recognizing that this approach is the most likely to result in meaningful changes in the regulatory environment, Permittees elected to continue on this course in FY 2010-11 to achieve compliance with this provision. One change in FY 2010-11 is that the oversight of this provision was removed from the purview of the BASMAA Monitoring and POCs Committee and instead oversight was provided directly by the BASMAA BOD. Two project profiles were developed and approved by the BASMAA BOD, one to fund the reporting element of this task and one to fund the actual work of tracking pesticide -related regulatory actions. These profiles were approved by the BOD on June 23, 2011 and Oct. 29, 2010, respectively.

The actual work of tracking and participating in the ongoing regulatory efforts related to pesticides was accomplished through BASMAA member participation in the UP3, and chairing of the CASQA Pesticides Subcommittee. FY 2010-11 was very productive; details of the specific achievements in FY 10-11 can be found in the Appendix A1 –Pesticide Regulation for Water Quality Protection, Annual BASMAA Participation Summary and Outcomes Assessment, 2011 (TDC Environmental 2011).

C.9.g. Evaluate Implementation of Source Control Actions Relating to Pesticides

There are no Annual Reporting requirements for Provision C.9.g in 2011. In future years, additional information will be provided on the status of implementation activities designed to comply with this provision.

TRASH LOAD REDUCTION (C.10)

The goal of MRP Provision C.10 (Trash Load Reduction) is to implement control measures and other actions to significantly reduce trash loads to local urban creeks by the end of the term of the MRP (i.e., 40% by 2014), which will set the course for additional load reductions in future years. To achieve this goal, Co-permittees are required to develop and implement a Short-Term Trash Load Reduction Plan, which includes the installation and maintenance of trash full-capture devices, designed to treat a mandatory minimum level of land area, and implementation of other control measures and best management practices (i.e., trash reduction ordinances) to prevent or remove trash loads. To address longer-term goals of trash reduction, Co-permittees are also required to develop a Long-Term Trash Load Reduction Plan near the end of the MRP term in preparation for the next permit.

Activities associated with Provision C.10 requirements were conducted at the Permittee, stormwater program and regional levels in FY 2010-11 on behalf of Permittees. Actions conducted by Permittees are documented in section C.10 of each Permittee's annual report. Regional projects are coordinated through the BASMAA Trash Committee, which includes participation by Bay Area stormwater program and Permittee staff, Water Board staff and other stakeholders (e.g., Save the Bay, Clean Water Action and USEPA Region 9), and approved by the BASMAA Board of Directors (BOD).

In FY 2010-11, the BASMAA Trash Committee began implementing the following three regional projects on behalf of all MRP Permittees in compliance with MRP C.10 provisions:

- Baseline Trash Load Project;
- Trash Load Reduction Tracking Method; and,
- Model Short-Term Trash Reduction Plan.

Summaries on the status of each BASMAA regional project are included in this section. Summaries are organized by MRP provision or by major heading (both marked in bold).

C.10.a.i Model Short-Term Trash Loading Reduction Plan

Provision C.10.a.i of the Municipal Regional Permit (MRP) requires each Co-permittee to submit a Short-Term Trash Load Reduction Plan to the Water Board by February 1, 2012. The plan must describe control measures and best management practices that are currently being implemented and the current level of implementation, and the planned new or enhanced control measures and best management practices that will be implemented to attain a 40% trash load reduction by July 1, 2014.

Near the end of FY 2010-11, BASMAA began to develop a *Draft Model Short-Term Trash Reduction Plan* (Model Plan) to assist Permittees in complying with this requirement (C.10.a.i) and reduce resources needed by each Permittee to develop a plan. The Model Plan provides a template for Permittees to use when developing their own plans and creates MRP-wide consistency in format. The Draft Model Plan is currently under review by Permittees and includes model text descriptions for the following information:

- Trash baseline load for the Permittee;
- Baseline trash control measure implemented prior to the effective date of the MRP (12/1/09);
- Enhanced levels of trash control measure implementation expected to address the 40% trash load reduction goal; and,
- Schedule for implementation of enhanced control measures.

The Model Plan is expected to be finalized by the BASMAA Trash Committee in the fall of 2011.

C.10.a.ii Baseline Trash Loading Rates

MRP Provision C.10.a.ii requires Permittees to develop and report on baseline trash loads from their MS4s by February 1, 2012. On February 1, 2011, BASMAA submitted a progress report to the Water Board on behalf of all towns, cities, and counties (i.e., Permittees) subject to this provision of the MRP. Through the submittal of this progress report, all MRP Permittees agreed to use methods developed collaboratively through BASMAA to develop their baseline trash load. These methods are fully described in the *Baseline Trash Loading Rates Literature Review and Methodology – Technical Memorandum* (BASMAA 2010a) and the *Baseline Trash Loading Rates Sampling and Analysis Plan* (BASMAA 2010b).

Baseline trash loading estimates are currently under development via the BASMAA *Baseline Trash Loading Rates Project*, which was approved by the BOD in December 2010. Roughly 160 storm drain inlets equipped with full capture devices that are dispersed throughout the Bay Area serve as the monitoring sites that will assist Permittees in establishing baseline loading rates. Monitoring sites were selected to test the effect that land use and other factors (e.g., economic profile and population density) may have on trash loading rates.

It is anticipated that trash and other debris will be removed and characterized an average of three times from each device. The first cleanout and characterization event occurred in May 2011 and is depictive of the 2010/11 wet weather season. The dry weather season cleanout and characterization event is scheduled for September 2011. Additional wet weather cleanout/characterization events are planned for late fall and winter 2011.

As an outcome of the Trash Baseline Loading Rates Project, dry and wet weather trash generation rates will be calculated for each monitoring site. These generation rates can then be used by Permittees to develop trash baseline loading rates and trash loads specific to their jurisdictional areas and incorporate the effectiveness of current (baseline) street sweeping and stormwater conveyance system maintenance programs. Trash baseline loading rates will be reported by each Permittee in their *Short-Term Trash Load Reduction Plans* by February 1, 2012.

C.10.a.ii Trash Load Reduction Tracking Method

Provision C.10.a(ii) requires Permittees to develop a method by which they will demonstrate progress towards the MRP trash load reduction goal (i.e., 40% by 2014). On February 1, 2011, BASMAA submitted a progress report to the Water Board on behalf of all towns, cities, and counties (i.e., Permittees) subject to this provision of the MRP. Through the submittal of this progress report, all MRP Permittees agreed to use the load reduction tracking methods that will be developed collaboratively by BASMAA.

In FY 2010-11, the BASMAA BOD approved a regional project to develop load reduction tracking methods. As a first step, a list of trash control measures that may be considered for implementation by Permittees was developed. These control measures formed the scope of a literature review that was conducted by BASMAA to document methods that were successfully used to assess effectiveness. The findings of the literature review were documented in BASMAA (2011c) and discussed among participants on a control measure by control measure basis at monthly BASMAA Trash Committee meetings during FY 2010-11. Based on these discussions, trash control measures were tentatively separated into two general types: 1) quantification formulas and, 2) credits (Table A.1).

A preliminary Draft Trash Load Reduction Tracking Method Technical Report is currently under development by BASMAA. It is anticipated that the technical report will fully describe the load reduction tracking method selected for each control measure, and the process by which load reduction tracking will take place. On behalf of all Permittees, the Final Trash Load Reduction Tracking Method Technical Report will be submitted to the Water Board by BASMAA by February 1, 2012.

Table A.1. Initial trash control measures selected by BASMAA for trash load reduction tracking method development.

| |
|---|
| Load Reduction Quantification Formulas |
| Single-use Carryout Plastic Bag Ordinance |
| On-land Litter Pickup/Removal (Volunteer and/or Municipal) |
| Enhanced Street Sweeping |
| Partial-Capture Treatment Devices |
| Enhanced Stormwater Conveyance System Maintenance |
| Full-Capture Treatment Devices |
| Creek/Channel/Shoreline Cleanups (Volunteer and/or Municipal) |
| Load Reduction Credits |
| Polystyrene Foam Food Service Ware Ban |
| Public Education and Outreach Programs |
| Trash Reduction from Vehicles with Unsecured Loads |
| Anti-Littering and Illegal Dumping Enforcement Activities |
| Improved Trash Bin/Container Management (Municipally or Privately-Controlled) |

JOINT MERCURY AND POLYCHLORINATED BIPHENYLS (PCBS) CONTROLS

Provisions C.11.c through C.11.j for mercury are written almost identically to C.12.c through Provision C.12.g for PCBs. This reflects similarities between the respective TMDLs for these pollutants, based on the legacy and sediment-associated nature of their occurrence. For Provisions C.11/12.c through C.11/12.f, MRP requirements focus on pilot studies (sites for these pilots will primarily be chosen on the basis of the potential for reducing PCB loads, but consideration will be given to mercury removal in the final design and implementation of the studies). Provisions C.11.i and C.12.i are written identically, since the primary San Francisco Bay beneficial use impairment for both mercury and PCBs is associated with consumption of fish containing these pollutants.

Overview of Mercury and PCB Pilot Projects

Provisions C.11/12.c through Provision C.11/12.f require pilot studies to test methods to reduce urban runoff loadings of PCBs and mercury to San Francisco Bay. These provisions require that Permittees pilot-test a variety of potential control methods, including site remediation, enhanced sediment management during municipal operation and maintenance activities, stormwater treatment retrofitting, and diversion of stormwater to existing Publicly-Owned Treatment Works (POTWs). Table A.2 summarizes the wide range of pilot projects proposed by BASMAA agencies to pilot-test various control methods. Most projects are located in the older industrial regions in the Bay Area where past studies have found elevated PCB and mercury concentrations in sediments collected from street and storm drain infrastructure. Thus the pilot projects,

Table A.2. Bay Area PCB/Mercury Pilot Projects

| Project Watershed Location | City/County | C.11/12.c – Pilot Property ID & Referral | C.11/12.d –Pilot Sediment Management | C.11/12.e – Pilot Stormwater Treatment Retrofit | C.11/12.f -Pilot Stormwater Diversion to POTW | Green Street | Source(s) of Funding |
|-------------------------------------|------------------------|--|--|--|--|--------------|--------------------------------------|
| Ettie St. Pump Station watershed | Oakland, Alameda | Yes | Pipe flushing to POTW | 1. Amended sand filter 2. Tree well(s)? | 1. Hard-piped pump station to POTW 2. Pipe flushing to POTW | No | CW4CB, ACCWP, Oakland |
| Lauritzen Channel watershed | Richmond, Contra Costa | Yes | 2 nd St. and Cutting Blvd. storm drain inlet cleanout | 1 st and Cutting PG&E substation flow-through biotreatment | No | No | CW4CB, CCCWP, Richmond |
| Parr Channel watershed | Richmond, Contra Costa | Yes | Possible frequency of storm drain inlet cleaning study | Nevin Ave. green street improvements - bioretention, flow-through biotreatment, tree well(s). ² | No | Yes | CW4CB, CCCWP, Richmond |
| Pulgas Creek Pump Station watershed | San Carlos, San Mateo | Yes | Street flushing to POTW | Bransten Rd. bioretention curb extensions | Street flushing to POTW | Yes | CW4CB, SMCo VLF, SMCWPPP, San Carlos |
| Leo Ave. watershed | San Jose, Santa Clara | Yes | Street sweeping study | Water quality-enhanced Hydrodynamic Separator | No | No | CW4CB, ARRA, SCVURPPP, San Jose |

²The Nevin Ave. green street improvements are located partly within the Parr Channel watershed and partly within an adjacent watershed in Richmond.

Table A.2. Bay Area PCB/Mercury Pilot Projects - continued

| | | | | | | | |
|--|--------------------------|----|--|---|--|-----|---------------------------|
| North Richmond Pump Station watershed | Richmond, Contra Costa | No | No | No | Hard-piped pump station to POTW | No | SFBWQIF, CCCWP, CCC-FCWCD |
| Drainage bounded by Hamilton Ave., Bryant St., Channing Ave., and Alma St. | Palo Alto, Santa Clara | No | No | No | Hard-piped diversion structure to POTW | No | SCVURPPP, Palo Alto |
| State St. Pump Station watershed | Fairfield, Solano | No | Strategic cleanout of pump station to POTW | No | Strategic cleanout of pump station to POTW | No | FSURMP |
| El Cerrito Green Street | El Cerrito, Contra Costa | No | No | Flow-through biotreatment | No | Yes | CW4CB, CCCWP, El Cerrito |
| Alameda and High St. - local unnamed sewerhed that drains into the canal between Oakland and Alameda | Oakland, Alameda | No | No | CDS unit for trash and sediment capture | No | No | ARRA, ACCWP? Oakland |
| International and 73 rd drainage area | Oakland, Alameda | No | No | CDS unit for trash and sediment capture | No | No | ARRA, CCCWP? Richmond |
| 31 st and Market drainage area - pending property owner identification and agreement to participate | Richmond, Contra Costa | No | No | Tree well(s) | No | No | CW4CB, CCCWP, Richmond |

Table A.2. Bay Area PCB/Mercury Pilot Projects - continued

| | | | | | | | |
|--|------------------|----|----|--|----|----|------------------------|
| Osgood Rd. - one-block drainage – may exclude because low PCBs and Hg? | Fremont, Alameda | No | No | Tree well(s) | No | No | CW4CB, ACCWP, Fremont |
| Under discussion | Vallejo, Solano | No | No | Swale or catch basin filter-type application by PG&E substation? | No | No | CW4CB, FSURMP, Vallejo |
| Under discussion | ? Santa Clara | No | No | ? | No | ? | CW4CB, SCVURPPP, ? |
| Trash capture devices in numerous Bay Area drainages | Various | No | No | Trash capture devices that also capture sediments | No | No | ARRA, BASMAA agencies |
| Low dissolved oxygen cleanouts in various pump station drainages –Under discussion | Various | No | ? | No | ? | No | BASMAA agencies |

which are described in more detail later in this section, appear representative of the known types of potentially effective control measures and the geographic area of potential wider implementation in the future.

