SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

555 County Center
Redwood City, CA 94063

P 650.599.1406
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flowstobay.org

September 17, 2012

Bruce Wolfe, Executive Officer
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

SUBJECT: SUBMITTAL OF THE SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM'S FY 2011/12 ANNUAL REPORT

Dear Mr. Wolfe:

The San Mateo Countywide Water Pollution Prevention Program (Countywide Program) is pleased to submit the enclosed Fiscal Year 2011/12 Annual Report. This report describes Municipal Regional Permit (MRP) compliance activities conducted at the regional and countywide levels on behalf of all of the Countywide Program's member agencies. It also incorporates by reference and includes as appendices several reports prepared by the Bay Area Stormwater Management Agencies Association (BASMAA) on behalf of all Bay Area MRP Permittees.

I certify under penalty of law that the Countywide Program FY 2011/12 Annual Report and BASMAA's associated regional reports were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my enquiry of the person or persons who manage the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The Countywide Program and its 22 member agencies look forward to continuing to work with you and your staff on implementation of the MRP. If you have any questions or comments, please call me at (650) 599-1419.

Sincerely,

Matthew Fabry

Matthew Fabry
Program Coordinator

Enclosure: Countywide Program FY 2011/12 Annual Report

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

Countywide Program Annual Report

FY 2011-12

September 15, 2012

A Program of the City/County Association of Governments

Credits

This report is being submitted by the participating agencies in the

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.
www.flowstobay.org

Town of Atherton
City of Belmont
City of Brisbane
City of Burlingame
Town of Colma
City of Daly City
City of East Palo Alto
City of Foster City
City of Half Moon Bay
Town of Hillsborough
City of Menlo Park
City of Millbrae
City of Pacifica
Town of Portola Valley
City of Redwood City
City of San Bruno
City of San Carlos
City of San Mateo
County of San Mateo
San Mateo County Flood Control District
City of South San Francisco
Town of Woodside

Implementation of the Program Coordinated by:
San Mateo Countywide Water Pollution Prevention Program
555 County Center
Redwood City, California 94063
A Program of the City/County Association of Governments (C/CAG)

Report Prepared by:
San Mateo County Environmental Health and
EOA, Inc.

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FY 2011-2012 Annual Report Forms completed by member agencies are located in one electronic file submitted to the San Francisco Bay Regional Water Quality Control Board.

List of Acronyms

ABAG:	Association of Bay Area Governments
BASMAA:	Bay Area Stormwater Management Agencies Association
BASMAA MPC:	Bay Area Stormwater Management Agencies Association Monitoring and Pollutants of Concern Committee
BASMAA RMC:	Bay Area Stormwater Management Agencies Association Regional Monitoring Coalition
BMPs:	Best Management Practices
CASQA:	California Stormwater Quality Association
C/CAG:	City/County Association of Governments of San Mateo County
CEH:	County Environmental Health
CII:	Commercial/Industrial/Illicit (Subcommittee)
CW4CP:	Clean Watersheds for a Clean Bay
CWEA:	California Water Environment Association
DO:	Dissolved Oxygen
EPA:	Environmental Protection Agency
FY:	Fiscal Year
HHW:	Household Hazardous Waste
IPM:	Integrated Pest Management
IMS:	Information Management System
LID:	Low Impact Development
MRP:	Municipal Regional Stormwater NPDES Permit
MS4:	Municipal Separate Storm Sewer System
MSI:	Marine Science Institute
NDS:	New Development Subcommittee
NPDES:	National Pollutant Discharge Elimination System

OWOW:	Our Water Our World
PAPA:	Pesticide Applicators Professional Association
PBDEs:	Polybrominated Diphenyl Ethers
PCBs:	Polychlorinated Biphenyls
PIP:	Public Information and Participation
POTW:	Publicly-Owned Treatment Works (sewage treatment plants)
QAPP:	Quality Assurance Project Plan
RMP:	San Francisco Estuary Regional Monitoring Program for Trace Substances
RMP STLS:	Regional Monitoring Program Small Tributaries Loading Strategy Work Group
RWQCB:	Regional Water Quality Control Board
SFEP:	San Francisco Estuary Partnership
SMC:	San Mateo County
SMCWPPP:	San Mateo Countywide Water Pollution Prevention Program
SOP:	Standard Operating Procedure
SWMP:	Stormwater Management Plan
SWPPP:	Stormwater Pollution Prevention Plan
TAC:	Technical Advisory Committee
TAPE:	Technology Assessment Protocol- Ecology
TMDL:	Total Maximum Daily Load
VSQG:	Very Small Quantity Generator
WAM:	Watershed Assessment and Monitoring

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EXECUTIVE SUMMARY

INTRODUCTION

The FY 2011-12 Annual Report was developed in compliance with the National Pollutant Discharge Elimination System (NPDES) stormwater Municipal Regional Permit (MRP) adopted in October 2009. This section summarizes stormwater pollution prevention and control activities implemented by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) in FY 2011-12.

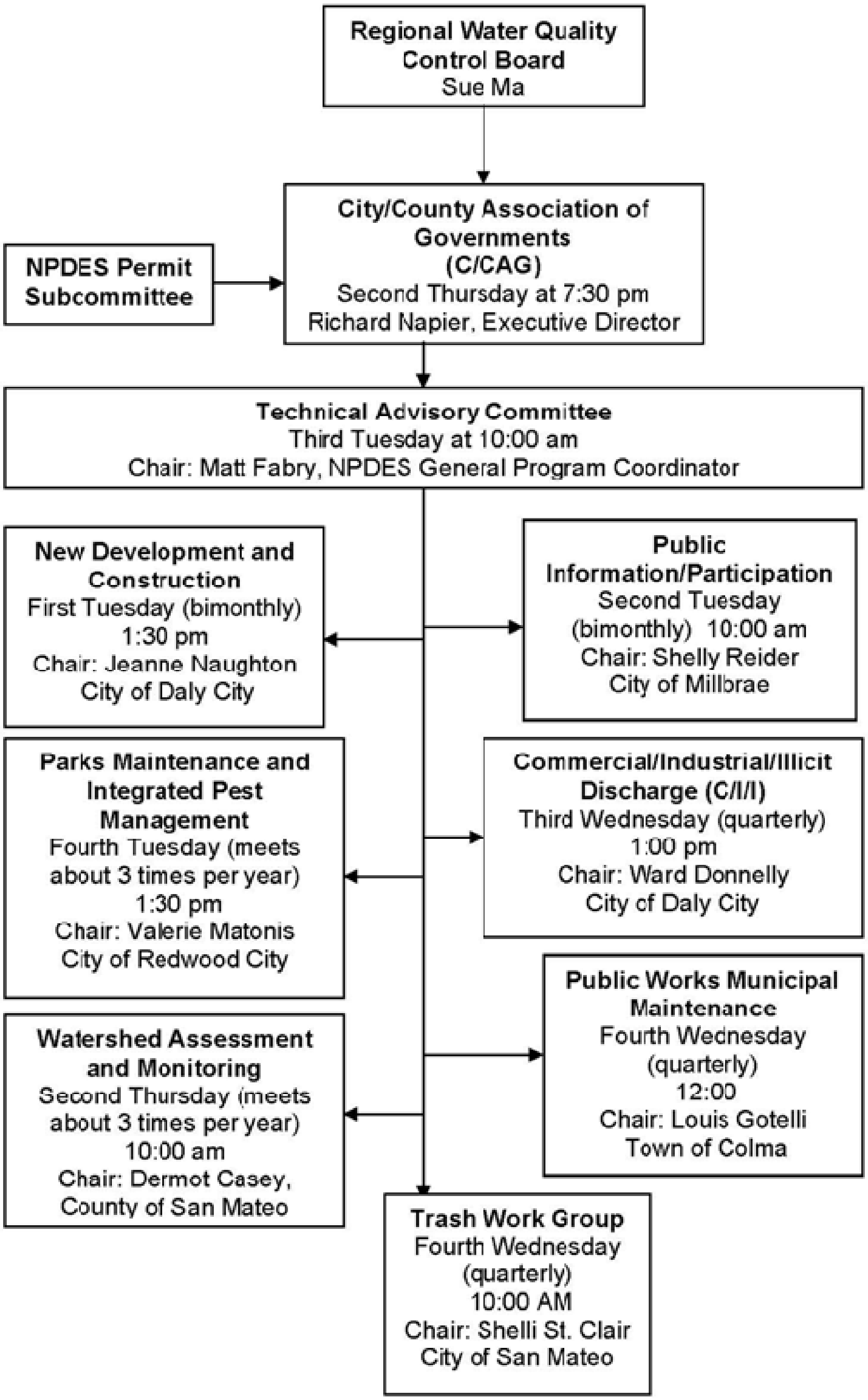
The FY 2011-12 Annual Report summarizes progress in implementing the MRP through the following five major components of SMCWPPP:

- Municipal Operations
- New Development and Construction Controls
- Industrial and Illicit Discharge Controls
- Public Information and Participation
- Watershed Assessment and Monitoring

SMCWPPP's activities benefit all of its member agencies. The organizational structure of SMCWPPP is provided in Figure 1-1. The City/County Association of Governments (C/CAG) of San Mateo County, comprised of local elected city council representatives from each member agency, a member of the County Board of Supervisors, and representatives from the transit district and transportation authority, is the administrative and policy making body for SMCWPPP. C/CAG is a Joint Powers Authority (JPA) for issues of regional importance to San Mateo County jurisdictions. A 1993 amendment to the JPA Agreement made C/CAG responsible for assisting member agencies with complying with the NPDES municipal stormwater permit, including its latest incarnation as the MRP.

Figure 1-1.

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM
ORGANIZATIONAL STRUCTURE AND MEETINGS



C/CAG's decisions are assisted by a Technical Advisory Committee (TAC), which is comprised of municipal representatives with a variety of backgrounds including engineering, planning, environmental health, wastewater treatment, and public works administration. The TAC has established various subcommittees and work groups to help implement the different aspects of the MRP.

The TAC met ten times during FY 2011-12 to assist with planning and organizing SMCWPPP's MRP compliance activities. Table 1-1 summarizes attendance at the TAC meetings held during FY 2011-12.

SUMMARY OF ACCOMPLISHMENTS

Major accomplishments during FY 2011-12 are described below.

Municipal Maintenance Activities

The MRP includes the following three municipal operations-related provisions that are implemented with the assistance and participation of the subcommittee and work groups listed below:

- Implementation of Provision C.2 Municipal Operations is coordinated through the SMCWPPP Public Works Municipal Maintenance Subcommittee.
- Implementation of Provision C.9 Pesticides Toxicity Control (except Provision C.9.h - public outreach) is coordinated through the SMCWPPP Parks Maintenance and Integrated Pest Management (IPM) Work Group.
- Implementation of Provision C.10 Trash Load Reductions is coordinated through the SMCWPPP Trash Work Group.

Major accomplishments during FY 2011-12 include the following:

- Facilitated group buy of storm drain markers for Municipal Maintenance Subcommittee members.
- Collaborated with the San Mateo County Agriculture/Weights & Measures staff to conduct the SMCWPPP annual Landscape IPM Training Workshop in February 2012.
- Collaborated with the San Francisco Estuary Partnership to conduct a Structural IPM Training Workshop in November 2011.
- Updated the SMCWPPP Model IPM Policy with input from Regional Water Board staff and prepared an example City Council report and resolution for use by agencies adopting the updated version of the Model IPM Policy.
- Worked with BASMAA to develop a Model Short-Term Trash Loading Reduction Plan template for Permittees to use when developing their own Short-Term Plans and then assisted Member Agencies develop and submit their plans to the Regional Water Board by February 1, 2012.
- Worked with BASMAA to submit two regional trash technical memoranda (i.e., *Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s* and *Trash Load Reduction Tracking Method*) (see Appendix F) to the Regional Water Board on

February 1, 2012.

New Development and Construction Controls

In FY 2011-12, SMCWPPP'S New Development Subcommittee assisted member agencies in complying with Provisions C.3 (New Development and Redevelopment) and C.6 (Construction Site Control) of the MRP, with a focus on implementing the low impact development (LID) requirements which went into effect on December 1, 2011. As of this date, projects regulated by Provision C.3 must meet stormwater treatment requirements using evapotranspiration, infiltration, and/or rainwater harvesting and reuse. Where this is infeasible, biotreatment measures may be used.

Major accomplishments in FY 2011-12 include the following:

- Held the 2011 New Development Workshop on October 6, 2011. A total of 57 staff members and consultants attended the workshop, which focused on the new LID requirements.
- Held a special training session on LID feasibility and infeasibility criteria on November 17, 2011 to offer practice exercises to implement the new LID requirements. A total of 22 municipal staff members and consultants attended the training.
- Began project planning and design of the Bransten Road pilot green street project, in accordance with Permit Provision C.3.b.iii. Funding sources include the San Mateo County vehicle license fee and EPA's San Francisco Bay Water Quality Improvement Fund through BASMAA's Clean Watersheds for a Clean Bay Project.
- Updated SCMWPPP's C.3 Technical Guidance to help member agencies implement the new LID requirements.
- Prepared various model documents, including the following model worksheets to assist member agencies with complying with the requirement to evaluate the feasibility of treating the amount of stormwater runoff specified in Provision C.3.d with infiltration, evapotranspiration, or rainwater harvesting and use, before allowing biotreatment:
    - Feasibility Screening Worksheet
    - Infiltration Feasibility Worksheet
    - Rainwater Harvesting and Use Feasibility Worksheet
- Participated in regional projects through BASMAA to prepare for implementing MRP requirements that went into effect in 2011, including the development of four fact sheets on the following types of site design measures that small projects will be required to implement under Provision C.3.i, beginning December 1, 2012:
    - Pervious paving
    - Managing stormwater runoff with landscaping
    - Rain barrels and cisterns
    - Rain gardens.
- Updated the SCMWPPP Construction Site Inspection plan sheet outreach piece for project applicants, to reflect the most recent guidance on construction site BMPs.

- Offered a training workshop in February on construction site stormwater inspection, with a session on conducting operation and maintenance verification inspections of permanent post-construction stormwater controls. A total of 48 staff members and consultants attended the workshops.
- Prepared a flyer describing BMPs to be used during the installation, cleaning, treating and washing of the surface of copper architectural features, to help member agencies comply with Provision C.13.a requirements for addressing architectural copper in development and construction projects.

Industrial and Illicit Discharge Controls

The goals of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component include:

- To control the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable.
- To effectively prohibit the discharge of illicit, non-stormwater discharges to the municipal storm drain system.

SMCWPPP member agencies are responsible for complying with various business inspection requirements (MRP Provision C.4), controlling non-stormwater discharges prohibited by the MRP (MRP Provision C.5), and managing certain non-stormwater discharges exempted or conditionally exempted by the MRP (MRP Provision C.15). SMCWPPP's CII component assists member agency staff with understanding these MRP requirements and developing various tools, templates, reporting forms, and other MRP compliance support materials.

Major accomplishments in FY 2011-12 included the following:

- Conducted an inspector training workshop on April 25, 2012. The workshop included presentations on conducting commercial and industrial facility stormwater inspections, industrial sources of PCBs and copper, and illicit discharge control.
- Updated Stormwater Business Inspector and Illicit Discharge Coordinator contact lists available on the SMCWPPP website (www.flowstobay.org).
- Convened a Water Utility Work Group that began developing guidance materials related to Provision C.15 requirements.

Public Information and Participation

The primary goals of SMCWPPP’s Public Information and Participation (PIP) component are:

- To educate the public about the causes of stormwater pollution and its serious effects on the quality of local creeks, lagoons, shorelines, and neighborhoods;
- To encourage residents to adopt less polluting and more environmentally beneficial practices; and
- To increase residents’ hands-on involvement in SMCWPPP activities.

PIP is essential for controlling pollution at the source because most pollutants originate from preventable, everyday activities. Pollutants in stormwater may be reduced by educating residents about the benefits of preventing stormwater pollution and motivating them to do their share to reduce pollution. This approach is recognized as being both cost-effective and efficient in meeting the goal of reducing pollutants in stormwater to the maximum extent practicable.

The SMCWPPP PIP Subcommittee met six times in FY 2011-12 to oversee the development of educational materials and to guide the implementation of the PIP component. Shelly Reider of the City of Millbrae served as the chairperson this year for the PIP Subcommittee.

Major accomplishments in FY 2011-12 included the following:

- Garnered local media attention with local newspapers writing articles about three successful SMCWPPP projects: Green Streets and Parking Lots Design Guidebook, Community Action Grant, and the coordination of California Coastal Cleanup Day.
- Continued to maintain the www.flowstobay.org website, with an increase in the number of subscribers to the following pages: Community Events, Resources for Teachers and Schools, New Information, Community Action Grant, Litter Reduction and Coastal Cleanup Day, Newsletter, Less Toxic Pest Control, and Press Room.
- Continued to implement a discount car wash campaign that involved partnerships with eleven commercial car washes located throughout the county to encourage residents to wash cars at commercial car washing facilities. Revised and distributed over 12,000 discount car wash cards through municipal channels and outreach events. Revised a webpage detailing the discount program, and provided a point of contact to the public for the purpose of learning about the program and obtaining the discount card. Continued to educate the residents who choose to wash their cars at home to use minimal soap when washing cars and to divert the runoff to landscaped areas.
- Worked with the Trash Work Group Committee to satisfy public involvement requirements related to cleanup events for documenting baseline trash data and establish methods for documenting overall trash load reductions.
- Continued to coordinate the California Coastal Cleanup Day for San Mateo County diverting 25,436 pounds of trash and 3,911 pounds of recyclables from waterways. An estimated 4,178 residents volunteered for this event, a slight decrease from 2010. Since SMCWPPP started coordinating the program in 2006, there has been an overall over four-fold increase in volunteers.
- Hosted an educational outreach booth at the 9-day County Fair with an emphasis on the Regional Youth Litter Campaign.
- Participated in the San Francisco Bay Protection and Behavior Change Campaign project meetings and as a member of the steering committee for this regional project dedicated to developing a regional brand for stormwater and wastewater outreach activities.
- Updated the online "Resource Guide of Groups and Organizations in San Mateo County with Watershed Stewardship Efforts" featuring local groups and organizations providing volunteer opportunities for residents. Added two new groups: "Burlingame Citizen Volunteers" and "Redwood Creek Preservation Trust" to the guide. Worked with groups to promote cleanup activities through the creation of a new web page entitled "Spring Cleaning SMC" found under the Litter Prevention section.
- Awarded $15,000 to six organizations through the Community Action Grant program.

- Sponsored an educational assembly program for elementary-age students entitled "We All Live Downstream," performed by the Banana Slug String Band. The program emphasized the importance of not littering or dumping substances into the storm drain to protect the marine environment.
- Sponsored a high school educational program entitled "Water Pollution Prevention and Your Car," presented by Rock Steady Science. The program emphasizes proper car maintenance, including motor oil recycling and proper car washing, as well as watershed education and the "Green Streets and Parking Lots" urban runoff management approach to civil engineering.
- Continued to participate in the region-wide integrated pest management "Our Water Our World" campaign by working with local retail stores to maintain point of purchase information on less toxic pest control.
- Promoted IPM courses to 80 structural and landscape pest control operators registered with the County Agricultural Commissioner.

Watershed Assessment and Monitoring

SMCWPPP's Watershed Assessment and Monitoring (WAM) component assists member agencies to achieve compliance with MRP provisions related to water quality monitoring (Provision C.8) and certain water quality pollutants of concern (Provisions C.11, C.12, C.13.c and e, and C.14). Much of this work is accomplished through participation in BASMAA regional projects. SMCWPPP staff helps implement and oversee these regional projects by participating in the activities of a number of regional committees and work groups, including the BASMAA Monitoring and Pollutants of Concern Committee (BASMAA MPC), the Regional Monitoring Coalition (BASMAA RMC) Work Group, the Clean Watersheds for a Clean Bay Project Management Team, and the Regional Monitoring Program (RMP) Small Tributaries Loading Strategy (STLS) Work Group.

Major accomplishments during FY 2011-12 included the following:

- Through the BASMAA MPC, SMCWPPP staff helped to develop and implement regional project work plans, scopes of work, schedules, and associated budgets. The status and results of these BASMAA regional projects are described in detail in *Regional Pollutants of Concern Report for FY 2011-2012 and Regional Monitoring Coalition Monitoring Status Report for February-June 2012* (see Appendix F), hereinafter referred to as the POC and Monitoring Regional Supplement.
- In coordination with other BASMAA agencies, SMCWPPP continued to contribute funding to the San Francisco Estuary Regional Monitoring Program, participate in selected RMP committees and work groups, and providing input to related work plans and reports.
- Through the BASMAA RMC, SMCWPPP staff helped finalize several documents critical to support water quality monitoring and compliance with Provision C.8.c. – Creek Status Monitoring / Rotating Watersheds. SMCWPPP staff also assisted the BASMAA RMC to evaluate database platforms to house the RMC water quality monitoring data and contract with a database developer in June 2012 to begin development of the RMC Information Management System using Microsoft Access.