To evaluate effectiveness of the pilot studies, field monitoring will be conducted to inform a quantitative estimation of the degree to which each type of stormwater control measure reduces PCBs and other pollutants to the Bay. Monitoring results and conclusions will be presented in the Integrated Monitoring Report due March 2014 to the Water Board. Pilot study results presented in the Integrated Report, at a minimum, will be evaluated based on the following general criteria:

1. **Feasibility** – is a control measure technically and economically feasible?
2. **Cost Efficiency** – what is the cost-effectiveness of the control measure (e.g., \$/kg pollutant load removed or avoided).
3. **Opportunity** – what mass of the pollutant can reasonably be avoided over a given time period via the control measure? For example, enhanced inlet cleaning is potentially feasible and cost-effective but it is possible that only a relatively limited mass of sediment and associated pollutants could be captured each year using this method due to the small amount of sediment usually found in Bay Area inlets.

The successful pilot program outcome will contribute to developing a comprehensive regional strategy for reducing PCB and mercury loads in urban runoff, based on the relative effectiveness of a range of potential pollutant control methods.

Recommendations to implement the most feasible and cost-effective control methods that significantly reduce pollutant loads to the Bay on a more widespread scale may be included in the regional strategy.

Overview of Clean Watersheds for a Clean Bay

Clean Watersheds for a Clean Bay (CW4CB) is a grant-funded project that is anticipated to result in Permittee compliance with the following MRP Provisions that jointly address PCBs and mercury (each of these provisions is described further in subsequent sections):

- C.11/12.c (CW4CB Tasks 2 and 3) - Pilot Projects to Investigate and Abate Mercury/PCB Sources;
- C.11/12.d (CW4CB Task 4) - Pilot Projects to Evaluate and Enhance Municipal Sediment Removal and Management Practices;
- C.11/12.e. (CW4CB Task 5) - Pilot Projects to Evaluate On-Site Stormwater Treatment via Retrofit; and,
- C.11/12.i (CW4CB Task 6) - Development of a Risk Reduction Program Implemented throughout the Region.

These provisions implement priority urban runoff-related actions called for by the San Francisco Bay PCBs and mercury Total Maximum Daily Load (TMDL) water quality restoration programs. CW4CB will help implement these TMDLs by developing and

pilot-testing a variety of potential methods to reduce urban runoff loading of PCBs and mercury to the Bay. The project began July 1, 2010 and is scheduled for implementation over four years.³ CW4CB is facilitated through a partnership among Bay Area municipalities and countywide municipal stormwater management programs and is funded by a grant to BASMAA from the United States Environmental Protection Agency (EPA).⁴ A work plan was submitted to EPA on September 23, 2009 (a final revised version is dated April 19, 2010).⁵ The total project cost is \$7.04 million - \$5M from EPA and \$2.04M matching funds from Bay Area municipal stormwater agencies, municipal wastewater treatment agencies, and industrial dischargers. The project's efforts are also leveraged by in-kind assistance from participating municipalities. The knowledge and experience gained and the lessons learned during CW4CB will be promoted and made readily available to inform future similar efforts by others in the Bay Area and elsewhere in California and the United States.

Oversight and Coordination

A Project Management Team (PMT) consisting of BASMAA's executive director and representatives from several BASMAA member agencies (i.e., Bay Area stormwater programs)⁶ was formed at the outset of the project. Several Bay Area cities are also participating in CW4CB and send representatives to the PMT.⁷ The PMT provides project oversight and facilitates coordination among the participating stormwater programs and cities. The PMT meets periodically, usually on the second Wednesday of the month, and met eight times during FY 2010/11: (July 14, August 11, October 13, November 10, and December 8, 2010, and February 9, April 13, and June 8, 2011). Each meeting's highlights and action items are memorialized in subsequent meeting agenda packages that are available upon request. The PMT also formed two workgroups during FY 2010/11. One workgroup focuses on CW4CB Task 4 (sediment management) and met once during FY 2010/11 on May 23, 2011. A large number of municipal public works operation and maintenance staff attended this meeting. The other new workgroup focuses on CW4CB Task 5 (urban runoff treatment retrofitting) and met three times during FY 2010/11: April 11, April 26, and June 22, 2011.

³It should be noted that CW4CB started later than originally anticipated. EPA's original Request for Proposal included an anticipated award date of February 2010. However, despite EPA's and BASMAA's best efforts to expedite the process, EPA was not able to provide BASMAA with an assistance agreement until June 2010 which resulted in a project start date of July 1, 2010.

⁴Funding is through EPA's San Francisco Bay Water Quality Improvement Fund.

⁵Clean Watersheds for a Clean Bay. Proposal/Workplan prepared by BASMAA for EPA for funding via San Francisco Bay Water Quality Improvement Fund. Submitted September 23, 2009. Revised April 19, 2010 (included with FY2009-10 Annual Reporting BASMAA Regional Supplement for POCs and Monitoring as its Appendix A2).

⁶The following BASMAA agencies are represented on the PMT: San Mateo Countywide Water Pollution Prevention Program, Santa Clara Valley Urban Runoff Pollution Prevention Program, Alameda Countywide Clean Water Program, Contra Costa Clean Water Program, and Fairfield-Suisun Urban Runoff Management Program.

⁷The following cities are participating in CW4CB: City of Oakland, City of San Carlos, City of Richmond, and the City of San Jose.

Technical Advisory Committee

A Technical Advisory Committee (TAC) comprised of local and national experts will help optimize the scientific and technical soundness, integrity, and objectivity of CW4CB. The areas of expertise for the TAC members include:

1. Designing and implementing stormwater pollutant controls targeting particle-bound pollutants such as PCBs and mercury.
2. Addressing pollutants via enhancement of municipal operation and maintenance activities that remove sediment from streets and storm drain system infrastructure (i.e., sediment management).
3. Designing and implementing urban runoff treatment retrofits, especially in highly urbanized built-out industrial areas where available land space is often sparse.
4. Evaluating the effectiveness of stormwater pollutant controls through field monitoring, including estimating load reductions.

During FY 2010/11, the PMT developed a document that compiles information needed to facilitate convening the TAC (BASMAA 2011a).⁸ The document included an introduction to CW4CB, project background, a description of the purpose of the TAC, scope of work, a list of additional candidate members, and a list of questions to ask when interviewing additional candidates. The PMT then formed a TAC comprised of four to five individuals:

1. Dr. Tom Mumley (Assistant Executive Officer, Regional Water Board).
2. Dr. Lester McKee (Director of the Watershed Program, San Francisco Estuary Institute).
3. Scott Taylor (Senior Vice President, RBF Consulting) - pending confirmation
4. Roger Bannerman (Environmental Scientist, Wisconsin Department of Natural Resources) - pending confirmation

An initial meeting of the TAC is tentatively scheduled for October 2011.

Sampling and Analysis and Quality Assurance Plans

On March 7, 2011 CW4CB's Principal Investigator and Project Manager met with the EPA Project Manager and Quality Assurance Officer assigned to CW4CB to discuss scoping the CW4CB Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). Initial draft versions of the SAP (BASMAA 2011b)⁹ and QAPP (BASMAA 2011c)¹⁰ were subsequently submitted to EPA on July 29, 2011. These documents cover field sampling related activities associated with CW4CB Task 3. Tasks 4 and 5 will be

⁸BASMAA 2011a. Clean Watersheds for a Clean Bay. Technical Advisory Committee. Draft May 9, 2011.

⁹BASMAA 2011b. Sampling and Analysis Plan: Clean Watersheds for a Clean Bay – Implementing the San Francisco Bay's PCBs and Mercury TMDLs with a Focus on Urban Runoff, EPA San Francisco Bay Water Quality Improvement Fund Grant No. CFDA 66.202. Prepared by Applied Marine Sciences, Inc. DRAFT July 29, 2011.

¹⁰BASMAA 2011c. Quality Assurance Project Plan: Clean Watersheds for a Clean Bay – Implementing the San Francisco Bay's PCBs and Mercury TMDLs with a Focus on Urban Runoff, EPA San Francisco Bay Water Quality Improvement Fund Grant No. CFDA 66.202. Prepared by Applied Marine Sciences, Inc. DRAFT July 29, 2011.

conducted chronologically later than Task 3 and future revisions of the SAP and QAPP will provide further details about the Task 4 and 5 monitoring fieldwork.

C.11/12.c - Pilot Projects To Investigate and Abate Mercury/PCB Sources

CW4CB Tasks 2 and 3 are anticipated to result in Permittee compliance with MRP Provisions C.11/12.c. Task 2 of CW4CB was completed during FY 2010/11 and entailed selecting five Bay Area region watersheds for pilot source property identification and referral investigations. Each watershed was selected due to the relatively high levels of PCBs¹¹ observed in sediments from roadway and stormwater drainage infrastructure and other attributes that previous studies¹² indicated would make these watersheds high priority for investigation. Task 3 of CW4CB entails conducting the investigations. Further details regarding the selection methodology and maps of the watersheds are provided in a progress report that was submitted to EPA in April 2011.¹³ The following five project watersheds were selected:

1. Ettie Street Pump Station watershed in the City of Oakland, Alameda County
2. Lauritzen Channel watershed in the City of Richmond in Contra Costa County
3. Parr Channel watershed in the City of Richmond in Contra Costa County
4. Pulgas Creek Pump Station watershed in the City of San Carlos, San Mateo County
5. Leo Avenue watershed in the City of San Jose, Santa Clara County.

As Task 3 of CW4CB, during FY 2010/11 Permittees began implementing the process to identify specific PCB and mercury source properties within the five project watersheds and refer these sites to regulatory agencies for cleanup and abatement. The process consists of the following five steps:

1. Records review. Review general information sources (e.g., spill site databases) and records on specific properties/businesses to begin identifying potential source properties within the pilot watersheds.
2. Driving/walking survey. Perform a driving/walking survey of each pilot watershed to further identify potential source properties and begin looking for evidence that runoff from such locations is likely to convey pollutants to storm drains.
3. Facility inspections. Perform inspections of selected facilities within each pilot watershed.
4. Surface soil/sediment testing. Test surface soils/sediments from the public right-of-way and private properties in the pilot watersheds for PCBs, mercury and other particle-bound pollutants.
5. Property referrals. Where laboratory data confirm elevated pollutant concentrations, refer properties to regulatory agencies for cleanup and abatement.

¹¹ Reducing loads of PCBs is the primary selection factor whereas reducing loads of mercury and other sediment-bound pollutants is a secondary consideration.

¹² Discussed in Appendix A3 of the FY2009-10 Annual Reporting Regional Supplement for POCs and Monitoring

¹³ Clean Watersheds For a Clean Bay (CW4CB) Semi-Annual Progress Report Number 2. April 29, 2011.

During FY 2010/11 the PMT prepared a general work plan and guidance (BASMAA 2011e)¹⁴ for the Steps 1 - 3 above and investigations were initiated in each watershed. The results from Steps 1 - 3 will characterize each inspected property in the project watersheds as having higher, medium or lower potential to release PCBs/mercury to streets and stormwater conveyances. It should be noted that in some watersheds some of these types of activities have previously been conducted and thus the extent of additional effort needed is under evaluation. Table A.3 presents typical attributes of sites with higher, medium or lower potential for PCB/mercury release. A map of each watershed showing the locations of sites with higher potential for PCB/mercury release will be created using GIS software. This information will be used to inform the development of a soil/sediment sampling and chemical analysis monitoring program designed to identify potential source properties (above Step 4).

The surface soil/sediment sampling is anticipated to be conducted on both the public right-of-way and private properties within the project watersheds. Soil/sediment samples will be analyzed for PCBs, mercury, total organic carbon (TOC), and grain size. Approximately 10 percent of these samples (selected randomly) will also be analyzed for dioxins, PBDEs, organochlorine pesticides, and PAHs. In general, the first phase of Task 3 (records review, field surveys, and facility inspections) in the watersheds is scheduled for completion by September 2011 and soil/sediment sampling is scheduled for September through December 2011, except for two of the watersheds, Parr and Lauritzen, where the site investigations were completed in June 2011. Further details are provided in the project SAP. In addition, further details regarding investigations in individual watersheds are provided in the following sections.