- Field monitoring required by MRP Provision C.8.c was initiated in San Mateo County during the FY 2011-12 wet weather season and involved sampling the suite of parameters listed in Table 8.1 of the MRP at multiple sites.
- Through the RMP STLS Work Group, SMCWPPP staff helped to select and initiate monitoring for pollutants of concern, in compliance with MRP Provision C.8.e, at four stations in the RMC area. The STLS Work Group identified two additional monitoring sites that will be sampled in FY 2012-13 to fully comply with MRP Provision C.8.e. One of these sites is located at the Pulgas Creek Pump Station in the City of San Carlos.
- To encourage citizen monitoring, SMCWPPP staff coordinated with Acterra on several issues: 1) discussed water quality conditions at their restoration site in San Mateo County on Arroyo Ojo de Agua Creek 2) discussed providing in-kind technical support for water quality methods including toxicity and pathogen indicator sampling; 3) encouraged them to submit a grant to USEPA to expand their Riparian Restoration/Water Quality Outreach and Monitoring Program; 4) provided contacts to other watershed groups conducting monitoring in San Mateo County and encouraged them to also contact these groups for technical advice and as potential collaborators in monitoring and grant applications.
- Provisions C.11 and C.12 implement stormwater runoff-related actions required by the mercury and PCBs Total Maximum Daily Load (TMDL) water quality restoration programs. During FY 2011-12, SMCWPPP staff participated in a number of BASMAA regional projects that address mercury and PCBs in stormwater runoff, including the EPA grant-funded project entitled Clean Watersheds for a Clean Bay (CW4CB) and the PCBs in Caulk project, which is funded by the federal stimulus program (American Recovery and Reinvestment Act). The POC and Monitoring Regional Supplement report contains further details about these projects and their status.
- SMCWPPP staff worked with BASMAA to develop a spreadsheet entitled "FY 11-12 Estimated Mass of Mercury Collected Calculator (Version 1.0)" and used the calculator to estimate the mass of mercury collected by the San Mateo County Household Hazardous Waste Program during FY 2011-12.
- SMCWPPP staff prepared a project work plan for the Pulgas Creek Pump Station pilot diversion project and submitted to Regional Water Board staff in May 2012. SMCWPPP staff also obtained a wastewater discharge permit from SBSA and began identification and mobilization of equipment needed for the pilot diversion project.
- Provision C.13.c. (Copper Controls - Vehicle Brake Pads) requires Permittees to participate in the Brake Pad Partnership (BPP) process to develop California legislation phasing out copper from certain automobile brake pads sold in California. Provision C.13.e (Copper Controls - Studies to Reduce Uncertainties) 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. During FY 2011-12, SMCWPPP staff participated in BASMAA regional projects that address these provisions. The POCs and Monitoring Regional Supplement contains further details.
- MRP Provision C.14 requires San Mateo County and other MRP Permittees to work collaboratively to begin identifying, assessing, and managing controllable sources of the following lower priority pollutants that have been found in stormwater runoff: polybrominated diphenyl ethers (PBDEs), legacy pesticides, and selenium. During FY

2011-12, SMCWPPP staff participated in a BASMAA regional project that addresses this provision. The POCs and Monitoring Regional Supplement report provides further details about this project and its status.

Table 1-1: FY 2011-2012 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	**Telephone #**	**Email Address**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan***	**Feb**	**Mar**	**Apr**	**May**	**Jun**
SMCWPPP/ CCAG														
Matt Fabry	(650) 599-1419	mfabry@co.sanmateo.ca.us	X		X	X		X	X	X	X	X	X	X
Richard Napier	(650) 599-1420	rnapier@co.sanmateo.ca.us			X					X		X	X	
Sandy Wong	(650) 599-1409	slwong@co.sanmateo.ca.us												
EOA, Inc.														
Fred Jarvis	(510) 832-2852		X		X	X		X						
Jon Konnan	(510) 832-2852	jkonnan@eoainc.com						X	X	X	X	X	X	X
Adam Olivieri	(510) 832-2852	awo@eoainc.com				X								
Water Board														
Sue Ma	(510) 622-2386	sma@waterboards.ca.gov												
Selina Louie	(510) 622-2383	slouie@waterboards.ca.gov												
Atherton														
Steve Tyler	(650) 752-0570	styler@ci.atherton.ca.us	X					X					X	X
Belmont														
Leticia Alvarez	(650) 595-7469	lalvarez@belmont.gov				X			X		X		X	
Dalia Corpus	(650) 595-7468	dcorpus@belmont.gov	X											
Gilbert Yau	(650) 595-7425				X									
Brisbane														
Randy Breault	(415) 508-2130	rbreault@ci.brisbane.ca.us	X		X	X		X	X				X	
Karen Kinser	(415) 508-2133	kkinser@ci.brisbane.ca.us												
Shelley Romriell	(415) 508-2128	sromriell@ci.brisbane.ca.us								X		X		X
Burlingame														
Steve Daldrup		stephen.daldrup@veoliawaterna.com									X	X	X	X
Eva Justimbaste		eva.justimbaste@veoliawaterna.com						X					X	X
Kiley Kinnon	(650) 342-3727		X		X									
Victor Voong	(650) 558-7230	vvoong@burlingame.org	X		X	X		X	X	X	X	X	X	X
Colma														
Muneer Ahmed	(650) 757-8888	muneer.ahmed@colma.ca.gov	X		X	X		X	X		X		X	
Brad Donohue										X		X		X
Saied Mostafavi													X	
Daly City														
Jesse Myott	(650) 991-8054	jmyott@dalycity.org	X			X		X		X	X			
Cynthia Royer	(650) 991-8203	croyer@dalycity.org	X			X			X				X	X
East Palo Alto														
Lucy Chen	(650) 853-3191				X									
Michelle Daher	(650) 853-3165	mdaher@cityofepa.org				X		X	X	X	X	X	X	X
Foster City														
Norm Dorais	(650) 286-3279	ndorais@fostercity.org	X			X				X	X		X	X
Mike McElligott	(650) 286-8140	mmcelligott@fostercity.org			X									
Half Moon Bay														
Muneer Ahmed		muneer@csgengr.com	X		X	X		X	X		X		X	

* January meeting held via conference call

Table 1-1: FY 2011-2012 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	**Telephone #**	**Email Address**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan***	**Feb**	**Mar**	**Apr**	**May**	**Jun**
Brad Donohue										X		X		
Laura Snideman														X
Hillsborough														
Dave Bishop	(650) 375-7588	dbishop@hillsborough.net							X					
Jen Chen	(650) 375-7488	jchen@hillsborough.net				X								
Catherine Chan		cchan@hillsborough.net	X		X				X		X		X	X
Menlo Park														
Rebecca Fotu	(650) 330-6765	rlfotu@menlopark.org						X	X	X	X	X	X	X
Jennifer Ng	(650) 330-6740		X		X	X		X						
Millbrae														
Khee Lim	(650) 259-2347	klim@ci.millbrae.ca.us	X						X					X
Kelly O'Dea	(650) 259-2448	kodea@ci.millbrae.ca.us									X	X		
Anthony Riddell	(650) 259-2337	ariddell@ci.millbrae.ca.us												
Pacifica														
Elizabeth Claycomb	(650) 738-7361	claycombe@ci.pacifica.ca.us												
Raymund Donguines	(650) 738-3768	donguinesr@ci.pacifica.ca.us	X		X	X		X	X	X	X	X	X	X
Portola Valley														
Howard Young	(650) 851-1700 x2:	hyoung@portolavalley.net								X				
Redwood City														
Marilyn Harang	(650) 780-7477	mharang@redwoodcity.org			X	X		X	X	X		X		
Harry Kwong	(650) 780-7473											X		
Peter Vorametsanti										X		X		
San Bruno														
Robert Howard	(650) 616-7179		X					X						
Gino Quinn	(650) 616-7169	gquinn@sanbruno.ca.gov												X
San Carlos														
Ray Chan		rchan@cityofsancarlos.org												
San Mateo, City														
Debra Bickel	(650) 522-7343	dbickel@cityofsanmateo.org						X						
Shelli St. Clair	(650) 522-7342	sstclair@cityofsanmateo.org	X		X	X		X	X	X	X		X	X
San Mateo, County														
Mary Bell Austin	(650) 372-6259	maustin@co.sanmateo.ca.us												
Julie Casagrande	(650) 599-1457	jcasagrande@co.sanmateo.ca.us	X		X	X		X	X	X		X	X	X
Dermot Casey	(650) 372-6257	djcasey@co.sanmateo.ca.us	X		X	X		X		X	X	X	X	X
Carole Foster		cfoster@smcgov.org									X			
Tim Swillinger	(650) 372-6245	tswillinger@co.sanmateo.ca.us												
So. San Francisco														
Rob Lecel	(650) 829-3882	rob.lecel@ssf.net				X		X			X	X	X	
Cassie Prudhel	(650) 829-3840	cassie.prudhel@ssf.net	X		X				X	X				X
Shoshana Wolff	(650) 829-3880	shoshana.wolff@ssf.net												

* January meeting held via conference call

Table 1-1: FY 2011-2012 NPDES TAC Attendance Record			Month											
AGENCY AND NAME	**Telephone #**	**Email Address**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan***	**Feb**	**Mar**	**Apr**	**May**	**Jun**
Woodside														
Gratien Etchebehere	(650) 851-6790	getchebehere@woodsidetown.org			X								X	
Dong Nguyen	(650) 851-6790	dnguyen@woodsidetown.org						X			X	X		X
Caltrans														
John Michels	(510) 622-5996	jmichels@caltrans.ca.gov											X	
Karen Mai		kmai@caltrans.ca.gov											X	
Guests/Public														
Geoff Brosseau, CASQA	(650) 365-8620		X											
Attendance			**22**	**0**	**20**	**20**	**0**	**22**	**18**	**19**	**19**	**19**	**25**	**22**

* January meeting held via conference call

2
MUNICIPAL OPERATIONS

INTRODUCTION

The MRP includes the following three municipal operations-related provisions that are implemented with the assistance and participation of the SMCWPPP subcommittee and work groups listed below:

- Implementation of Provision C.2 Municipal Operations is coordinated through the SMCWPPP Public Works Municipal Maintenance Subcommittee.
- Implementation of Provision C.9 Pesticides Toxicity Control is coordinated through the SMCWPPP Parks Maintenance and Integrated Pest Management (IPM) Work Group (except Provision C.9.h, the public outreach portion of Pesticides Toxicity Control, which is implemented through the SMCWPPP Public Information and Participation component - see Chapter 5 of this report).
- Implementation of Provision C.10 Trash Load Reductions is coordinated through the SMCWPPP Trash Work Group.

Most MRP-required municipal operations tasks need to be implemented by each SMCWPPP member agency. SMCWPPP helps agency staff to understand MRP requirements and develops various tools needed to effectively plan, implement, and report on compliance activities.

During FY 2011-12, there were a number of activities accomplished with input and assistance provided by the Public Works Municipal Maintenance Subcommittee, the Parks Maintenance and IPM Work Group, and the Trash Work Group. SMCWPPP's accomplishments during FY 2011-12 included the following tasks to assist with implementation of Provisions C.2, C.9 and C.10:

- Facilitated group buy of storm drain markers for Municipal Maintenance Subcommittee members.
- Collaborated with the San Mateo County Agriculture/Weights & Measures staff to conduct the SMCWPPP annual Landscape IPM Training Workshop in February 2012.
- Collaborated with the San Francisco Estuary Partnership to conduct a Structural IPM Training Workshop in November 2011.
- Updated the SMCWPPP Model IPM Policy with input from Regional Water Board staff and prepared an example City Council report and resolution for use by agencies adopting the updated version of the Model IPM Policy.
- Worked with BASMAA to develop a Model Short-Term Trash Loading Reduction Plan template for Permittees to use when developing their own Short-Term Plans and then assisted Member Agencies develop and submit their plans to the Regional Water Board by February 1, 2012.

- Worked with BASMAA to submit two regional trash technical memoranda (i.e., *Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s* and *Trash Load Reduction Tracking Method*) to the Regional Water Board on February 1, 2012.

More detailed information about SMCWPPP's assistance in helping member agencies comply with MRP requirements in Provisions C.2, C.9 and C.10 is included in the following sections.

IMPLEMENTATION OF MRP PROVISIONS

Provision C.2 Municipal Operations

The objective of MRP Provision C.2 is to ensure development and implementation of appropriate BMPs by all Permittees to control and reduce discharges of non-stormwater and stormwater runoff pollutants to storm drains and watercourses during operation, inspection, and routine repair and maintenance activities of municipal facilities and infrastructure.

<u>Participation and Coordination with the Public Works Municipal Maintenance Subcommittee</u>

The Public Works Municipal Maintenance Subcommittee met four times during FY 2011-12 to share information about municipal operations-related MRP requirements and methods for achieving compliance. The meetings provided a forum to share experiences with implementing MRP provisions and applying associated BMPs related to activities such as:

- Street and road repair maintenance activities.
- Sidewalk/plaza maintenance and pavement washing.
- Graffiti removal.
- Corporation yard activities.
- Stormwater pump station monitoring and inspections.

Bill Butler and Steve Tyler from the Town of Atherton chaired the subcommittee up until December 2011. Louis Gotelli from the Town of Colma has chaired the subcommittee since January 2012. A FY 2011-12 subcommittee attendance list is included in Appendix A. A majority of the subcommittee's four meetings were attended by staff from the Cities of Atherton, Belmont, Brisbane, Burlingame, Colma, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Carlos and the San Mateo County Mosquito and Vector Control District. It should be noted that the October 2011 meeting facilitated coordination with the San Mateo County Mosquito and Vector Control District regarding storm drain inlet cleanings and automatic retractable trash control screens. In addition during FY 2011-12, outside of the subcommittee meetings SMCWPPP staff facilitated the purchase of storm drain markers.

Program Materials

Since the MRP was adopted, SMCWPPP staff has developed a number of materials to assist municipal maintenance staff with implementing Provision C.2. (e.g., sources of BMP information, SWPPP template, and inspection forms). These materials are all available on the SMCWPPP website (www.flowstobay.org) for use by agency staff and are described below.

In FY 2009-10, SMCWPPP developed a Stormwater Pollution Prevention Plan (SWPPP) template for use by member agencies in tailoring, updating, or creating SWPPPs for their corporation yards, satellite facilities, and maintenance facilities. In FY 2010-11, SMCWPPP prepared the "Municipal Corporation Yard Inspection Form." This form provides detailed checklists for the types of BMPs recommended in the corporation yard SWPPP template.

During FY 2010-11, SMCWPPP prepared "Sources of Stormwater BMP information for Maintenance Activities Listed in MRP's Provision C.2," to assist member agencies with complying with the following Provision C.2 requirements: Provision C.2.a Street and Road Repair and Maintenance; Provision C.2.b Sidewalk/Plaza Maintenance and Pavement Washing; Provision C.2.c Graffiti Removal; and Provision C.2.f Corporation Yards. The sources of BMP information used to develop these materials are CASQA's Stormwater BMP Handbook Maintenance and Caltrans' Storm Water Quality Handbook Maintenance Staff Guidance.

The following twelve agencies in San Mateo County operate storm drain pump stations: Cities of Belmont, Burlingame, East Palo Alto, Foster City, Menlo Park, Millbrae, Pacifica, Redwood City, San Carlos, San Mateo, and South San Francisco, and the San Mateo County Flood Control District. During FY 2010-11, SMCWPPP developed the "Stormwater Pump Station Dry Season DO Monitoring and Inspection Form" to assist member agencies in developing a systematic and efficient way to collect MRP-required DO monitoring and inspection information.

Provision C.9 Pesticides Toxicity Control

To prevent the impairment of urban streams by pesticide-related toxicity, MRP Provision C.9 require Permittees to implement a pesticide toxicity control program that addresses their own and others' use of pesticides within their jurisdictions that pose a threat to water quality and that have the potential to enter the municipal conveyance system. This provision implements requirements of the *TMDL for Diazinon and Pesticide related Toxicity for Urban Creeks* in the region.

SMCWPPP assists member agencies with implementing MRP Provision C.9 by working with the Parks Maintenance and IPM Work Group, except that Provision C.9.h, the public outreach portion of Pesticides Toxicity Control, is implemented through the SMCWPPP Public Information and Participation Subcommittee (see Chapter 5 of this report).

During FY 2011-12, the following materials or activities were completed with input and assistance from the Parks Maintenance and IPM Work Group:

- Collaborated with the San Mateo County Agriculture/Weights and Measures staff to conduct the SMCWPPP annual IPM Workshop in February 2012.

- Collaborated with the San Francisco Estuary Partnership to conduct the Structural IPM Training Workshop in November 2011.
- Updated the SMCWPPP Model IPM Policy with input from Regional Water Board staff and developed an example City Council Report and Resolution for SMCWPPP member agencies to use in adopting the updated Model IPM Policy.
- Added San Mateo County Agriculture/Weights and Measures contact information to the SMCWPPP website for reporting suspected improper pesticide usage or disposal that may affect water quality.

Participation and Coordination with the Parks Maintenance and IPM Work Group

The Parks Maintenance and IPM Work Group met three times during FY 2011-12 to share information about MRP requirements and methods for achieving compliance. Valerie Matonis from the City of Redwood City chaired the IPM Work Group during FY 2011-12. A FY 2011-12 subcommittee attendance list is included in Appendix A. A majority of the work group's three meetings were attended by staff from the Cities of Brisbane, Colma, Daly City, Foster City, Half Moon Bay, Pacifica, Redwood City, San Bruno, San Mateo, and South San Francisco. Participation on the Work Group has remained steady during the past few years. In addition, every meeting was attended by one or more staff from San Mateo County Agriculture/Weights and Measures.

Eleventh Annual Landscape Integrated Pest Management Workshop

The SMCWPPP annual Landscape IPM workshop was held on February 28, 2012 at the City of Brisbane's Mission Blue Center. Over sixty people representing twelve municipalities attended. SMCWPPP works closely with San Mateo County Agriculture/Weights and Measures staff to provide Department of Pesticide Regulations Continuing Education Credits for participants and to have a regulatory refresher presentation at the workshop. Workshop attendance for 2012 was lower than in 2011 workshop, but a Structural IPM Workshop was also offered in 2012.

Evaluation forms completed by the workshop's attendees included many positive comments and indicated that overall the workshop met their expectations. Appendix A includes the workshop agenda, attendance list and a summary of the completed evaluation forms. Other workshop materials are available on the SMCWPPP website (www.flowstobay.org) for use by agency staff.

Structural Integrated Pest Management Workshop

SMCWPPP, in collaboration with the San Francisco Estuary Partnership (SFEP), held a Structural IPM Workshop on November 9, 2011 at the City of Foster City Recreation Center. The workshop provided information on implementing IPM during pest control at structures and included a presentation on contracting for structural IPM Pest Control. Fifty-four people representing a total of seventeen municipalities attended.

Evaluation forms completed by the workshop's attendees included many positive comments and indicated that overall the workshop met their expectations. Appendix A included the workshop agenda, attendance list, and a summary of the completed evaluation forms.

San Mateo Countywide Water Pollution Prevention Program Model Integrated Pest Management Policy

During FY 2011-12 SMCWPPP completed an updated version of the SMCWPPP Model IPM Policy. The updated IPM Policy clarifies that the use of IPM is a requirement and describes the hierarchical decision-making process and multi-step approach that will be used to control pests. The updated IPM Policy incorporated input from the San Mateo County Agricultural Commissioner and Water Board staff. In addition, during FY 2011-12 SMCWPPP completed preparation an example city council report and resolution for adoption of the updated IPM Policy. These materials are available on the SMCWPPP website (www.flowstobay.org) for use by agency staff.

Interfacing with County Agricultural Commissioners

To assist member agencies with reporting suspected instances of improper pesticide usage that may affect water quality, SMCWPPP added the County Agriculture/ Weights & Measures contact information to its website (www.flowstobay.org) in FY 2010-2011. Based on discussions at the Parks Maintenance and IPM Work Group meetings, it is anticipated that agency staff would rarely encounter instances of suspected improper pesticide usage. However, the presence of San Mateo County Agriculture/Weights and Measures staff at each Subcommittee meeting in FY 2011-12 facilitates communication with this agency. In addition, SMCWPPP works closely with the County Agriculture/Weights and Measures staff when organizing the annual landscape IPM workshop.

Participation in BASMAA and CASQA

During FY 2011-12 SMCWPPP representatives continued to participate in the BASMAA Municipal Operations Committee and BASMAA Board of Directors meetings. Information on three of the Bay Area Pesticide Applicators Professional Association (PAPA) Seminars which focus on IPM was provided at a BASMAA Municipal Operations Committee meeting. Water Board staff's review of FY 2010-2011 Annual Report C.9 sections was also discussed at a BASMAA Board of Directors meeting with Water Board staff. In addition, SMCWPPP staff stayed current with pesticide regulatory work by participating in CASQA Pesticide Committee and Urban Pesticide Committee meetings.