Ettie Street Pump Station Watershed

In 2000 and 2001 investigations by the Alameda Countywide Clean Water Program suggested that there are multiple sites in the Ettie Street Pump Station watershed that continue to discharge legacy PCBs to the storm drain system, but no specific current sources were identified. The City of Oakland sought funding from a State Water Resource Control Board Proposition 13 Grant to further investigate, identify, and remediate sources of PCBs in the watershed and evaluate control measures for addressing these sources of PCBs. The City was awarded \$460,000 for the PCB Abatement Grant Project and initiated work in 2004. Project tasks included: surveying potential source areas for PCBs in the watershed, inspections of private properties, collection and chemical analysis soil/sediment samples from locations in the public right-of-way and on private properties, preparation of sampling reports, abatement of PCB-containing sediments in the public right-of-way, coordination with regulatory agencies for enforcement of PCB cleanup on private properties, and preparation and distribution of education and outreach materials (including a Fact Sheet).

Table A.3. Typical attributes of sites with higher, medium and lower potential for

¹⁴BASMAA 2011e. General Work Plan and Guidance for CW4CB Task 3 Records Review, Driving/Walking Survey and Facility Inspections. August 2011.

PCB/mercury release to streets and stormwater conveyances.

Typical attributes of sites with higher potential for PCB/mercury release:

- Records of PCB/mercury release at the site.
- Indications of PCB/mercury-associated materials/processes.
- Locations where sediment may erode and be mobilized off-site by stormwater runoff, vehicles, and/or wind (e.g., unpaved areas).
- Illegal dumping occurs.
- Outdoor hazardous material/waste storage areas (e.g., tanks, drums) with poor housekeeping.

Typical attributes of sites with medium potential for PCB/mercury release:

- Industrial land uses.
- Electrical equipment (e.g., PCB transformers).
- Outdoor hazardous material/waste storage areas (e.g., tanks, drums) with good housekeeping.
- Unidentified barrels or drums.
- Demolition, large-scale window replacements, or other renovations have occurred (potentially releasing PCB caulks/sealants).

Typical attributes of sites with lower potential for PCB/mercury release:

- Non-industrial land uses.
- Minimal potential for sediment loading to stormwater collection system.
- No history of PCB/mercury-related activities.

A case study and final report that details the methods and results for the PCB Abatement Grant Project was completed (Kleinfelder 2006).¹⁵ For CW4CB Task 3 the City of Oakland is currently reviewing the inspection and sampling data in detail to determine if any additional sampling is needed in the watershed. In particular, the City will conduct sampling on industrial properties that were considered “high priority” sites but lack sufficient sampling data to determine if the property is a potential source. A review of existing data and additional sampling results will be used to provide referrals to the appropriate agencies. These referral identifications will be performed after coordination with the referral agencies and are anticipated for fall/winter 2011.

Parr Channel and Lauritzen Channel Watershed

In FY2010-2011, CCCWP conducted investigations of properties in catchments draining into the Lauritzen Channel and the Parr Channel watersheds. Of 166 parcels identified in those watersheds, 62 parcels were inspected from outside the property line, and 13

¹⁵Kleinfelder 2006. Final Project Report, Ettie Street Pump Station Watershed, Oakland, California. Prepared for City of Oakland PWA - ESD by Kleinfelder, Inc. September 29, 2006.

were inspected onsite. Inspection procedures built upon lessons learned from similar investigations that have been conducted in the past in the Ettie Street catchment in Alameda County. The focus of the inspections was to identify any sources of bare dirt on the property that could serve as a sediment source, and determine whether any known or suspected current or past activities could involve materials containing PCBs (i.e. transformers, wire insulation, hydraulic fluids, caulks and paints). Inspection results included field logs, photographs, site flow path sketches, and aerial photos from Google Earth. Inspection results were compiled in a simple Excel-based database. The CCCWP will coordinate with other programs and the CW4CB project management team in early 2011-2012 to share lessons learned from the site inspections and propose priorities for monitoring under CW4CB tasks.

Pulgas Creek Pump Station Watershed

In 2000 and 2001, BASMAA member agencies collaborated to measure concentrations of PCBs, mercury and other pollutants in embedded sediments within stormwater conveyance systems throughout the Bay Area. The primary goal of this project, referred to as the Joint Stormwater Agency Project (JSAP), was to characterize the distribution of pollutants among land uses in watersheds draining to San Francisco Bay. The JSAP identified elevated PCB concentrations in the Pulgas Creek Pump Station watershed, an area with current and historic industrial land uses in the City of San Carlos, and other urban areas around the Bay Area (KLI and EOA 2002).¹⁶ In 2002 and 2003, the San Mateo Countywide Stormwater Pollution Prevention Program (SMCWPPP) performed a PCB source identification case study (EOA 2003)¹⁷ in the Pulgas Creek Pump Station watershed. The study identified some potential source properties in the watershed; however, based on the spatial distribution of PCBs in storm drain sediments other sources remained unidentified.

For CW4CB Task 3, the records review process for this watershed began in November 2010. Address and parcel information on the 480 properties located within the watershed was obtained from the San Mateo County assessor website.¹⁸ The addresses and parcel numbers of these properties were then used to perform an online search of a number of databases that contain information regarding pollutant use and/or release sites (see BASMAA 2011e¹⁹). During December 2010 and February 2011, all available hazardous materials records for properties in the watershed were reviewed at the San Mateo County Department of Environmental Health (SMCDEH).²⁰ In July 2011, additional records regarding stormwater inspections were obtained from the City and

¹⁶KLI and EOA 2002. Final Report, Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs, and Organochlorine Pesticides. Prepared by Kinnetic Laboratories, Inc. and EOA, Inc. April 2002.

¹⁷EOA, Inc. 2003. Case Study Investigating Elevated Levels of PCBs in Storm Drain Sediments in the Pulgas Creek Pump Station Drainage, San Carlos, CA. Prepared for the San Mateo Countywide Stormwater Pollution Prevention Program by EOA, Inc. June 2003.

¹⁸<http://www.smcare.org/apps/ParcelMaps/default.aspx>

¹⁹ See footnote 14 above for BASMAA 2011e reference

²⁰San Mateo County Department of Environmental Health regulates hazardous materials use and hazardous waste generation by businesses in the county. Properties not regulated report that hazardous wastes are not generated and hazardous materials are stored only in small quantities (less than 55 gallons liquid, 500 pounds solid or 200 cubic feet gas).

reviewed. All pertinent information related to the records review was entered into a data management spreadsheet developed for this watershed.

The next steps in the records review for this watershed are scheduled to commence in September 2011. SMCWPPP will review City business permits for information regarding types of current and historic activities at properties within the watershed. In addition, satellite and aerial imagery software (Google Earth™) will be used to preliminarily identify the current land use of properties located within the watershed, including screening out low priority properties such as residential units and commercial buildings. Google Earth™ will also be used to collect preliminary information about apparent housekeeping and current property condition, including the existence of unpaved areas and the condition of paved areas such as parking lots and driveways.

Based on the information collected in the previous steps, SMCWPPP may also review other data sources described in the Task 3 general work plan and guidance (BASMAA 2011e).

In September 2011, SMCWPPP and the City plan to carry out a driving and walking reconnaissance survey of the watershed's public right-of-way areas to collect additional information about the properties and verify information collected during the records review. A survey field form created as part of the Task 3 general work plan and guidance (BASMAA 2011e) will be used to record information during the survey. In addition, a global positioning system camera will be used to capture locations and photographs of suspect properties that may be PCB or mercury sources, including those that have the potential for sediment mobilization to the public right-of-way. The records review spreadsheet will then be updated and corrected as needed based upon information obtained during the survey. This information will then be used to build upon the records review data and assist SMCWPPP and the City select and prioritize sites for facility inspections.

Facility inspections are scheduled for October and November 2011 and will be coordinated with the City and SMCDEH, the agency that routinely conducts stormwater inspections in the city. The results of the records review, field survey, and facility inspections will be used to characterize each inspected property in the project watersheds as having higher, medium or lower potential to release PCBs/mercury to streets and stormwater conveyances. This information will then be used to inform the development of a soil/sediment sampling and chemical analysis monitoring program designed to identify potential source properties in the watershed.

Leo Avenue Watershed

One of the locations with elevated PCB concentrations identified by the JSAP (KLI and EOA 2002 - see previous section) was the Leo Avenue area in San Jose. In response, the City of San Jose, in collaboration with Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), conducted a source identification study at the Leo Avenue area in 2002/2003 that included a review of the enforcement history for stormwater-related violations in the area directly draining to the stormwater

conveyance on Leo Avenue and additional sediment sampling (City of San Jose and EOA 2003).²¹ Through this effort some private properties on Leo Avenue were identified as possibly contributing PCBs to the stormwater conveyance system. Additionally, large volumes of sediment containing PCBs were removed from the stormwater conveyance system via line flushing and proper disposal.

For CW4CB Task 3, a study area referred to as the Leo Avenue watershed was delineated for further investigation. This larger geographical area (540 acres) includes the area where the original studies and actions described above took place. In February 2011, the SCVURPPP and the City began developing a work plan to outline the steps that will be taken during Task 3 (SCVURPPP 2011)²² and the work commenced in June 2011 following completion of the work plan.

As a first step, the Santa Clara County (County) assessor website was accessed to obtain addresses and parcel information for the 234 properties located within the watershed. The addresses and parcel numbers of these properties were then used to perform an online search of a number of databases that contain information regarding pollutant use and/or release sites (see BASMAA 2011e).

The next step was to review the City Hall Records Imaging System (CHRIS) database. CHRIS is a comprehensive City database containing information about hazardous waste generators, hazardous materials business plans and types of historic businesses. These records were reviewed for any indication of potential PCB sources in the watershed. Other City and County databases were considered for further records review research; however, CHRIS contained the necessary information for this step and further database searches were determined to be unnecessary.

Finally, satellite and aerial imagery software (Google Earth™) was used to gain a better understanding of the type of properties currently located within the watershed. Using Google Earth™, the list of 234 relevant properties was reduced to 139 by removing land uses such as residential units and commercial buildings that are low priority for this project. Google Earth™ was also used to collect preliminary information about apparent housekeeping and the current condition of properties, including the existence of unpaved areas and the condition of paved areas such as parking lots and driveways.

Following the completion of the records review, SCVURPPP and the City carried out a driving and walking reconnaissance survey around the Leo Avenue watershed to collect additional information about subject properties and verify information collected during the records review. A survey form created as part of the Task 3 general work plan and guidance (BASMAA 2011e) was used to collect information during the survey. Additionally, a global positioning system camera was used to capture locations and

²¹City of San Jose and EOA 2003. Year Two Case Study Investigating Elevated Levels of PCBs in Storm Drain Sediments in San Jose, California. July 2003.

²²SCVURPPP 2011. Work Plan – PCBs Source Identification Pilot Project Leo Avenue Watershed, San Jose, California. June 2011.

photographs of suspect properties that may be PCB or mercury sources, including those that have the potential for sediment mobilization to the public right-of-way. Information was recorded that was later used to correct the records review spreadsheet and fill in missing information. After the survey, the spreadsheet was also refined to remove properties that have closed, relocated, or were paved or remediated.

Google Earth™ was then revisited to determine whether certain businesses should remain on the list as potential inspection sites. The results of the reconnaissance survey led to reducing the list of 139 properties to approximately 40 that are being considered for inspection. SCVURPPP and the City are in the process of assigning an inspection priority to each of the 40 properties, and final decisions will be made in September as to which will be inspected by the City and SCVURPPP. Staff from the San Jose Fire Department will be involved in the inspections if properties are hazardous waste generators. In addition, although not on the property inspection list, abandoned and vacant properties and historic railroad right-of-ways were identified for right-of-way sampling.

In October, the City and SCVURPPP will conduct facility inspections at the facilities on the final list of sites. Based on the results of the records review, walking/driving surveys, and property inspections, high priority locations for public right-of-way and/or private property sampling will be identified. This information will then be used to inform the development of a soil/sediment sampling and chemical analysis monitoring program designed to identify potential source properties in the watershed.

C.11/12.d - Pilot Projects to Evaluate and Enhance Municipal Sediment Removal and Management Practices

CW4CB Task 4 is anticipated to result in Permittee compliance with MRP Provisions C.11/12.d. This task is pilot-scale evaluation of methods to enhance the pollutant load reduction benefits of municipal operation and maintenance activities that remove sediment from streets and storm drain system infrastructure. Most of the pilot studies will be conducted within the five Bay Area region watersheds with elevated PCB levels described in the previous section.

Literature Review

During FY 2010/11, existing literature was reviewed for information on previous studies related to sediment and pollutant removal during municipal operation and maintenance activities and other information relevant to the pilot evaluations ((BASMAA 2011f, Appendix A2)²³. The literature review identified the following key data gaps with respect to evaluating the effectiveness of municipal sediment management practices in reducing PCB and mercury loads to San Francisco Bay:

- Existing studies do not address PCBs and mercury - although there have been a few Bay Area studies that characterized PCBs and mercury concentrations in

²³(BASMAA 2011f. Sediment Management Practices, Clean Watersheds for a Clean Bay Task 4 Literature Review. Prepared for BASMAA by EOA, Inc. and Geosyntec Consultants. June 7, 2011.

materials collected from streets, stormwater conveyance systems and in street sweeper hoppers, there is a lack of information addressing the effectiveness of sediment management practices to reduce loads of PCBs and mercury. One particular concern is the lack of information on the buildup of PCBs and mercury on street surfaces, which can affect the frequency at which sweeping would be most effective. Thus, it is necessary to infer the effectiveness of street sweeper studies based on the effectiveness of sweepers to remove dust and dirt (<2 mm) and in particular the finer fractions of dust and dirt (less than 63 µm). In addition, information is lacking in regards to the amount of sediment that accumulates in inlets, particularly in industrial areas with elevated pollutant concentrations, and the concentrations of PCBs and mercury in that sediment. In addition, very limited information is available on how PCB and mercury mass is distributed among various particle sizes.