Provision C.9.e requires Permittees to track and participate in regulatory processes relevant to pesticide toxicity control. During FY 11-12, SMCWPPP accomplished this task by working with BASMAA and CASQA. For additional information, see the *Regional Pollutants of Concern Report for FY 2011-2012 and Regional Monitoring Coalition Monitoring Status Report for February-June 2012* (Appendix F).

Provision C.10 Trash Load Reduction

MRP Provision C.10 (Trash Load Reduction) requires Permittees to:

- Identify and select a required number of trash hot spots in creeks or shorelines that will be the focus of required annual trash assessments and cleanups.
- Install and maintain full trash capture devices to treat runoff from a specified amount of acreage, in most cities.

- Reduce trash loads from the municipal separate storm sewer system by 40 percent by July 1, 2014.

During FY 2011-12, the following trash control activities were completed by SMCWPPP:

<u>Participation and Coordination of the Trash Work Group</u>

SMCWPPP's Trash Work Group assists member agencies with the implementation of new or enhanced trash control measures and actions required by the MRP. The Trash Work Group generally meets quarterly. Additional meetings are scheduled as necessary to address high priority issues. During FY 2011-12, the Trash Work Group met five times and was chaired by Shelli St. Clair from the City of San Mateo. Shelli became the new chairperson in fall 2011 and replaced Kiley Kinnon from Burlingame. A FY 2011-12 subcommittee attendance list is included in Appendix A. Staff from the following member agencies attended a majority of the Work Group's meetings during FY 2011-12: Cities of Belmont, Brisbane, Burlingame, Colma, Daly City, East Palo Alto, Half Moon Bay, Menlo Park, Pacifica, San Carlos, San Mateo, South San Francisco, and Woodside; and San Mateo County.

During FY 2011-12, the Trash Work Group and/or SMCWPPP staff conducted the following tasks:

- Worked with BASMAA to develop a Model Short-Term Trash Loading Reduction Plan (Model Plan) template for Permittees to use when developing their own Short-Term Plans. The Model Plan was finalized in December 2011. Additional information is provided below.
- Worked with each member agency on the development and submittal of their S*hort-Term Trash Loading Reduction Plan* (Short-Term Plan) to the Regional Water Board by February 1, 2012, including the development of preliminary trash baseline loading estimates. Additional information is provided below.
- Worked with BASMAA to submit two regional trash technical memoranda (i.e., *Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s* and *Trash Load Reduction Tracking Method*) to the Regional Water Board on February 1, 2012. Additional information is provided below.
- Worked with BASMAA to develop FY 2011-12 Annual Report formats for Provision C.10.
- Worked with BASMAA to develop a response letter with the approach and time schedule for responding to Regional Water Board staff comments on Permittee Short-Term Plans and the two regional trash technical memoranda. The response letter was submitted to the Regional Water Board on July 6, 2012.
- Explored interest in having SMCWPPP coordinate spring trash cleanups.
- Continued encouraging member agencies to participate in the ABAG/SFEP full trash capture demonstration project, which is funded by a grant from the State Water Resources Control Board as part of the federal American Recovery and Reinvestment Act. The vast majority of member agencies participated in the demonstration project. A few remaining member agencies will be installing full capture trash devices by the November 1, 2012 deadline.
- Provided the San Mateo County Mosquito and Vector Control District staff with contact

information for the automated retractable screen manufacturer so it may discuss modifying the screen to allow the easier application of vector controls.

Short-Term Trash Loading Reduction Plan

In accordance with the MRP, each Permittee was required to submit a Short-Term Plan to the Regional Water Board by February 1, 2012. The Short-Term Plans describe control measures and BMPs that are currently being implemented and the current level of implementation, and the planned new or enhanced control measures and BMPs that will be implemented to attain a 40 percent trash load reduction by July 1, 2014.

With assistance from SMCWPPP staff, BASMAA developed a Model Short-Term Trash Loading Reduction Plan (Model Plan) to provide a template for Permittees to use when developing their own Short-Term Plans. SMCWPPP staff also conducted individual meetings in November and December 2011 with member agency staff to discuss Short-Term Plan development. Topics discussed at each meeting included: 1) the review and updating of land use maps for each member agency, 2) additional information needs for baseline trash load estimate development, 3) review of the Model Plan and draft Tracking Method, 4) guidance on trash load reduction actions, and 5) roles, responsibilities and schedule for completing the Short-Term Plan.

As part of the Short-Term Plan development process, SMCWPPP staff assisted in calculating preliminary baseline loads for each member agency. This involved working directly with staff from each member agency to obtain information (e.g., street sweeping frequency, streets with parking enforcement, streets which are considered to have a parking enforcement equivalent, number of storm drain inlets, number of stormwater pump stations with trash racks, number of full capture treatment devices) necessary to develop preliminary baseline loading estimates. In addition, BASMAA with assistance from SMCWPPP staff developed a Trash Load Reduction Calculator for estimating the predicted trash load reductions associated with the implementation of new or enhanced trash control measures. Each member agency used the calculator when developing their Short-Term Plan, consistent with the Trash Load Reduction Tracking Method - version 1.0 (see below). Anticipated trash load reductions were reported in Section 5 of their Short-Term Plans. On behalf of each member agency, SMCWPPP submitted Permittee Short-Term Plans to the Regional Water Board on February 1, 2012.

BASMAA Trash Load Reduction Tracking Method

In accordance with the MRP, Permittees are required to develop a method by which they will demonstrate progress towards the MRP trash load reduction goal (i.e., 40 percent by July 2014). To accomplish this task, the BASMAA Board of Directors approved a regional project to develop load reduction tracking methods. SMCWPPP staff played a large role in implementing the regional project. As a first step, a list of trash control measures 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. After further consideration, BASMAA member agencies identified a list of trash control measures for which trash load reduction methods should be developed. The list was based on the potential for Permittees to implement, availability of information required for populating formulas and developing credits, and the expected benefit of implementation.

On February 1, 2012, BASMAA submitted a technical report entitled Trash Load Reduction Tracking Method: Assessing the Progress of San Francisco Bay Area MS4s Towards Stormwater Trash Load Reduction Goals – Version 1.0 (Tracking Method) to the Regional Water Board (under BASMAA letterhead). This report fully describes the load reduction tracking method selected for each control measure, and the process by which load reduction tracking will take place. During FY 2012-13, BASMAA will be working with MRP Permittees to refine the Tracking Method.

BASMAA Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s

In accordance with the MRP, Permittees are required to develop and report on baseline trash loads from their MS4 s by February 1, 2012. To accomplish this task, the BASMAA Board of Directors approved the Preliminary Baseline Trash Generation Rates Project for developing (default) baseline trash generation rates used to develop preliminary baseline trash load estimates in December 2010. As part of this project, SMCWPPP funded the installation of twelve connector pipe screens at selected land uses within the City of San Mateo. During FY 2011-12, SMCWPPP continued funding the maintenance of these devices. Each device was cleaned in May 2011, September 2011, January 2012 and April 2012. Collected trash and debris was saved for characterization by BASMAA. The results from the May and September 2011 characterization events were used to develop the preliminary baseline trash load estimate included in the technical report entitled *Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s* submitted to the Regional Water Board (under BASMAA letterhead) on February 1, 2012.

The technical memorandum submitted on February 1, 2012 to the Regional Water Board was revised to include results from the January and April 2012 characterization events, and incorporates findings from similar efforts conducted in Los Angeles County in the early 2000's. The final technical report also includes an analysis of factors other than land use that may further differentiate trash generation rates. The results of all analyses are fully documented in the technical report entitled *Final Baseline Trash Generation Rates for San Francisco Bay Area MS4s* included within Appendix F of this Annual Report.

FUTURE ACTIONS

SMCWPPP activities that are planned for FY 2012-13 to assist member agencies comply with MRP requirements in Provisions C.2, C.9 and C.10 include the following:

- Hold up to four Public Works Municipal Maintenance Subcommittee meetings, up to three Parks Maintenance and IPM Work Group meetings, and up to four Trash Work Group meetings.
- Plan and hold a Municipal Maintenance Workshop.
- Improve member agencies' staff understanding and provide staff training where needed regarding:
    - Adoption and implementation of the updated IPM policy.
    - Possible revision and implementation of standard operating procedures for pesticide use and IPM.
    - Requirements for agency contractors to implement IPM (e.g., standard contract specifications).

- Conduct the annual IPM training workshop in collaboration with County Agriculture/Weights & Measures staff.
- Continue to interface with County Agriculture/Weights & Measures staff to help implement MRP C.9 Pesticide Toxicity Control requirements.
- Continue to work with BASMAA to refine the Trash Reduction Tracking Method. A refined Tracking Method will be submitted to the Regional Water Board by February 1, 2013.
- Revise member agency preliminary baseline trash load estimates based on refined trash generation rates developed through a BASMAA regional project.
- Develop a standardized annual reporting format for demonstrating trash reductions associated with creek and/or shoreline cleanups.
- Begin assisting with development of member agency Long-Term Trash Load Reduction Plans to address 70% and 100% trash load reduction goals. The Long-Term Trash Load Reduction Plans will be developed based on revisions to the Tracking Method, Model Plan and other guidance.
- Work with BASMAA to begin implementing a grant-funded project entitled "Tracking California's Trash", including the development of tools to monitor trends in trash loads and impacts. Look at the EOA scope of work for additional tasks and add here.
- Work with BASMAA to begin developing a trash full capture operation and maintenance procedures and verification program.
- Conduct a technical project to assist member agencies in beginning to identify optimal locations for future installation of full capture treatment devices in San Mateo County.

3
NEW DEVELOPMENT AND CONSTRUCTION CONTROLS

INTRODUCTION

In FY 2011-12, this component of SMCWPPP assisted member agencies in complying with MRP Provisions C.3 (New Development and Redevelopment), C.6 (Construction Site Control), and C.13.a (Copper Architectural Features), with a focus on implementing the low impact development (LID) requirements which went into effect on December 1, 2011. As of this date, projects regulated by Provision C.3 must meet stormwater treatment requirements using evapotranspiration, infiltration, and/or rainwater harvesting and reuse. Where this is infeasible, biotreatment measures may be used.