- Few studies have been conducted in semi-arid climates - most reviewed street sweeper effectiveness studies that evaluate advanced sweeper types designed to improve water quality benefits were not carried out in semi-arid climates like the Bay Area. Moreover, a number of studies were conducted where road abrasives are applied during the winter, and this can cause results to be even less representative. There are even fewer studies for inlet cleaning, and only one local study was found that evaluated the effect of cleaning frequencies on the effectiveness of sediment removal.
- Few studies have documented water quality improvements - a number of studies have attempted to measure the potential improvement in water quality associated with street sweeping; however, very few studies indicated a statistically reliable improvement in water quality. A recent paper (Kang et. al 2009) indicates that most street sweeping study designs do not have sufficient statistical power to measure a change given the variability in runoff water quality. One inlet cleaning study attempted to measure water quality improvements based on a semi-annual cleaning frequency; however, it was determined that the number of samples collected was insufficient to characterize the improvements.
- Lack of local studies that evaluate recent improvements in street sweeper technology - no recent studies were found conducted in Bay Area that evaluate the effectiveness of equipment that reflects improvements in street sweeper technology in approximately the last decade.
- Confounding factors make it difficult to compare results across studies - most street sweeper effectiveness studies are affected by confounding factors that affect effectiveness, including climate, particle loadings, street texture, moisture, parking car conditions, equipment operating conditions, and frequency of cleaning and also differ in terms of study design such that it is difficult to compare results amongst different studies. Thus, the best comparison amongst sweeper types is limited to the same study and study conditions. There are also factors that confound comparisons among the results of inlet cleaning effectiveness studies, including variations in rainfall patterns, particle size distributions of local sediments collected, configurations of inlet structure, and cleanout frequency.

- Most studies address effectiveness of catch basins rather than drop inlets – the majority of studies found during this literature review addressed catch basins (with sumps) rather than drop inlets (without sumps). Drop inlets are believed to be the predominant type of inlet in the Bay Area. Since catch basins tend to accumulate more sediment than drop inlets, these studies have limited applicability to the effectiveness of inlet cleaning in the Bay Area.
- Limited information was found on the effectiveness of stormwater conveyance system cleaning enhancements - only limited information was found on the effectiveness of storm drain inlet cleaning (and especially how effectiveness varies with frequency of cleanout) and storm drain line and street flushing.
- Cost-benefit information is not adequately addressed - there was a general lack of cost-benefit analysis found for the major municipal maintenance practices included in this literature review (street sweeping, storm drain inlet cleaning, storm drain line flushing, and street flushing).

Regarding the design of future studies that evaluate the effectiveness of municipal sediment management practices in relation to reducing PCB and mercury loads to San Francisco Bay, the literature review recommended that such studies should:

- Be conducted in Bay Area industrial areas known to have elevated concentrations of PCBs in street and storm drain system sediments.
- Measure concentrations of PCBs and mercury and particle size distributions in sediments. Evaluating effectiveness via water quality monitoring is likely to be challenging. For example, Kang et al. (2009) examined why most studies could not document an effect of street sweeping on water quality and concluded that most monitoring studies do not have sufficient statistical power to distinguish the effect of sweeping given the variability in runoff water quality.
- Be conducted at appropriate spatial and temporal scales to optimize what can be learned within resource constraints. This may require implementation at relatively small scales.
- Document rainfall totals and intensities in the study area over the course of the study.
- Gather the appropriate data and conduct cost-benefit analyses.
- Incorporate working with municipal maintenance staff to document practical lessons learned (e.g., successes, failures, challenges) and thereby facilitate future training of maintenance staff if enhanced practices are implemented on a more widespread basis.

The literature review also noted that as new information is generated by future Bay Area studies on municipal sediment management practices, the spreadsheet models developed during SFEI's Proposition 13-funded study on urban stormwater BMPs should be adapted and refined to incorporate available data on costs and benefits, including estimated load reduction projections based on regional implementation scenarios and associated cost-benefit analyses.

The literature review also recommended consideration of conducting street sweeper effectiveness studies on road segments containing elevated levels of PCBs and mercury that focus on one or more of the following:

- Establishing a baseline for sweeper effectiveness and costs for removing sediment (fine and coarse) and associated PCBs and mercury;
- Evaluating the effect of increasing frequency on sweeper effectiveness and costs;
- Evaluating the effects of utilizing advanced street sweeper equipment on sweeper effectiveness and costs;
- Documenting the effects of site-specific confounding factors that affect sweeper effectiveness and costs; and
- Conducting marginal cost benefit analysis for modifying sweeper programs.

The literature review noted that particular care should be taken to control for confounding factors. Experience has shown that studies that consider controls, differences in surface loadings on different streets, statistical study design (a sampling plan that is sufficient to distinguish the changes anticipated), and quality assurance and control are likely to be more successful. In evaluating sweeper types, it is critical that the testing ensure that the sweepers alternatively operate on the same roadway segments so that the surface loading on the streets is the same for each type of equipment. General guidance on conducting street sweeping programs can be found in the literature.

The literature review also recommended consideration of conducting three general types of stormwater conveyance system cleaning studies:

1. Evaluating the effect of increasing storm drain inlet cleanout frequency on PCB/mercury load reduction benefits and costs.
2. Evaluating costs and PCB/mercury load reduction benefits of street sediment removal including flushing and capture of wash water.
3. Evaluating costs and PCB/mercury load reduction benefits of storm drain line flushing with capture of wash water.

The literature review noted that these studies should include working with municipal staff to develop inventories and maps within the study area of storm drain facilities and other pertinent drainage characteristics, including:

- Types and locations of inlet structures (e.g., drop inlet vs. catch basin) and condition.
- Types and locations of piping and condition.
- Sources of sediment to the storm drain system.
- Specific points within the storm drain system where sediment accumulates (e.g., certain inlets and any "sag" points in piping).

Sediment Management Pilot Studies

Based on the results of the literature review and discussions with municipal staff, the CW4CB Task 4 sediment management workgroup has developed a conceptual regional plan for sediment management studies (Table A.4). Individual work plans are currently under development that detail planned field activities for each pilot sediment management study and include tasks, schedules and budgets.

Table A.4. Pilot Sediment Management Studies

| Project Watershed Location | City/County | Type of Study |
|-------------------------------------|------------------------|--|
| Ettie St. Pump Station watershed | Oakland, Alameda | Pipe flushing to POTW |
| Lauritzen Channel watershed | Richmond, Contra Costa | 2 nd St. and Cutting Blvd. storm drain inlet cleanout |
| Parr Channel watershed | Richmond, Contra Costa | Frequency of storm drain inlet cleaning study |
| Pulgas Creek Pump Station watershed | San Carlos, San Mateo | Street flushing to POTW |
| Leo Ave. watershed | San Jose, Santa Clara | Street sweeping study |
| State St. Pump Station watershed | Fairfield, Solano | Strategic cleanout of pump station to POTW |

To evaluate effectiveness of the pilot studies, a field monitoring plan will be developed in FY 2011-12 that includes collecting and analyze sediment samples to inform a quantitative estimation of the degree to which enhanced sediment management activities reduce loads of PCBs (and other pollutants as appropriate) to the Bay. The desired outcome is to evaluate the cost-effectiveness of various sediment management methods and provide recommendations regarding the implementation of cost-effective methods on a larger scale.

C.11/12.e. - Conduct Pilot Projects to Evaluate On-Site Stormwater Treatment via Retrofit

CW4CB Task 5 is anticipated to result in Permittee compliance with MRP Provisions C.11/12.e. Through the implementation of this task, existing infrastructure will be retrofitted with stormwater treatment measures at 8 to 10 sites in the Bay Area region, and the effectiveness of each measure to remove PCBs and other pollutants will be evaluated. Areas in the Bay Area urban landscape with elevated PCBs are the primary targets for retrofits, with mercury and other pollutants being a secondary consideration. At least one retrofit will likely be installed in each of five major Bay Area counties (Santa Clara, San Mateo, Alameda, Contra Costa, and Solano).²⁴ The retrofits will use proven

²⁴It is anticipated that some but not all of the retrofits will be sited within the five watersheds selected for source property identification and referral described previously.

existing technologies (e.g., filtration devices such as sand filters and green street bioretention facilities) that have been shown to be effective at removing pollutants when properly designed, installed, operated and maintained. These technologies rely on one or more of a variety of processes to remove pollutants, including sedimentation, filtration, adsorption, and decomposition. Devices that can be characterized as meeting "Low Impact Development" principles are being emphasized to the extent their use is consistent with the overall project objectives. Per MRP requirements, the retrofit types will span treatment types and to some extent Bay Area urban watersheds' characteristics.

During FY 2010-11, a preliminary conceptual planning document (BASMAA 2011g)²⁵ was prepared that serves as a roadmap for all aspects of the stormwater treatment retrofitting program including planning, design, engineering, permitting and construction of the retrofits and associated schedules and budgets. The strategy for selecting retrofit types and locations included issuing a call for existing/planned Capital Improvement Projects (CIPs) that include or could be modified to include stormwater treatment retrofits. This strategy was chosen based upon the retrofit workgroup's assessment that this may produce the best results given existing budget and schedule constraints. After completion of the call for projects the work group evaluated the results and prepared a document presenting candidate locations and types of urban runoff treatment retrofits (BASMAA 2011h, Appendix A3).²⁶

The current schedule calls for the construction of the retrofits to be completed by October 2012. A field monitoring plan will be developed to evaluate pilot retrofit effectiveness by collecting and analyzing water samples during the 2012/13 rainy season. The results of the monitoring will inform a quantitative estimation of the degree to which the retrofits reduce loads of PCBs (and other pollutants as appropriate) to the Bay. The desired outcome is to evaluate the cost-effectiveness of various stormwater treatment retrofits and provide recommendations regarding potentially implementing the more cost-effective types on a larger scale.

C.11/12.i - Development of a Risk Reduction Program Implemented throughout the Region

Provisions C.11/12.i require that Permittees implement a regional program of risk communication activities to raise public awareness of fish contamination issues in San Francisco Bay and to encourage fish-consuming populations to reduce their exposure to pollutants in contaminated fish. These provisions require that Permittees report in this 2011 Annual Report the status of the risk reduction efforts. Task 6 of the CW4CB project work plan (submitted with the FYr 2009-10 Annual Reporting Regional Supplement for POCs and Monitoring) includes a description of the tasks being conducted via the

²⁵BASMAA 2011g. Conceptual Planning Roadmap for Implementing Urban Runoff Treatment Retrofits, Clean Watersheds for a Clean Bay Task 5. Prepared for BASMAA by Geosyntec Consultants. August 2011.

²⁶BASMAA 2011h. Candidate Locations and Types of Urban Runoff Treatment Retrofits, Clean Watersheds for a Clean Bay Task 5. Prepared for BASMAA by Geosyntec Consultants. August 2011.

project to raise public awareness and encourage reduction of exposure. The effort includes four general subtasks:

- Sub-task 1. Convene a risk reduction stakeholder advisory group.
- Sub-task 2. Develop a broad risk communication strategy.
- Sub-task 3. Award and oversee implementation of mini-grants.
- Sub-task 4. Conduct evaluation activities.

This section reports on progress during FY 2010-11 for all of the above sub-tasks. BASMAA further developed task workplans and an associated schedule in coordination with a Bay Area risk communication and exposure reduction work group that included representatives from BASMAA, the California Department of Public Health (CDPH), Bay Area Clean Water Agencies (BACWA), and Water Board and EPA staff. CDPH is now under contract through the Aquatic Science Center (ASC) to BASMAA to conduct the above sub-tasks as part of what is now called the San Francisco Bay Fish Project" (SFBFP).

Through the CW4CB project in FY 10-11, the Permittees initiated and made significant progress on sub-tasks 1-4 as described below.

Sub-task 1. Convene a risk reduction stakeholder advisory group – BASMAA worked with the Bay Area risk communication and exposure reduction work group and also ASC to plan the details of how this task will be managed and implemented, including the role of the Aquatic Science Center and plans for convening the Stakeholder Advisory Group (SAG). The SAG's primary function is to review and guide the risk communication and exposure reduction activities implemented under the SFBFP. The SAG also provides a forum for SAG members to learn about fish contamination and related topics, and promote collaboration and new activities. The SAG met in December 2010 and in February 2011 to develop a request for proposals (RFP) and a process for awarding a request for proposals (RFP) and a process for selecting proposers to receive mini-grants (i.e., sub-awards) as part of sub-task 3 (see below). The SAG also met in May 2011 to be introduced to the funded groups and their projects and for all to receive and discuss a presentation about the new advisory for San Francisco Bay, including key advisory messages and effective delivery methods.

Sub-task 2. Develop a broad risk communication strategy – The Bay Area risk communication and exposure reduction work group has agreed that this sub-task will focus on developing a broad risk communication framework that will serve as the basis for planning future outreach, education, and risk reduction activities. The framework will address how to communicate information about fish contamination issues, including the current advisory, to fish consuming populations, with an emphasis on those populations at greatest risk. One important component of the framework is the mini-grant program (sub-task 3). During FY 10-11, CDPH developed a draft framework for review and comment by

the SAG, including a project goal and five objectives; and after review and comment, the framework was finalized.