This assistance continued to be provided through the New Development Subcommittee, which was chaired by Matthew Fabry, SMCWPPP Coordinator and a municipal representative from the City of Brisbane through December 2011, at which time Jeanne Naughton, the Daly City representative, was elected as Subcommittee Chair. The Subcommittee enjoyed good participation, as shown by the FY 2011-12 attendance list, which is included in Appendix B. Representatives from ten municipalities showed perfect attendance: Belmont, Burlingame, Colma, Daly City, Half Moon Bay, Redwood City, San Bruno, San Carlos, County of San Mateo, and South San Francisco. Representatives of Atherton and Menlo Park attended five of the six meetings. Through this Subcommittee, SCMWPPP conducted tasks to implement MRP Provisions C.3 and C.6. This section describes 2011-12 implementation actions and planned future actions.

IMPLEMENTATION OF MRP PROVISIONS

Provision C.3 New Development and Redevelopment

SMCWPPP's accomplishments during FY 2011-12 include the following major tasks to assist with implementation of Provision C.3:

- Held the 2011 New Development Workshop on October 6, 2011.
- Held a special training session on LID feasibility and infeasibility criteria on November 17, 2011.
- Prepared various worksheets and forms to assist member agencies with complying with Provision C.3.
- Began project planning and design of the Bransten Road pilot green street project, in accordance with Permit Provision C.3.b.iii.
- Updated the Program's C.3 Technical Guidance to help agencies implement the new LID requirements that went into effect on December 1, 2011.

- Participated in regional projects through BASMAA to prepare for implementing MRP requirements that went into effect in 2011.

New Development Workshop

The New Development Workshop was held on October 6, 2011 at the Mission Blue Center in Brisbane and attended by 57 people. The full-day workshop focused on the new LID requirements that went into effect on December 1, 2011. The workshop included a session on pervious paving and exercises to practice completing the Draft Infiltration and Rainwater Harvesting and Use Feasibility Worksheet and other forms prepared by SMCWPPP used by member agencies to implement Provision C.3. Appendix B includes a copy of the workshop flyer, agenda, sign-in sheet, and evaluation summary.

LID Feasibility and Infeasibility Training

On November 17, 2011, a half-day training session was held at the Mission Blue Center in Brisbane and attended by 22 people. The training focused on practice exercises filling out the new LID feasibility worksheets. Appendix B includes a copy of the training session flyer, agenda, and evaluation summary.

Feasibility Worksheets

To assist agency staff with implementing Provision C.3.c feasibility criteria and procedures in Provision C.3 Regulated Projects, SMCWPPP partnered with the Clean Water Program of Alameda County and the Santa Clara Valley Urban Runoff Pollution Prevention Program to prepare the following worksheets, which are included in Appendix B:

Photo simulation of potential green street improvements along Bransten Road in San Carlos.

- Infiltration and Rainwater Harvesting and Use Feasibility Screening Worksheet – a simplified approach that screens out applicable projects from a more detailed analysis of feasibility.
- Infiltration Feasibility Worksheet – If the results of the screening worksheet show that infiltration of the amount of stormwater runoff specified in Provision C.3.d may be feasible, this worksheet is used to determine feasibility.
- Rainwater Harvesting and Use Worksheet – If the results of the screening worksheet show that harvesting and use of the amount of runoff specified in Provision C.3.d may be feasible, this worksheet is used to determine feasibility.

Impervious Surface Data Collection Worksheet

SMCWPPP updated its Impervious Surface Data Collection Worksheet to assist agency staff with implementing the new LID requirements. The Impervious Surface Data Collection Worksheet has been used by agency staff since 2003 to record information that is required to be reported for C.3 Regulated Projects, which is included in Permittee Annual Reports. The updated Impervious Surface Data Collection Worksheet is included in Appendix B. Subsequent to updating this form, SMCWPPP decided to discontinue the use of the Impervious Surface Data Collection Worksheet, and to replace it with a new C.3 and C.6 Data Collection Form, described below.

C.3 and C.6 Data Collection Form and Other Components of the C.3 Compliance Checklist

The Subcommittee replaced its existing Impervious Surface Data Collection Worksheet with a new C.3 and C.6 Data Collection Form, which serves as a component of the comprehensive C.3 and C.6 Compliance Checklist, which SMCWPPP prepared for agencies that prefer to use one comprehensive form to document C.3 compliance. For agencies that prefer to use separate forms for different aspects of the project, the C.3 Compliance Checklist is separated into the following component forms, which are included in Appendix B:

- Summary of C.3 Stormwater Requirements
- C.3 and C.6 Data Collection Form
- Stormwater Requirements Checklist
- C.3 and C.6 Closeout Form

Special Projects Worksheet

SMCWPPP collaborated with the Santa Clara Valley Urban Runoff Pollution Prevention Program and Clean Water Program of Alameda County to prepare the Special Projects Worksheet, which may be used by agency staff to determine whether projects meet the Special Projects criteria in Provision C.3.e.ii, as amended on November 28, 2011. The Special Projects Worksheet is included in Appendix B.

Potential Special Projects Reporting Form

SMCWPPP developed a Potential Special Projects Reporting Form, based on Special Projects reporting requirements included in Provision C.3.e.vi, as amended on November 28, 2011. The Potential Special Projects Reporting Form is designed to help agencies meet the new requirement of submitting specific information on potential Special Projects every March 15. The Annual Report Form has been amended to help agencies report this information every September 15, as required by Provision C.3.e.vi. The Potential Special Projects Reporting Form is included in Appendix B.

Project area for the Bransten Road green street project in San Carlos.

Green Streets and Parking Lots

The Sustainable, Green Streets and Parking Lots Program is funded by a countywide vehicle license fee under Assembly Bill (AB) 1546, which went into effect on July 1, 2005, and was subsequently extended through 2012 by Senate Bill (SB) 348. In November 2010, San Mateo County voters approved Measure M, which will provide revenues from a countywide vehicle registration fee that may be used to help fund green streets. The Measure M vehicle registration fee will continue for 25 years.

SMCWPPP is partnering with the City of San Carlos and BASMAA to develop the Bransten Road green street project, on Bransten Road in San Carlos, between Industrial Road and Old County Road. The project area includes a location at which stormwater runoff and sediment monitoring has identified elevated PCB levels. Funding sources for the project include the countywide vehicle license fee and EPA's San Francisco Bay Water Quality Improvement Fund through BASMAA's Clean Watersheds for a Clean Bay project. During FY 2011-12, the Bransten Road project team selected a design consultant, prepared a project design concept, met with property and business owners in the project area, and began preparing the preliminary design.

C.3 Technical Guidance Update

SMCWPPP collaborated with the Clean Water Program of Alameda County to update its C.3 Technical Guidance, to help municipalities implement the new requirements for Special Land Use Categories (Provision C.3.b) and Low Impact Development (Provision C.3.c), which went into effect on December 1, 2011.

Peer Review of Guidance for Combined Flow and Volume Hydraulic Sizing of Treatment Measures

SMCWPPP collaborated with the Santa Clara Valley Urban Runoff Pollution Prevention Program and Clean Water Program of Alameda County to conduct a peer review of the guidance for Combined Flow and Volume Hydraulic Sizing of Treatment Measures included in the Clean Water Program C.3 Technical Guidance. The peer-reviewed guidance will be added to the C.3 Technical Guidance in FY 2012-13.

Provision C.3.i Flyer

SMCWPPP prepared a flyer to inform project applicants of the new Provision C.3.i site design requirements for small projects, which will go into effect on December 1, 2012. The requirements apply to projects that create and/or replace at least 2,500 square feet of impervious surface but less than 10,000 square feet of impervious surface, and individual single family home projects that create and/or replace 2,500 square feet or more of impervious surface. A copy of the flyer is included in Appendix B.

Regional Collaboration

SMCWPPP representatives participated in BASMAA's Development Committee to work on regional tasks to assist SMCWPPP and its member agencies in meeting specific requirements of Provision C.3, as described below.

Special Projects Criteria and Procedures

SMCWPPP representatives participated with other members of the BASMAA Development Committee in a collaborative process with Water Board staff to modify the proposed Special Projects criteria for inclusion in an amendment to the MRP, which was adopted by the Water Board on November 28, 2011. Special Projects requirements went into effect on December 1, 2011. To help member agencies meet new Special Projects reporting requirements, SMCWPPP representatives participated in BASMAA's development of guidance for preparing a narrative discussion of the feasibility or infeasibility of 100 percent LID treatment in Special Projects that are under municipal review or were approved during the reporting period.

BASMAA also coordinated with a Contech representative to obtain information and applicable hydraulic sizing criteria for the Washington Department of Ecology's Technology Assessment Protocol - Ecology (TAPE) program. SMCWPPP and other Countywide stormwater programs are recommending TAPE as the government certification program for agencies to use when they report to the Water Board that non-LID treatment systems used in Special Projects have received certification issued by a government agency. Appendix B includes a copy of the template for developing a narrative discussion of the feasibility or infeasibility of 100 percent LID treatment for Special Projects. SMCWPPP prepared this template based on BASMAA's guidance. In addition, a table prepared by Contech staff as a courtesy to BASMAA, which includes the applicable TAPE hydraulic sizing criteria, is included in Appendix B.

Planning Process for the 2013 Feasibility/Infeasibility Status Report

SMCWPPP representatives actively participated in the planning process for the preparation of a regional Status Report on Application of Feasibility and Infeasibility Criteria, which is due to the Water Board on December 1, 2013. More information on the regional tasks related to LID Feasibility/Infeasibility is provided in the BASMAA FY 11-12 Regional Supplement for New Development and Redevelopment, which is included within Appendix F of this Annual Report.

Green Streets Pilot Project Reporting

SMCWPPP staff reviewed and commented on the green street pilot project reporting form and procedures. SMCWPPP staff and representatives from Burlingame and San Carlos submitted green street reporting information to BASMAA's consultant, Geosyntec, which is managing data and reporting on green streets projects that are developed to meet the Provision C.3.b.iii requirements for green street pilot projects. The Cities of Burlingame and San Carlos are the member agencies that are implementing pilot green streets. Burlingame's Donnelly Avenue green street project was completed in FY 2009-10; the status of San Carlos' Bransten Road green street project is described above.

Provision C.3.i Fact Sheets

A SMCWPPP representative served as Project Officer for BASMAA's project to prepare fact sheets regarding the types of site design measures that small projects will be required to implement under Provision C.3.i, which goes into effect on December 1, 2012. Fact sheets were prepared on the following four topics:

- Pervious paving,
- Managing stormwater runoff with landscaping,
- Rain barrels and cisterns,
- Rain gardens.