Sub-task 3. Award and oversee implementation of mini-grants – As reported under sub-task 1, working through the SAG, CDPH developed an RFP and proposal selection process for awarding mini-grants (i.e., sub-awards). CDPH received significant and valuable input from the SAG to guide the general goals of the mini-grant program and several SAG members, including a BASMAA / Permittee representative, were selected to be on the proposal selection panel. The RFP was released in mid-February 2011 with nine proposals received in April. The selection panel selected four projects from the following organizations for funding:

- California Indian Environmental Alliance
- APA Family Support Services
- Greenaction for Health and Environmental Justice
- Kids for the Bay

CDPH assessed the training needs of the four groups, developed the training, and conducted the training for nine staff from the four grantee groups in June. The first half of the training focused on fish contamination issues including the sources of PCBs and mercury in San Francisco Bay, health risk and benefits of fish, and the San Francisco Bay advisory (see sub-task 4 for information on the second half training). Also, by June 30, Memoranda of Agreements regarding the mini-grants for two of the four groups had been signed.

Sub-task 4. Conduct evaluation activities – Evaluation is a critical sub-task. Evaluation activities include: evaluation of the SAG, mini-grant evaluation activities by the funded groups, and evaluation of the mini-grants task overall. During FY 10-11, CDPH facilitated real-time, self-evaluations by the SAG of their meetings. Additionally, the RFP required that project evaluation be a key component of any mini-grant proposal and subsequent project, including assigning a significant amount of the proposal scoring (20%) to that aspect of the proposals.

The second half of the training CDPH conducted in June (see sub-task 3) focused on evaluation and included an overview of evaluation methods and tools, and a review of project evaluation reporting requirements. Also, the funded groups filled out an “Evaluation Workbook” that will serve as their project’s evaluation plan.

C.11/12.f Diversion of Dry Weather and First Flush Flows to POTWs

Provisions C.11.f and C.12.f are nearly identical provisions for control of mercury and PCBs requiring pilot studies that evaluate diversion of dry weather urban runoff and first flush events into publicly owned treatment works (POTWs). The first deliverable was met through submittal of a Feasibility Evaluation Report (FER) that was included in the 2010

Annual Report. The MRP requires annual updates of the status of pilot studies in each subsequent Annual Report.

The FER was revised in December 2010 in response to Water Board staff comments. Preliminary descriptions of candidate diversion projects were then summarized by BASMAA on behalf of member programs in a brief preliminary memorandum to the Water Board in February 2011. During the remainder of FY 2010-11, programs developed more detailed definitions of six pilot diversion projects, as described in Appendix A4 (BASMAA 2011i).²⁷ Three of the six diversion projects involve hard-piped diversions of dry and/or wet weather flows to a POTW, two of which entail diversion of discharges from stormwater pump stations. The other three projects are operational diversions that entail street flushing, stormwater conveyance piping flushing, and a periodic strategic cleanout of a pump station sump. These operational diversions correspond to the following general scenarios for removing sediments containing PCBs and other pollutants from urban stormwater conveyance infrastructure and treating at a POTW:

1. Flushing out to POTW sediment with PCBs/Hg that collected in streets in urban areas with elevated levels of PCBs.
2. Flushing out to POTW sediment with PCBs/Hg that collected in storm drain piping in urban areas with elevated levels of PCBs.
3. Removing sediment with PCBs/Hg that collected in pump station sumps in urban areas.

The three above possibilities represent the general range of scenarios that could potentially be scaled-up for wider implementation in the future. The first two scenarios essentially entail creating an artificial "first flush," capturing the flows and diverting to a POTW. Such projects avoid the relatively high costs of diversion structure capital improvements and therefore may be more practical for wider implementation in the future, especially in the short-term.

Baseline monitoring has commenced at the North Richmond Pump Station pilot diversion project, which is further along compared to other projects due to a recent grant award that was funded in 2010. In addition, monitoring work plan development has commenced in support of the Ettie Street Pump Station diversion pilot project (see Appendix A4).

²⁷BASMAA 2011i, Technical Memorandum: Status Report on Candidate Pilot Diversion Projects. Prepared for BASMAA by Brown and Caldwell. August 2011.

C.11/12.g Monitor Stormwater Pollutant Loads and Loads Reduced

Provisions C.11.g and C.12.g require Permittees to develop and implement a monitoring program to quantify mercury and PCB loads and loads reduced through source control, treatment and other management measures implemented by Permittees. Average annual region-wide mercury (160 kg/yr) and PCB (20 kg/yr) loads to the San Francisco Bay from urban (and non-urban) runoff discharges have been calculated by the Water Board through the development of Total Maximum Daily Loads (TMDLs) for these pollutants. Over the next five years, refinement of PCB and mercury loading estimates will occur through the implementation of Pollutants of Concern Monitoring required by Provision C.8.e, and associated technical studies coordinated through the BASMAA Regional Monitoring Coalition (see Water Quality Monitoring Section) and the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP). These loading estimates provide a baseline to which compliance with TMDL Waste Load Allocations (WLAs) issued to Bay Area stormwater agencies can be determined.

A BASMAA regional project was initiated in FY 09-10 to develop methods to assess Permittee progress towards TMDL milestones and attainment of WLAs. The project entailed the review of existing information on loads reduced methodologies developed through other recent efforts (e.g., SFEI Proposition 13 Urban Runoff BMP Project) and development of draft loads reduced formulas for specific stormwater management measures. These methods are intended to assist Permittees in calculating PCB and mercury loads reduced through stormwater management measures.

A draft technical memorandum describing initial load reduction quantification methods was submitted to the Water Board in the BASMAA FY 2009-10 Regional POCs and Monitoring Supplement. Written comments were received by Water Board staff and are currently being addressed (see Appendix A5). In FY 11-12, a revised technical memorandum will be developed that incorporates Water Board staff comments and aligns load reduction quantification methods for PCBs and mercury with those currently under development for trash (see Trash Section). Additionally, as information on the effectiveness of management measures becomes available via the Clean Watersheds for Clean Bay (CW4CB) project or other MRP-required pilot studies, the methods presented in the revised technical memorandum may be updated.

In compliance with the MRP, loads reduced reporting for PCBs and mercury will begin with the Integrated Monitoring Report due on March 15, 2014.

MERCURY CONTROLS

This section includes summaries of regional projects/tasks conducted in compliance with provision C.11 that are not connected to parallel PCB (C.12) provisions.

C.11.b. Monitor Methylmercury

MRP Provision C.11.b duplicates the requirement in C.8.g to report results of methylmercury monitoring required in Provision C.8.e. Per the schedule for commencement of POC monitoring described in the Monitoring Status Report, methylmercury monitoring was not required in FY 2010-11.

C.11.h Fate and Transport Study of Mercury in Urban Runoff

This MRP provision requires Permittees to conduct or cause to be conducted studies aimed at better understanding the fate, transport, and biological uptake of mercury discharged in urban runoff to San Francisco Bay and tidal areas. The 2009-10 annual report described the specific manner in which Permittees will meet these information needs through the RMP. The RMP Master Plan (see Appendix A6) describes several strategies to address pollutant-specific information needs and support management decisions through investigation of prioritized Management Questions. During FY 2010-11, the RMP's Mercury Strategy activities included:

- Continuing work on the synthesis of results from recently completed studies on food web mercury uptake and methods to identify high leverage pathways that introduce mercury to Bay food webs. Recommendations for further studies are anticipated in a draft report later in 2011, and may include the development of a methylmercury fate model, more work on mercury isotopes, and more small fish studies.
- A draft report outlining a conceptual model of transport and food web uptake for mercury and PCBs in Bay Margin areas.
- Ongoing Status and Trends monitoring of mercury, PCBs and other pollutants in water, sediment and biota.

BASMAA representatives will continue participation in RMP Work Groups and Committees to ensure future implementation of studies that meet the MRP's stated information needs, which include understanding the in-Bay transport of mercury discharged in urban runoff, the influence of urban runoff on the patterns of food web mercury accumulation, and the identification of drainages where urban runoff mercury is particularly important in food web accumulation.

C.11.j Develop Allocation Sharing Scheme with Caltrans

The San Francisco Bay Mercury TMDL wasteload allocations for urban stormwater implicitly include California Department of Transportation (Caltrans) facilities located within the geographic boundaries of Bay Area urban runoff management agencies. Caltrans manages roadways and other transportation facilities within the urban areas that are covered under both the MRP and the TMDL. Consistent with the TMDL, MRP Provision C.11.j requires the Permittees to develop an equitable mercury allocation-

sharing scheme, in consultation with Caltrans, to address runoff from the Caltrans facilities in the program area.

Caltrans may elect to pursue its own program of mercury load reduction, in lieu of sharing the allocation with the urban runoff management agencies, in which case the Water Board may designate a separate mercury wasteload allocation for Caltrans.

The Permittees are required to report on the status of the efforts to develop the allocation-sharing scheme in the 2010, 2011, and 2012 Annual Reports, and to submit in the 2014 Integrated Monitoring Report the details regarding the manner in which the urban runoff mercury TMDL allocation will be shared between the Permittees and Caltrans.

To comply with this provision, the Permittees are conducting a study with the following objectives:

- Estimate the relative contributions of runoff from Caltrans facilities to urban runoff mercury loadings on an average annual basis within the MRP regulated area,
- Identify any significant temporal or geographical factors that may influence relative proportions of Caltrans vs. MS4 loadings,
- Identify the appropriate share of the TMDL's urban runoff wasteload allocation that is attributable to Caltrans, and
- Engage in a facilitated discussion with Caltrans to identify an equitable allocation-sharing scheme.

As initial steps in this process, BASMAA representatives met with representatives of Caltrans District 4 and Caltrans Headquarters on June 23, 2011, and subsequently exchanged documents relating to pertinent BASMAA and Caltrans activities. Initial discussions have focused on mercury data needs, the potential for collaboration between BASMAA and Caltrans in future mercury monitoring projects, and preliminary work performed to date regarding the estimated proportion of Caltrans contributions to mercury runoff loadings in the SF Bay Area.

Stormwater runoff from Caltrans facilities is regulated under a separate, statewide stormwater NPDES permit, and Caltrans has an active stormwater management program (SWMP). An important aspect of the ongoing discussions involves reconciliation by Caltrans of mercury monitoring requirements within the TMDL, the MRP, and the statewide Caltrans NPDES permit.

Based on monitoring data collected over a number of years, Caltrans has developed a mathematical characterization of stormwater discharge quality from highways and other types of facilities under its jurisdiction, through the Caltrans Discharge Characterization Study. Using data from this study, which includes total mercury, Caltrans has prepared preliminary estimates of the relative contributions of runoff from Caltrans facilities to the overall urban runoff mercury loadings in the SF Bay Area.

Additional document exchange with Caltrans is planned in FY 2011-12, along with follow-up meetings involving BASMAA and Caltrans representatives. Meanwhile the Permittees also will be proceeding with the study as described above.

PCB CONTROLS

This section includes summaries of regional projects/tasks conducted in compliance with provision C.12 that are not connected to parallel Mercury (C.11) provisions.

C.12.b Conduct Pilot Projects to Evaluate Managing PCB-Containing Materials and Wastes during Building Demolition and Renovation (e.g., Window Replacement) Activities

To fulfill MRP requirements in Provision C.12.b, BASMAA has been working with the regional PCBs in Caulk Project (Project) managed by the San Francisco Estuary Partnership (SFEP) and funded by federal stimulus funds (ARRA). The objective is to evaluate the effectiveness of management practices that address legacy caulks containing PCBs as measures to reduce PCB loadings to the Bay. All of the Project deliverables described below are anticipated to be finalized by the Project end date of January 2012. The Project is:

- Evaluating PCB levels in caulk sampled from at least 10 Bay Area sites to better understand which types/ages of buildings are most likely to have caulks with PCBs, so that management actions can be targeted effectively. Surveys previously conducted in Europe and other parts of North America have found caulks/sealants containing PCBs, sometimes in very high concentrations, in a large proportion of older buildings, particularly those built or renovated in the 1950s, 1960s and 1970s. SFEI has conducted the sampling and submitted samples to the laboratory. SFEI anticipates releasing a draft report with the results in October 2011.
- Developing Best Management Practices (BMPs), a Model Implementation Process (MIP), and associated model policies or ordinances to reduce or prevent the release of PCB-laden caulks to the environment during renovation, maintenance and demolition of Bay Area buildings and the subsequent conveyance of the PCB-laden caulks by urban stormwater runoff to San Francisco Bay.

Related products currently available on the SFEP web site include:²⁸

- Best Management Practices (2nd draft)
- Model Implementation Process (2nd draft)
- Training Program Outline (2nd draft)

²⁸<http://www.sfestuary.org/projects/detail.php?projectID=29>

- Technical memorandum on existing regulatory controls and policies related to managing wastes and hazardous materials during building demolition and/or remodeling programs.
- Requests for Participation in Sampling and Implementation Trial Elements of the Project
- Request for Participation - Sampling Element
- Request for Participation - Implementation Trials Element (for municipalities)
- Request for Participation - Implementation Trials Element (for non-municipal agencies and organizations)

During FY 2010-11, BASMAA approved continuation of a Regional Project that allows staff from member stormwater programs to dedicate time on behalf of all Permittees to working with the Project team on implementing the project. The stormwater program staff reports to and receives feedback and guidance from the BASMAA Monitoring and POCs Committee. The staff has fully participated in all facets of the project, including frequent project teleconferences, development of project work plans, review and commenting on all project deliverables, a stakeholder meeting held on October 26, 2010, and a workshop held on July 26, 2011 to perform implementation trials of the recently developed regulatory process to add PCB controls to demolition/renovation permitting. The workshop targeted municipal staff with responsibility for this type of permitting.

It should be noted that the following important direction was provided to Permittees during a discussion with Water Board staff at the BASMAA Board of Directors meeting on June 23, 2011.

- When the MRP was developed it may have been envisioned that PCB BMPs would be applied during demolition/renovation. It now seems more plausible that a process involving hazardous material inspection, sampling, lab testing, preparing an abatement plan, and abatement, would all happen before demolition/renovation, similar to current procedures for asbestos and lead.
- The construction and demolition industry is becoming aware of the problem with PCBs but the focus is on human exposure at the site rather than water quality concerns.
- The various facets of the "big picture" need to be addressed together (e.g., human exposure at the site, water quality, disposal) rather than trying to apply water quality BMPs outside of this context. BASMAA should continue to participate in the stakeholder process as EPA develops related regulations.
- The Project should continue as planned. At this time the highest priority is to use the results from the recent local sampling to estimate how large this source is relative to other PCB sources to the Bay. SFEI is currently addressing this issue via implementing a scope of work that focuses on the following four management questions:
 1. What is the PCB mass associated with sealants in currently standing, commercial and industrial buildings constructed between 1950 and 1980 in the Bay Area?

2. What is the PCB mass released to stormwater during the renovation and demolition of these buildings using current practices (i.e. prior to any PCB in caulk BMP implementation)?
3. How does mass released to stormwater from building renovation and demolition sources compare to other PCB sources in the Bay Area?
4. What information is available, if any, regarding the removal efficiency of BMPs for demolition and renovation of PCB-containing caulk and sealants?

C.12.h Fate and Transport Study of PCBs in Urban Runoff

This MRP provision requires Permittees to conduct or cause to be conducted studies aimed at better understanding the fate, transport, and biological uptake of PCBs discharged in urban runoff. The 2009-10 annual report described the specific manner in which Permittees will meet these information needs through the RMP. The RMP Master Plan (see Appendix A6) describes several Strategies to address pollutant-specific information needs and support management decisions through investigation of prioritized Management Questions. During FY2010-11 the RMP's PCB strategy activities included:

- Recommendations for further studies are anticipated in a draft report later in 2011, and may include more small fish work and ongoing modeling work in an effort to identify high leverage pathways.
- A draft report outlining a conceptual model of transport and food web uptake for mercury and PCBs in Bay Margin areas.
- Monitoring of mercury, PCBs and other pollutants in biota, both ongoing (Status & Trends) and in a special 3-year study of Small Fish living along the Bay margins that are an important link in the Bay food web (funded 2008-2010).
- Development of conceptual models of transport and food web uptake for mercury and PCBs, and Bay Margin areas that will be incorporated with a planned water-sediment-contaminant model linking small tributary inputs to Bay processes.

BASMAA representatives will continue participation in RMP Work Groups and Committees to ensure future implementation of studies that meet the MRP's stated information needs, which include understanding the in-Bay transport of PCBs discharged in urban runoff, the influence of urban runoff on the patterns of food web PCBs accumulation, and the identification of drainages where urban runoff PCBs are particularly important in food web accumulation.

COPPER CONTROLS

C.13.c Vehicle Brake Pads

This MRP provision requires Permittees to engage in efforts to reduce the copper discharged from automobile brake pads to surface waters via urban runoff. Provision

C.13.c.iii requires that the Permittees report on legislation development and implementation status in Annual Reports during the permit term.

Compliance is being achieved through continued participation in a process initiated by the Brake Pad Partnership (BPP) to develop California legislation phasing out copper from certain automobile brake pads sold in California. In FY2010-11 the BPP achieved passage of Senate Bill 346 (Chapter 307, Statutes of 2010). Appendix A7 provides a summary of the bill's provisions and key Permittee activities during_FY 10-11, which included:

1. Participating in revisions to bill language and strategy discussions with bill sponsors during negotiations with industry representatives from the auto and brake pad manufacturers, brake pad wholesalers and retailers, and car dealers;
2. advocating for passage of the bill in the Senate and for signature into law by Governor Schwarzenegger; and
3. tracking and supporting initial implementation steps for the new law.

The above activities were coordinated through the California Stormwater Quality Association (CASQA) BPP Team, a group of stormwater quality agencies affected by copper or metals listings, TMDLs, or permit requirements; as well as through BASMAA.

Appendix A7 also describes progress towards implementation of SB 346. Additional documentation in the form of final SB346 language, a fact sheet from CASQA, two BASMAA support letters, and legislative analysis of the Senate version of the bill are provided in Appendices A8, A9, A10, A11, and A12, respectively.

C.13.e Studies to Reduce Copper Pollutant Impact Uncertainties

This MRP provision requires Permittees to conduct or cause to be conducted technical studies to investigate possible copper sediment toxicity and technical studies to investigate sub-lethal effects on salmonids. These uncertainties regarding copper effects in the Bay are described in the amended Basin Plan's implementation program for copper site-specific objectives. Provision C.13.e.ii does not require reporting on this provision in 2011. Compliance will be achieved through continued participation in the RMP, which is preparing a report on Causes of Toxicity and initiating a study of salmonid olfactory effects that will be completed in FY 2011-12.

PBDES, LEGACY PESTICIDES, AND SELENIUM

C.14.a Control Program for PBDEs, Legacy Pesticides, and Selenium.

This provision requires the Permittees to work with the other municipal stormwater management agencies in the Bay Region to identify, assess, and manage controllable sources of poly-brominated diphenyl ethers (PBDEs), legacy pesticides, and selenium found in urban runoff. The reporting requirement for 2011 is to describe progress towards the following MRP implementation objectives:

Characterize the representative distribution of PBDEs, legacy pesticides, and selenium in the urban areas of the Bay Region covered by this permit to determine:

- (1) If PBDEs, legacy pesticides, and selenium are present in urban runoff;
- (2) If PBDEs, legacy pesticides, or selenium are distributed relatively uniformly in urban areas; and
- (3) Whether storm drains or other surface drainage pathways are sources of PBDEs, legacy pesticides, or selenium in themselves, or whether there are specific locations within urban watersheds where prior or current uses result in land sources contributing to discharges of PBDEs, legacy pesticides, or selenium to San Francisco Bay via urban runoff conveyance systems

The specific approach to filling these information needs is described in the POC Loads Monitoring section of the Monitoring Status Report (Part Two of this Document). The Small Tributaries Loading Strategy Multi-Year Plan (Appendix B2) serves as a framework for monitoring of representative Bay Area watersheds and estimation of regional pollutant loads. These activities will be coordinated among both MRP Permittees and the RMP. Monitoring data collected through the STLS will be supplemented by recent stormwater and sediment monitoring to characterize the distribution and potential source areas of legacy pesticides.

PART B
MONITORING STATUS REPORT

WATER QUALITY MONITORING

This monitoring status report was developed on behalf of all Permittees subject to the Municipal Regional Stormwater NPDES Permit (MRP, Order R2009-0074) issued by the San Francisco Regional Water Quality Control Board (Water Board) on October 14, 2009. Provision C.8 of the MRP requires Permittees to conduct water quality monitoring and associated projects during the term of the MRP.

All water quality monitoring activities required by Provision C.8 are coordinated regionally through the BASMAA Regional Monitoring Coalition (RMC). In a November 2, 2010 letter to Permittees, the Water Board's Assistant Executive Officer (Thomas Mumley) acknowledged that all Permittees have opted to conduct monitoring required by the MRP through the RMC. The letter noted that monitoring coordinated through the RMC must begin by October 2011. The letter also asked that Permittees submit to Water Board staff:

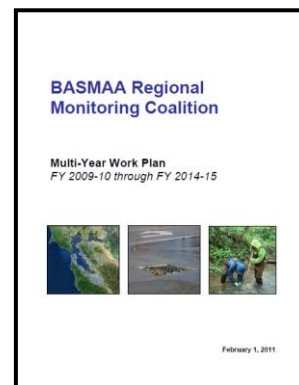
- Status reports on RMC projects and activities by March 15 and September 15 of 2011 and 2012; and,
- A status report and proposed schedule for completing an alternative sampling design(s) and associated multi-year monitoring plan(s) to address Pollutants of Concern and Long-Term Trends Monitoring requirements included in Provision C.8.e, no later than March 15, 2011.

A monitoring progress report was submitted to the Water Board on March 15, 2011. This progress report²⁹ provides updates on RMC activities conducted between January and mid-July 2011.

RMC MULTI-YEAR WORK PLAN

In February 2011, the RMC developed a Multi-Year Work Plan (RMC Work Plan) to provide a framework for implementing regional monitoring and assessment activities required under MRP provision C.8. The RMC Work Plan summarizes RMC projects planned for implementation between Fiscal Years 2009-10 and 2014-15. Projects were collectively developed by RMC representatives to the BASMAA Monitoring and Pollutants of Concern Committee (MPC), and were conceptually agreed to by the BASMAA Board of Directors (BOD). The BOD serves as the overall oversight committee to the RMC, and the MPC has the responsibility of directly managing and implementing projects summarized in The RMC Work Plan.

A total of 27 regional projects are identified in the RMC Work Plan, based on the requirements described in provision C.8 of the MRP. Many regional projects were approved as Regional Projects by the BOD during FY 2009-10 and 2010-11, and are



²⁹ This status report is not required by the MRP and is provided as a courtesy to Water Board staff in response to the November 2, 2010 letter. It addresses the above request for information to be provided by September 15, 2011.

currently underway. Others are planned to begin in FY 2011-12 or subsequent fiscal years based on schedules outlined in the MRP. The following sections provide brief summaries on progress made by the RMC on approved regional projects that are currently underway or in the planning process. Summaries provided are grouped by sub-provision of MRP provision C.8, which include:

- Compliance Options (C.8.a)
- San Francisco Estuary Receiving Water Monitoring (C.8.b)
- Creek Status Monitoring (C.8.c)
- Monitoring Projects (C.8.d)
- Pollutants of Concern and Long-Term Trends Monitoring (C.8.e)
- Citizen Monitoring and Participation (C.8.f)
- Reporting (C.8.g)
- Monitoring Protocols and Data Quality (C.8.h)

C.8.A COMPLIANCE OPTIONS

Provision C.8.a (Compliance Options) of the MRP allows Permittees to address monitoring requirements through a “regional collaborative effort” (e.g., RMC), their Stormwater Program, and/or individually. In June 2010, Permittees notified the Water Board in writing of their agreement to participate in a regional monitoring collaborative to address requirements in Provision C.8³⁰. The regional monitoring collaborative is referred to as the BASMAA Regional Monitoring Coalition (RMC). With notification of participation in the RMC, participating Permittees are required to commence water quality data collection by October 2011. Therefore, with the exception of monitoring described in this section under provision C.8.b (SF Bay Receiving Waters), Permittee efforts in FY 2010-11 described in this section were generally focused on the development and early implementation of the RMC- associated near-term projects.

C.8.B SAN FRANCISCO ESTUARY RECEIVING WATER MONITORING

As described in Provision C.8.b, Permittees are required to contribute their fair-share financially on an annual basis towards implementing an Estuary receiving water monitoring program that at a minimum is equivalent to the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP). During FY 2010-11, Permittees complied with this provision by making financial contributions to the RMP directly or through stormwater programs (Table B.1). Additionally, Permittees actively participated in RMP committees and work groups through Permittee and/or stormwater program staff as described in the following sections, which also provide a brief description of the RMP and associated monitoring activities conducted in FY 2010-11.

Regional Monitoring Program (RMP)

The RMP is a long-term monitoring program that shares financial support, direction, and participation by regulatory agencies and the regulated community with the goal of

³⁰ The Cities of Antioch, Brentwood and Oakley, and portions of Contra Costa County are not subject to the MRP, but have similar requirements and are therefore participating in the RMC.

assessing water quality in the San Francisco Bay. The regulated community includes Permittees, publicly owned treatment works (POTWs), dredgers and industrial dischargers. The RMP is intended to answer the following core management questions:

1. Are chemical concentrations in the Estuary potentially at levels of concern and are associated impacts likely?
2. What are the concentrations and masses of contaminants in the Estuary and its segments?
3. What are the sources, pathways, loadings, and processes leading to contaminant related impacts in the Estuary?
4. Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased?
5. What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?