More information on the regional tasks related to Site Design Measures for Small Projects and Single Family Homes is provided in the BASMAA FY 11-12 Regional Supplement for New Development and Redevelopment, which is included within Appendix F of this Annual Report.

Provision C.6 Construction Site Control

SMCWPPP's accomplishments during FY 2011-12 include the following major tasks to assist with implementation of Provision C.6:

- Updated SMCWPPP's plan sheet sized outreach piece on construction BMPs.
- Partnered with the California Building Inspectors Group (CalBIG) to offer training on construction BMPs on August 10, 2011.
- Partnered with the Santa Clara Valley Urban Runoff Pollution Prevention Program to offer a workshop on construction site stormwater control on February 7 and February 8, 2012.

<u>Construction Site BMP Plan Sheet</u>

SMCWPPP updated the Construction Site Inspection plan sheet to reflect the most recent guidance on construction site BMPs. The purpose of the plan sheet is for agency staff to communicate BMP requirements to project applicants and contractors. The updated plan sheet is included in Appendix B.

Construction BMP Training

The Program partnered with the California Building Inspectors Group (CalBIG) to offer training on construction site BMPs on August 10, 2011, at Pete's Harbor Restaurant in Redwood City. Approximately 40 people attended the training. Topics included the correct uses of specific BMPs and proper installation of BMPs. The flyer advertising the training session is included in Appendix B.

Construction Site Control Training Workshop

SMCWPPP partnered with the Santa Clara Valley Urban Runoff Pollution Prevention Program to offer a full-day training workshop on construction site stormwater inspection, with a session on conducting operation and maintenance verification inspections of permanent post-construction stormwater controls. The training was offered on February 7, 2012 at the Quinlin Center in Cupertino (Santa Clara County) and February 8, 2012 at the Belmont Sports Complex in Belmont (San Mateo County). Agency staffs from either countywide stormwater program were allowed to attend either day. Topics included the correct uses of specific BMPs, proper installation and maintenance of BMPs, permit requirements, local requirements, and implementation of enforcement response plans. The workshop was attended by 147 people on February 7 and had 56 attendees on February 8. The workshop flyer, agenda, sign-in sheets and evaluation summary are included in Appendix B.

Provision C.13.a Architectural Copper

To help member agencies comply with Provision C.13.a requirements for addressing architectural copper in development and construction projects, SMCWPPP partnered with the Santa Clara Valley Urban Runoff Pollution Prevention Program to prepare a flyer describing BMPs to be used during the installation, cleaning, treating and washing of the surface of copper architectural features. In preparing the new Stormwater Requirements Checklist for development projects, SMCWPPP included the architectural copper BMPs in the list of source control measures that should be considered for projects. The flyer was reviewed and discussed at the February and April 2012 meetings of the New Development Subcommittee. Training on the new architectural copper BMPs was also provided at the one-day Construction Site Stormwater Control Workshop offered on February 7 and February 8, 2012. A copy of the architectural copper BMPs flyer is included in Appendix B.

FUTURE ACTIONS

In FY 2012-13, SMCWPPP staff plans to work with the New Development Subcommittee to conduct the following activities to assist member agencies comply with MRP Provisions C.3 and C.6:

- Continue to exchange information with member agencies through bi-monthly New Development Subcommittee meetings and at the annual new development workshop.
- Conduct round table discussions, and/or project review presentations, to assess and/or track effectiveness.
- Finalize the comprehensive C.3/C.6 Compliance Checklist.
- Update the C.3 outreach flyer for builders and developers and the outreach flyer regarding Provision C.3.i requirements for small projects.
- Reorganize the New Development page on the Business portion of the SMCWPPP website.
- Update the C.3 Technical Guidance to include new information on LID treatment measures.

- Continue working with BASMAA on regional projects such as green street reporting and the 2013 Feasibility/Infeasibility Status Report.
- Update four existing flyers on construction BMPs regarding Paints and Solvents, Concrete and Mortar, Earth-Moving Activities, and Landscaping & Garden/Pool Maintenance.
- Update the Construction Site Inspection Checklist in coordination with construction site inspectors to improve user-friendliness.

4
INDUSTRIAL AND ILLICIT DISCHARGE CONTROLS

INTRODUCTION

The goals of SMCWPPP's Commercial, Industrial and Illicit Discharge (CII) component include:

- To control the discharge of pollutants in stormwater from commercial and industrial businesses to the maximum extent practicable.
- To effectively prohibit the discharge of illicit, non-stormwater discharges to the municipal storm drain system.

SMCWPPP member agencies are responsible for complying with various business inspection requirements (MRP Provision C.4), controlling non-stormwater discharges prohibited by the MRP (MRP Provision C.5), and managing certain non-stormwater discharges exempted or conditionally exempted by the MRP (MRP Provision C.15). SMCWPPP's CII component assists member agency staff with understanding these MRP requirements and developing various tools, templates, reporting forms, and other MRP compliance support materials. The following MRP provisions are implemented through SMCWPPP's CII component:

- Provision C.4 Industrial and Commercial Site Controls
- Provision C.5 Illicit Discharge Detection and Elimination
- Provision C.12.a PCBs Incorporate PCBs and PCB-containing Equipment Identification Into Existing Industrial Inspections
- Provision C.13.d Industrial Sources of Copper
- Provision C.15 Exempted and Conditionally Exempted Discharges

SMCWPPP’s assistance with the MRP provisions listed above was coordinated through the CII Subcommittee. Ward Donnelly from the City of Daly City continued to chair the CII Subcommittee during FY 2011-12. Dermot Casey from the County of San Mateo Health Services Agency, Environmental Health Services Division (County Environmental Health), represented San Mateo County and some of the cities that have an agreement with County Environmental Health to conduct stormwater inspections of businesses. A FY 2011-12 subcommittee attendance list is included in Appendix C. A majority of the subcommittee’s four meetings were attended by staff from the Cities of Belmont, Burlingame, Colma, Daly City, East Palo Alto, Half Moon Bay, Menlo Park, Millbrae, Pacifica, San Mateo, and South San Francisco, South Bayside System Authority and San Mateo County. The Cities of Brisbane, San Bruno and San Carlos had representatives attend one to two meetings. In general, the number of cities participating in CII Subcommittee meetings has increased.

The CII Subcommittee also has a Training Work Group that assists with the planning of trainings, developing educational outreach materials, and coordinating with the PIP Subcommittee on materials that affect businesses. Beginning in 2011, coordination and collaboration with the PIP Subcommittee was facilitated by CEH staff member Tim Swillinger. CEH helps SMCWPPP with staffing the PIP Subcommittee. The Training Work Group includes representatives from the Cities of Millbrae and South San Francisco and the County of San Mateo.

Major CII component accomplishments in FY 2011-12 included the following:

- Conducted an inspector training workshop on April 25, 2012. The workshop included presentations on conducting commercial and industrial facility stormwater inspections, industrial sources of PCBs and copper, and illicit discharge control.
- Updated Stormwater Business Inspector and Illicit Discharge Coordinator contact lists available on the SMCWPPP website (www.flowstobay.org).
- Convened a Water Utility Work Group that began developing guidance materials related to Provision C.15 requirements.

The following sections provide additional information regarding SMCWPPP's assistance to its member agencies through the CII component. Information on the status of the MRP Provisions C.12.a and C.13.d are included with Provision C.4 below since each involves business inspector training.

IMPLEMENTATION OF MRP PROVISIONS

Provision C.4 Industrial and Commercial Site Controls, Provision C.12.a PCBs Controls, and Provision C.13.d Copper Controls

The following tasks were completed with input and assistance from the CII Subcommittee and its Training Work Group:

- Updated Stormwater Business Inspector and Illicit Discharge Coordinator contact lists available on the SMCWPPP website (www.flowstobay.org).
- Facilitated communication and coordination between CEH and cities resulting in a Memorandum of Understanding under which CEH conducts certain hazardous materials and retail food facility stormwater inspections. A better understanding was reached of inspections, reporting and follow-up roles for both CEH and city inspectors.
- Conducted an all day inspector training workshop on April 25, 2012.

The inspector training workshop is described below.

<u>Commercial and Industrial Facility and Illicit Discharge Inspector Training Workshop</u>

The Training Work Group took the lead in planning the inspector training workshop held on April 25, 2012 at the South San Francisco corporation yard. Rob Lecel from the City of South San Francisco volunteered the use of this facility. The workshop was attended by 68 people and included presentations on conducting commercial and industrial facility stormwater inspections, industrial sources of PCBs and copper, and illicit discharge control. The workshop agenda, final attendance list and evaluation summary are included in Appendix C.

The workshop training was approved by the California Water Environment Association (CWEA) as providing four contact hours for Environmental Compliance Inspector certificate holders. The City of Millbrae's Catherine Allin assisted with obtaining CWEA's acceptance of the training as helping to fulfill the continuing education requirements for inspector re-certification.

The primary objective of the training was to provide an orientation to new inspectors and a refresher to existing inspectors who are responsible for inspecting businesses for compliance with local stormwater ordinances. Residential illicit discharge inspections and enforcement were also discussed. Workshop attendees found the regulatory overview presentation to be especially helpful. This presentation put the inspectors work in the context of the MRP requirements. Attendees also found the presentations by Dermot Casey and CEH staff on Business Inspection Workflow and Commercial Programs Inspections to be very helpful. The workshop also included presentations by EPA and Regional Water Board staff on PCBs and PCB-containing equipment. Workshop handouts included copies of presentations and example enforcement actions for residential illicit discharges provided by Daly City. In addition, Tim Swillinger and Mary Bell Austin from CEH brought PIP brochures and flyers for attendees.

The field exercise portion of the training workshop gave inspectors an opportunity to evaluate the effectiveness of BMPs used at different types of simulated activity areas. This also allowed city inspectors to interact with the CEH inspectors responsible for inspections in their jurisdiction.

Based on the evaluation forms submitted following the workshop, attendees were satisfied with the training. Approximately 91 percent of the attendees who completed the workshop evaluation form indicated that the workshop met their expectations. The other respondents did not answer this question. This workshop had almost twice as many attendees as the previous workshop, which was held in 2009.

Provision C.5 Illicit Discharge Detection and Elimination

During FY 2011-12, SMCWPPP staff continued to assist member agency staff with implementing MRP requirements to control illicit discharges through facilitation of periodic CII Subcommittee meetings and the training workshop described above.

The CII Subcommittee is currently reviewing a Mobile Business BMP brochure developed by the Santa Clara Valley Urban Runoff Pollution Prevention Program for use in San Mateo County. This project is expected to be completed next fiscal year.