Table B.1. Stormwater Program annual contributions to the Regional Monitoring Program for Water Quality in the San Francisco Bay Estuary in 2010 and 2011.

| Stormwater Program/Agency | 2010 | 2011 |
|---|-------------|-------------|
| Santa Clara Valley Urban Runoff Pollution Prevention Program | \$173,820 | \$173,934 |
| Alameda Countywide Clean Water Program | \$168,561 | \$168,592 |
| Contra Costa Clean Water Program | \$136,589 | \$136,623 |
| San Mateo Countywide Water Pollution Prevention Program | \$83,603 | \$83,602 |
| Marin Countywide Stormwater Pollution Prevention Program | \$55,557 | \$55,507 |
| Vallejo Sanitation and Flood Control District | \$12,864 | \$12,809 |
| Fairfield-Suisun Urban Runoff Management Program | \$14,803 | \$14,697 |
| City and County of San Francisco ^a | \$38,773 | \$38,805 |
| California Department of Transportation (CalTrans) ^a | \$76,063 | \$76,063 |

^aAlthough contributors to the RMP under the umbrella of "stormwater", during FY 2010/11 these entities were not members of BASMAA.

The RMP budget is generally broken into two major program elements: Status and Trends, and Pilot/Special Studies. The following paragraphs provide a brief overview of these programs.

RMP Status and Trends Monitoring Program

The Status and Trends Monitoring Program (S&T Program) is the long-term contaminant-monitoring component of the RMP. The S&T Program was initiated as a pilot study in 1989 and redesigned in 2007 based on a more rigorous statistical design that enables the detection of trends. In FY 2010-11, the S&T Program was comprised of the following

program elements that collect data to address RMP management questions described above:

- Water/Sediment/Biota Chemistry and Toxicity Monitoring
- Sediment Benthos Monitoring
- Small and Large Tributary Loading Studies
- Small Fish and Sport Fish Contamination Studies
- Studies to Determine the Causes of Sediment Toxicity
- Suspended Sediment, Hydrography and Phytoplankton Monitoring
- Bird Egg Monitoring

Additional information on the S&T Program and associated monitoring data are available for downloading via the RMP website using the Status and Trends Monitoring Data Access Tool at www.sfei.org/rmp/data.htm.

RMP Pilot and Special Studies

The RMP also conducts Pilot and Special Studies (P/S Studies) on an annual basis. Studies usually are designed to investigate and develop new monitoring measures related to anthropogenic contamination or contaminant effects on biota in the Estuary. Special Studies address specific scientific issues that RMP committees and standing workgroups identify as priority for further study. These studies are developed through an open selection process at the workgroup level and selected for funding through RMP committees. Results and summaries of the most pertinent P/S Studies can be found on the RMP website (www.sfei.org/rmp/).

In FY 2010-11, a considerable amount of RMP and Stormwater Program staff time was spent in defining and implementing special studies associated with the RMP's Small Tributary Loading Strategy (STLS) and the development of the STLS Multi-Year Monitoring Plan (MYP). Pilot and special studies associated with the STLS are intended to fill data gaps associated with loadings of Pollutants of Concern (POC) from relatively small tributaries to the San Francisco Bay. Additional information is provided on STLS-related studies under section C.8.e (POC and Long-Term Trends Monitoring) of this monitoring status report.

Participation in Committees, Workgroups and Strategy Teams

In FY 2010-11, Permittees actively participated in the following RMP Committees and work groups:

- Steering Committee (SC)
- Technical Review Committee (TRC)
- Sources, Pathways and Loadings Workgroup (SPLWG)
- Contaminant Fate Workgroup (CFWG)
- Exposure and Effects Workgroup (EEWG)
- Emerging Contaminant Workgroup (ECWG)
- Sport Fish Monitoring Workgroup
- Toxicity Workgroup
- Strategy Teams (e.g., PCBs, Mercury, Dioxins, Small Tributaries)

Committee and workgroup representation was provided by Permittee, stormwater program staff and/or individuals designated by RMC participants and the BASMAA Board of Directors (BOD). Representation included participating in meetings, reviewing technical reports and work products, co-authoring articles included in the RMP's *Pulse of the Estuary*, and providing general program direction to RMP staff. Representatives of the RMC also provided timely summaries and updates to, and received input from stormwater program representatives (on behalf of Permittees) during MPC and/or BOD meetings to ensure Permittees' interests were adequately represented.

C.8.C CREEK STATUS MONITORING

Provision C.8.c requires Permittees to conduct creek status monitoring that is intended to answer the following management questions:

1. Are water quality objectives, both numeric and narrative, being met in local receiving waters, including creeks, river and tributaries?
2. Are conditions in local receiving waters supportive of or likely supportive of beneficial uses?

Creek status monitoring parameters, methods, occurrences, durations and minimum number of sampling sites for each stormwater program are described in Table 8.1 of the MRP. Based on the implementation schedule described in MRP Provision C.8.a.(ii), creek status monitoring coordinated through the RMC is not scheduled to begin until October 2011 (FY 2011-12). Therefore, the status of field work required by Table 8.1 is not included in this progress report. That said, Permittee and stormwater program staff (on behalf of Permittees) spent considerable time conducting RMC creek status monitoring related planning projects included in the RMC Work Plan. Planning projects conducted in FY 2010-11 were intended to assist Permittees in designing and implementing a regional creek status monitoring program that will allow each stormwater program to assess the status of local water bodies, while contributing data to answering regional questions about the condition of aquatic life beneficial uses in all Bay Area creeks.

The following sections provide brief summaries of each RMC creek status monitoring project that was conducted in FY 2010-11. A draft implementation schedule for RMC creek status monitoring is included as Appendix B1.

Creek Status Monitoring Design

Significant progress was made in FY 2010-11 on designing a regional monitoring strategy for complying with MRP provision C.8.c - creek status monitoring. First, the RMC agreed to collectively design a regional creek status monitoring program that includes both ambient/probabilistic and targeted components. These monitoring designs allow each individual RMC participating program to assess the status of beneficial uses in local creeks within its Program (jurisdictional) area while contributing data to answer management questions at the regional scale (e.g., differences between aquatic life

condition in urban and non-urban creeks). The creek status monitoring designs are primarily intended to answer the following core management questions:

- What is the condition of aquatic life San Francisco Bay Area creeks?
- What are the major stressors to aquatic life?

Table B.2 lists each chemical, biological and physical response and stressor indicators that will be monitored by RMC participants, and the associated monitoring designs and reporting formats. Additional information is provided below about the design by which each of these questions will be answered, and can also be found in *Draft RMC Creek Status and Trends Monitoring Plan* that is currently under review by RMC participants and SWAMP.

Table B.2. Summary of RMC creek status indicators, associated monitoring designs and scales of reporting.

| Biological Response and Stressor Indicators | Monitoring Design | | Reporting | |
|---|--------------------------------|------------------|-----------|-------|
| | Regional Ambient/Probabilistic | Locally Targeted | Regional | Local |
| Bioassessment & Physical Habitat Assessment | X | | X | |
| Chlorine | X | | X | |
| Nutrients | X | | X | |
| Water Toxicity | X | | X | |
| Sediment Toxicity | X | | X | |
| Sediment Chemistry | X | | X | |
| General Water Quality (Continuous) | | X | | X |
| Temperature (Continuous) | | X | | X |
| Bacteria | | X | | X |
| Stream Survey | | X | | X |

Regional Probabilistic Design

RMC participants will conduct a condition assessment to address the first core monitoring question, by sampling two biological response indicators: benthic macroinvertebrates and algae. This question will be addressed using an ambient (probabilistic) monitoring design in order to establish a statistically representative understanding of the relative condition of aquatic life in wadable creeks in the RMC area (Figure B.1). The number of monitoring sites sampled annually by RMC participants is consistent with Table 8.1 of the MRP. With agreement from Water Board staff, RMC participant sites are distributed among creek reaches with urban (80%) and nonurban (20%) land uses. Additionally, Region 2 SWAMP is also participating in the regional condition assessment by sampling 10 nonurban sites annually.

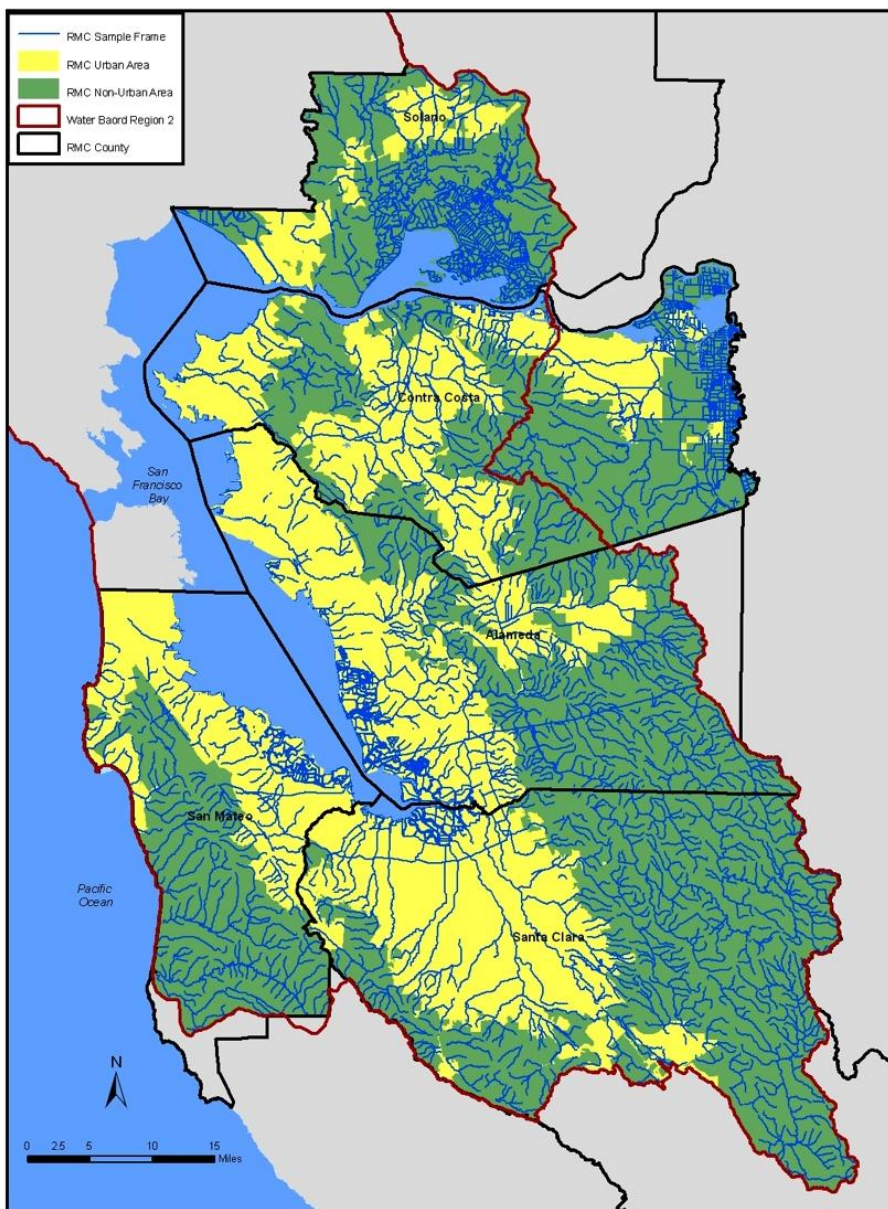


Figure B.1. BASMAA Regional Monitoring Coalition (RMC) applicable urban and non-urban areas and associated creeks.

Stressor Assessment

Stressor assessments will also be conducted by RMC participants in compliance with provision C.8.c. Stressor assessments are intended to address the second core RMC management question, and depending on the indicator, will either be monitored at bioassessment sites selected via the ambient (probabilistic) monitoring design or at targeted sites selected by RMC participating programs (see Table B.2).

Standard Operating and Data Quality Assurance Procedures

In parallel with the RMC creek status monitoring plan development, the RMC is also developing RMC-specific Standard Operating Procedures (SOPs) and a Quality Assurance Project Plan (QAPP) through a regional project. These documents are consistent with the existing SWAMP QAPP and build upon SWAMP SOPs. These documents are currently in draft form and under review by RMC participants and SWAMP staff. Finalization is expected in the fall of 2011.

Creek Status and Trends Information Management System Development

RMC participants are currently scoping the development of a regional RMC creek status and trends information management system (i.e., database) through a regional project. A draft Information Management System Work Plan has been created and is currently being reviewed by RMC participants. It is anticipated that database development will begin in the fall 2011 and be completed by spring 2012.

C.8.D MONITORING PROJECTS

Three types of monitoring projects are required by provision C.8.d of the MRP: 1) Stressor/Source Identification (C.8.d.i); 2) BMP Effectiveness Investigation (C.8.d.ii); and, 3) Geomorphic Project (C.8.d.iii). These projects are generally described in the RMC Work Plan. Based on the compliance schedules described in the MRP for these Provisions, in FY 2010-11 Permittees focused mostly on scoping future collaborative RMC projects, except that the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) completed field work for a stressor/source identification study in FY 2010-11 (Coyote Creek) and began planning for an additional FY 2011-12 study (Guadalupe River & Alviso Slough). Additional information on these studies can be found in the monitoring section of the SCVURPPP FY 2010-11 Annual Report.

C.8.E POLLUTANTS OF CONCERN AND LONG-TERM TRENDS MONITORING

POC Loads Monitoring

Pollutants of Concern (POC) loads monitoring is required by provision C.8.e(i) of the MRP. Loads monitoring is intended to assess inputs of POCs to the Bay from local tributaries and urban runoff, assess progress toward achieving wasteload allocations (WLAs) for TMDLs, and help resolve uncertainties associated with loading estimates for these pollutants. In particular, there are four priority management questions that need to be addressed through POC loads monitoring:

1. Which Bay tributaries (including stormwater conveyances) contribute most to Bay impairment from POCs;
2. What are the annual loads or concentrations of POCs from tributaries to the Bay;
3. What are the decadal-scale loading or concentration trends of POCs from small tributaries to the Bay; and,

4. What are the projected impacts of management actions (including control measures) on tributaries and where should these management actions be implemented to have the greatest beneficial impact.

Based upon compliance schedules described in MRP Provision C.8.a(ii), participants of the RMC are required to begin POC loads monitoring in October 2011. Therefore, RMC participant activities associated with POC loads monitoring during FY 2010-11 were generally spent preparing for monitoring by this date. To assist participants in effectively and efficiently conducting POC loads monitoring required by the MRP and answer POC loads management questions listed above, an RMP Small Tributaries Loading Strategy (STLS) was developed in 2009 by the STLS Team, which included representatives from BASMAA, Water Board, RMP/SFEI and technical advisors. The objective of the STLS is to develop a comprehensive planning framework to coordinate POC loads monitoring/modeling between the RMP and RMC participants.

FY 2010-11 STLS Projects

On behalf of RMC participants and the RMP, the STLS Team completed a number of POC loads monitoring projects in 2010-11. The main goal of the projects was to inform the development of an alternative approach to POC loads monitoring requirements described in MRP Provision C.8.e.i. The alternative approach is briefly described in the next section and fully described in the Small Tributaries Loading Strategy (STLS) Multi-Year Plan (Appendix B2). Summaries for STLS projects completed in FY 2010-11 are provided below. Full descriptions of these studies are included in the STLS MYP and associated appendices.

- Sampling Methods Optimization – The STLS Team completed a study in FY 2010-11 that evaluated a variety of POC loads sampling methods, including those currently employed by the RMP (e.g., turbidity surrogate) and the MRP default sampling method (i.e., flow-weighted composite). The methods optimization study was intended to provide recommendations on the most cost effective methods that could be employed by RMC participants and the RMP, while still adequately addressing POC loads management questions with needed accuracy and precision. The results of the study are presented in Appendix B2c.
- Watershed Categorization - The STLS Team completed a desktop study in FY 2010-11 that categorized watersheds into different “types” based on a variety of watershed characteristics (e.g., land use, imperviousness, area, sediment loading, and contaminant history). The goal of the study was to answer two key questions for the design of the STLS Multi-Year Plan (MYP) watershed monitoring:
 1. How many types of watersheds occur in the region and,
 2. How many watersheds should be studied to answer key management questions, and how should they be distributed among the identified types?

To answer these questions, SFEI conducted a preliminary characterization study using ordination and cluster analysis; exploratory statistical techniques designed

to visualize patterns on complex multivariate data sets. The study aimed for an initial classification of Bay Area small tributary watersheds into a small number (<10) of classes, relevant for POC loads monitoring and assessments of Bay margin impacts. A total of eight classes of watersheds were developed and appear to be meaningful for the STLS purposes. Additional information regarding this study is included in Appendix B2c.

- POC Characterization Monitoring (16 Watersheds) - As an alternative to continuing long-term POC loads monitoring at bottom of watershed locations (e.g., Guadalupe River or Zone 4 – Line A) in FY 2010-11, the STLS Team agreed that the RMP should conduct a geographically broader study in FY 2010-11 to characterize POC concentrations in a number of small tributaries in the Bay Area. A total of 16 tributaries were sampled during one or two storms that occurred in FY 2010-11 and water samples were analyzed for a number of POCs, including PCBs, total mercury, PBDEs, polycyclic aromatic hydrocarbons (PAHs) and selenium. Preliminary results were presented to the STLS Team and the Sources, Pathways and Loadings Workgroup (SPLWG) in spring 2011. Appendix B2e provides a summary of the methods and results.
- Regional Watershed Spreadsheet Model – In FY 2010-11, the STLS Team began development of a Regional Watershed Spreadsheet Model (RWSM), which will be the primary tool for estimation of overall POC loads to the Bay. Given the large number of small tributaries, initial STLS Team discussions indicated this is more suitable as a framework for regional load estimation than simulation models (e.g., HSPF and SWMM) that require large and detailed calibration datasets. The RWSM is structured similarly to Ha and Stenstrom (2008), using GIS-derived data for land use, imperviousness, average soil type/slope and annual precipitation. It also uses recent local data on land use based POC concentrations collected in the Bay area and augmented using recent stormwater literature on Event Mean Concentrations (EMCs). FY 2010-11 outcomes included the development of two parallel hydrological models, one using land use based runoff coefficients and the other using imperviousness based runoff coefficients. The model outcomes were compared to empirical observations in 18 calibration watersheds.

STLS Multi-Year Plan (version 2011)

Based on the consensus of the STLS Team, RMC representatives in coordination with SFEI staff created a STLS Multi-Year Plan (MYP) that is intended to assist Permittees in complying with provision C.8.e (POC Monitoring) through an alternative POC monitoring program than the one described in the MRP. The MYP is designed to address the four core POC monitoring management questions, while integrating activities funded by BASMAA via the RMC and the RMP. The MYP provides a more comprehensive description of the suite of activities to be included in the STLS over the next 5 to 10 years, including a detailed rationale for the methods and locations of proposed activities (e.g., POC loads monitoring in small tributaries).

The following four major POC monitoring components are included in the MYP (version 2011):

- Watershed modeling (RWSM);
- Bay Margins Modeling;
- Source Area Runoff Monitoring; and,
- Small Tributaries Monitoring

A full description activities planned in FY 11-12 for each of these components is included in the MYP (Appendix B2). The following paragraphs provide brief summaries of each.

- Watershed Modeling - Updates to the RWSM currently underway focus on developing load estimates for sediment, mercury and PCBs. Additional information on the status and future plans for the RWSM will be included i with the next version of the MYP. To be provided by March 2012.
- Bay Margins Modeling – The RMP is also in the process of developing a Bay Margins Conceptual Model as part of a separate Bay Modeling Strategy overseen by the RMP's Contaminant Fate Work Group. The initial draft strategy (Jones et al., 2011) recommends development of a full-Bay 3-D model that could identify high-leverage watersheds whose POC loadings contribute disproportionately to Bay impacts. Further development of the Bay Modeling Strategy is planned to occur in FY 2011-12.
- Source Area Runoff Monitoring – This is a placeholder in the STLS for studies to develop Event Mean Concentrations of POCs to parameterize the RWSM.
- Small Tributaries Watershed Monitoring - Four stations were selected for small tributary loads monitoring beginning in October 2011. These stations include; 1) Lower Marsh Creek(Contra Costa County); 2) Guadalupe River (Santa Clara County); 3) Lower San Leandro Creek (Alameda County); and, 4) Sunnyvale East Channel (Santa Clara County). The Lower Marsh Creek and Guadalupe River stations will be operated by the Contra Costa Clean Water Program and the Santa Clara Valley Urban Runoff Pollution Prevention Program, respectively, on behalf of RMC participants. The Lower San Leandro Creek and Sunnyvale East Channel stations will be operated by SFEI on behalf of the RMP. Monitoring methods and analytes are described in the MYP (Appendix B2).

Long-Term Trends Monitoring

In addition to POC loads monitoring, Provision C.8.e requires Permittees to conduct long-term trends monitoring to evaluate if stormwater discharges are causing or contributing to toxic impacts on aquatic life. Required long-term monitoring parameters, methods, intervals and occurrences are included in Table 8.4 of the MRP and prescribed long-term monitoring locations are included in Table 8.3. Similar to creek

status and POC loads monitoring, long-term trends monitoring is scheduled to begin October 2011 for RMC participants.

As described in the *Draft RMC Creek Status and Trends Monitoring Plan*, the State of California's Surface Water Ambient Monitoring Program (SWAMP) through its Statewide Stream Pollutant Trend Monitoring Program (SPoT) currently monitors the seven long-term monitoring sites required by Provision C.8.e.ii. Sampling via the SPoT program is currently conducted at the sampling interval described in Provision C.8.e.iii in the MRP. The SPoT program is generally conducted to answer the management question:

- What are the long-term trends in water quality in creeks?

Based on discussions with Region 2 SWAMP staff, RMC participants intend to comply with MRP provision C.8.e that are associated with long-term trends via monitoring conducted by the SPoT program. This manner of compliance is consistent with the MRP language in provision C.8.e.ii. In FY 2011-12, RMC representatives will continue to coordinate with the SPoT program on long-term monitoring to ensure MRP monitoring requirements are addressed.

Sediment Delivery Estimate/Budget

Provision C.8.e.(vi) of the MRP requires Permittees to develop a design for a robust sediment delivery estimate/sediment budget in local tributaries and urban drainages, and implement the study by July 1, 2012. The purpose of the sediment delivery estimate is to improve the Permittees' ability to estimate urban runoff contributions to loads of POCs, which are generally closely associated with sediment. To determine a strategy for a robust sediment estimate/budget, the BASMAA Board of Directors (BOD) approved a Regional Project in FY 2009-10 to begin reviewing current sediment delivery estimates, better define the objectives for improvement and determine what additional work is needed in FY 2010-11 and beyond. Based on the work conducted by the STLS Team in FY 2010-11, it is highly likely that RMC participants will rely on information collected via the STLS MYP and previous sediment delivery estimates developed by the RMP to comply with this MRP requirement. Therefore, the implementation of the sediment delivery/budget study will occur in parallel to the MYP. Additional information the scope of the study and pertinent details will be included in future Monitoring Status Reports (March and September 2012).

Emerging Pollutants Work Plan

In compliance with Provision C.8.e.v, Permittees are required by March 2014 to develop a work plan and schedule for initial loading estimates and source analyses for the following emerging pollutants: 1) endocrine-disrupting compounds; 2) PFOS/PFAS (Perfluorooctane Sulfonates (PFOS)); 3) Perfluoroalkyl Sulfonates (PFAS); and, 4) NP/NPEs (nonylphenols/nonylphenol esters —estrogenlike compounds). The intent of the work plan is to begin planning for implementation during the next permit term (i.e., post December 2014). Because the compliance date for completion of this work plan is over four years into the future, only initial discussions of the scope of this project were

discussed in FY 2010-11 by the RMC participants. BASMAA representatives to the STLS Team will coordinate efforts with the Emerging Contaminants Strategy being developed by the RMP through the Master Planning process. Additional information on the status of this project will be provided in subsequent Monitoring Status Reports.

C.8.F CITIZEN MONITORING AND PARTICIPATION

Participants of the RMC, to varying degrees, currently coordinate with or support citizen monitors within their geographical areas. As a result, relationships have been developed between RMC participants and citizen monitors. In FY 2010-11, Permittees began to plan for future coordination with citizen monitors in their respective geographical areas. Information sharing among RMC participants about activities designed to encourage citizen monitoring is planned to occur in FY 2011-12 and future years at MPC meetings.

C.8.G REPORTING

Provision C.8.g requires Permittees to report annually on water quality data collected in compliance with the MRP. Annual reporting requirements include: 1) water quality standard exceedances; 2) creek status monitoring electronic reporting; and, 3) urban creeks monitoring reporting. For RMC participants, annual reporting requirements begin following monitoring which is scheduled to commence in October 2011. Therefore, reporting of water quality monitoring data collected in compliance with the Provision C.8 of the MRP is not required in FY 2010-11.

In preparation for the development of future monitoring reports, and less frequent reporting requirements included in Provisions C.8.g.iv (Monitoring Project Reports) and C.8.g.v (Integrated Monitoring Report), the RMC Work Plan, Draft Creek Status and Trends Monitoring Plan, and STLS MYP describe reporting planned by RMC participants in future fiscal years.

C.8.H MONITORING PROTOCOLS, DATA QUALITY AND DATA MANAGEMENT

Provision C.8.h requires that water quality data collected by Permittees in compliance with the MRP should be of a quality that is consistent with the State of California's Surface Water Ambient Monitoring Program (SWAMP) standards, set forth in the SWAMP Quality Assurance Project Plan (QAPP). To assist Permittees in meeting SWAMP data quality standards and developing data management systems that allow for easy access of water quality monitoring data by Permittees, the RMC began implementing a number of regional projects in FY 2010-11. These projects include:

- Standard Operating and Data Quality Assurance Procedures – Two projects designed to address monitoring protocols and data quality requirements described in Provision C.8.h were approved by the BOD in FY 2009-10. The first entails the development of a new field manual and quality assurance project plan (QAPP) for POC loads monitoring coordinated through the STLS Team and described in the MYP (Appendix B2). The Field Manual and QAPP will be completed in FY 2011-12. The second project entails the adaptation of existing

creek status monitoring SOPs and QAPP developed by SWAMP to document the field procedures necessary to maintain comparable and high quality data among RMC participants. This project is also scheduled for completion in FY 2011-12.

- Information Management System Development/Adaptation – As described in the RMC Work Plan, RMC participants would like to store and manage water quality data collected in compliance with Provision C.8 in a cost effective manner that allows data users to easily access and query data and information. Therefore, in FY 2010-11 the RMC began two regional projects designed to develop POC Monitoring and Creek Status and Trends Information Management Systems (IMSs) for use by the RMC. The goal of these projects is to provide standardized data storage formats, thus providing a mechanism for sharing data among RMC participants. Each project is planned for completion in FY 2011-12.