BASMAA has a long-standing Surface Cleaner Training and Recognition program that focuses on improving the use of BMPs for businesses that clean surfaces (i.e., sidewalks, plazas, parking areas and building exteriors). During FY 2011-12, SMCWPPP staff continued to support this program via participation in the BASMAA Municipal Operations Committee. BASMAA uses a regional approach to support surface cleaner businesses online as part of BASMAA's Recognized Surface Cleaners. Cleaners may use BASMAA's website (www.basmaa.org) to get trained and recognized for the first time or renew their training and recognition, as required annually. SMCWPPP member agencies have continued to refer cleaners to BASMAA's website for surface cleaning training.

BASMAA continues to plan for an expansion of its surface cleaner training and recognition program to also include fleet washers and carpet cleaners.

Provision C.15 Exempted and Conditionally Exempted Discharges

MRP Provision C.15 (Exempted and Conditionally Exempted Discharges) has a number of monitoring and reporting requirements for Permittees that are also potable water purveyors. Municipal potable water purveyors in San Mateo County include: Cities of Brisbane, Burlingame, Daly City, Foster City, Hillsborough, Menlo Park, Millbrae, Redwood City, and San Bruno and San Mateo County. These requirements include documenting, monitoring, notifying, and reporting on various types of planned and unplanned potable water discharges.

During FY 2011-12, the CII Subcommittee recommended to SMCWPPP's Technical Advisory Committee that a Water Utility Work Group be temporarily formed to facilitate any training needs identified by SMCWPPP's member agencies. The eleven agencies that identified themselves as a water utility in the Annual Report were contacted to participate in the Work Group. The Work Group first met in April 2012. Subsequent meetings held in May and June 2012 focused on identifying training materials and workshop topics. A list of Work Group attendees is provided in Appendix C. In addition, SMCWPPP staff followed the progress of the Bay Area private water utilities that are funding a Regional Water Board staff position to facilitate development of a regional general permit for water utility potable water discharges. Draft guidance materials were developed and are expected to be finalized in FY 2012-13 prior to the training workshop.

MRP Provision C.15 also includes requirements for conducting educational outreach to discourage individual car washing where washwaters discharge directly to the MS4. As described within the PIP section of this Annual Report (Chapter 5), SMCWPPP developed a residential car wash coupon to encourage residents to use commercial car washes.

It should also be noted that MRP requirements for minimizing runoff and pollutant loading from excess irrigation are routinely addressed in the Parks Maintenance and IPM Work Group's discussions of water efficient landscape irrigation equipment, tools and techniques.

FUTURE ACTIONS

SMCWPPP activities that are planned for FY 2012-13 to assist member agencies comply with MRP requirements in Provisions C.4, C.5 and C.15 include the following:

1. Hold quarterly CII Subcommittee meetings.
2. Work with the Training Work Group to provide focused training for commercial and industrial facility and illicit discharge inspectors.
3. Assist member agencies with the implementation of commercial and industrial stormwater inspection tasks and illicit discharge detection and elimination tasks, including continuing to assist with business inspection plans and priorities, data management, enforcement response plans, complaint tracking and follow-up, and collection system screening programs.
4. Assist member agencies with implementing Provision C.12.a., incorporating PCBs and

PCB-containing equipment identification into inspection programs, and C.13.d., identifying, inspecting and ensuring proper BMPs at facilities likely to have sources of copper.

5. Help member agencies comply with the proposed requirements for controlling mobile sources described in MRP Provision C.5.d. This activity will include reviewing BASMAA's draft training and recognition materials for carpet cleaners and fleet washers. SMCWPPP will support opportunities for increasing the distribution and use of these materials once they have been finalized.
6. Prepare or adapt existing training materials for municipal water utility staff on complying with the MRP requirements for planned and unplanned potable water discharges. Hold a training workshop for municipal water utility operation and maintenance staff.
7. Prepare a list of any proposed additional types of non-stormwater discharges that the CII Subcommittee recommends be forwarded to the Regional Water Board's Executive Officer for approval.

5
PUBLIC INFORMATION AND PARTICIPATION

INTRODUCTION

The primary goals of SMCWPPP's Public Information and Participation (PIP) component are:

- To educate the public about the causes of stormwater pollution and its serious effects on the quality of local creeks, lagoons, shorelines, and neighborhoods;
- To encourage residents to adopt less polluting and more environmentally beneficial practices; and
- To increase residents' hands-on involvement in SMCWPPP activities.

PIP is essential for controlling pollution at the source because most pollutants originate from preventable, everyday activities. Pollutants in stormwater may be reduced by educating residents about the benefits of preventing stormwater pollution and motivating them to do their share to reduce pollution. This approach is recognized as being both cost-effective and efficient in meeting the goal of reducing pollutants in stormwater to the maximum extent practicable.

This section describes SMCWPPP's PIP accomplishments and assesses the effectiveness of the PIP activities completed in FY 2011-12.

The SMCWPPP PIP Subcommittee met six times in FY 2011-12 to oversee the development of educational materials and to guide the implementation of the PIP component. Shelly Reider of the City of Millbrae served as the chairperson this year for the PIP Subcommittee. An attendance list of regularly participating agencies is provided within Appendix D. A majority of the subcommittee's six meetings were attended by staff from the Cities of Belmont, Burlingame, Colma, Daly City, East Palo Alto, Foster City, Half Moon Bay, Millbrae, Pacifica, San Carlos, San Mateo, South San Francisco and San Mateo County. SMCWPPP accomplished the following major public information and participation tasks during FY 2011-12:

- Garnered local media attention with local newspapers writing articles about three successful SMCWPPP projects: Green Streets and Parking Lots Design Guidebook, Community Action Grant, and the coordination of California Coastal Cleanup Day.
- Continued to maintain the www.flowstobay.org website, with an increase in the number of subscribers to the following pages: Community Events, Resources for Teachers and Schools, New Information, Community Action Grant, Litter Reduction and Coastal Cleanup Day, Newsletter, Less Toxic Pest Control, and Press Room.
- Continued to implement a discount car wash campaign that involved partnerships with eleven commercial car washes located throughout the county to encourage residents to wash cars at commercial car washing facilities. Revised and distributed over 12,000 discount car wash cards

through municipal channels and outreach events. Revised a webpage detailing the discount program, and provided a point of contact to the public for the purpose of learning about the program and obtaining the discount card. Continued to educate the residents who choose to wash their cars at home to use minimal soap when washing cars and to divert the runoff to landscaped areas.

- Worked with the Trash Work Group to satisfy public involvement requirements related to cleanup events for documenting baseline trash data and establish methods for documenting overall trash load reductions.
- Continued to coordinate the California Coastal Cleanup Day for San Mateo County. The September 2011 event diverted 25,436 pounds of trash and 3,911 pounds of recyclables from waterways. An estimated 4,178 residents volunteered for this event, a slight decrease from 2010. However, since SMCWPPP started coordinating the program in 2006, there has been an overall more than four-fold increase in volunteers.
- Hosted an educational outreach booth at the nine day County Fair with an emphasis on the Regional Youth Litter Campaign.
- Participated in the San Francisco Bay Protection and Behavior Change Campaign project meetings and as a member of the steering committee for this regional project dedicated to developing a regional brand for stormwater and wastewater outreach activities.
- Updated the online "Resource Guide of Groups and Organizations in San Mateo County with Watershed Stewardship Efforts" featuring local groups and organizations providing volunteer opportunities for residents. Added two new groups: "Burlingame Citizen Volunteers" and "Redwood Creek Preservation Trust" to the guide. Worked with groups to promote cleanup activities through the creation of a new web page entitled "Spring Cleaning SMC" found under the Litter Prevention section.
- Awarded $15,000 to six organizations through the Community Action Grant program.
- Sponsored an educational assembly program for elementary-age students entitled "We All Live Downstream," performed by the Banana Slug String Band. The program emphasized the importance of not littering or dumping substances into the storm drain to protect the marine environment.
- Sponsored a high school educational program entitled "Water Pollution Prevention and Your Car," presented by Rock Steady Science. The program emphasizes proper car maintenance, including motor oil recycling and proper car washing, as well as watershed education and the "Green Streets and Parking Lots" urban runoff management approach to civil engineering.
- Continued to participate in the region-wide Integrated Pest Management (IPM) "Our Water Our World" campaign by working with local retail stores to maintain point of purchase information on less toxic pest control.
- Promoted IPM courses to 80 structural and landscape pest control operators registered with the County Agricultural Commissioner.

IMPLEMENTATION OF MRP PROVISION C.7

Provision C.7.a Storm Drain Inlet Marking

During FY 2011-12, SMCWPPP staff worked with the Public Works Municipal Maintenance Subcommittee to facilitate purchase of storm drain markers.

Provision C.7.b Advertising Campaigns

Advertising Campaign

SMCWPPP, as a member of BASMAA, participates directly with the BASMAA PIP subcommittee by attending all meetings, reviewing documents, and providing comments and feedback. During FY 2011-12, SMCWPPP took BASMAA-generated outreach materials pertaining to the Regional Youth Litter Campaign and developed them for local use. The following separate report developed by BASMAA summarizes the activities and surveys of the Regional Youth Litter Campaign conducted in FY 2011-12:

- BASMAA Youth Litter Campaign Report (see Appendix F)

SMCWPPP is also actively involved in the San Francisco Bay Protection and Behavior Change Campaign, which is a regional effort to create a brand for use on outreach materials and events that represent all stormwater and waste water public messages for the entire San Francisco Bay area. SMCWPPP staff has attended meetings from project inception in the spring of 2011 and has provided feedback and input on project management and brand development as a member of the project steering committee.

Pre-Campaign Survey

As SMCWPPP is a participant of the BASMAA Youth Litter Campaign, the following separate report developed by BASMAA summarizes the pre-campaign survey conducted in FY11-12:

- BASMAA Youth Litter Campaign Report (see Appendix F)

Provision C.7.c Media Relations

SMCWPP made all of its press releases available to the public as well as the media by posting them to http://www.flowstobay.org/ma_press_room.php. In addition to traditional release methods, the link to each release was also broadcast to our followers on Twitter.

Countywide Media Relations
Three press releases (see Appendix D) were sent out to local news editors, with resulting articles in local newspapers:

1. Public Invited to Participate in 2011 California Coastal Cleanup Day Events

Content: Details about the event, how to participate, and where to obtain more information.
Medium: Print and digital.
Date of publication: Released August 29, 2011.
As a result, two local print newspapers ran stories promoting the event, as did ten online papers and several non-profit partners' newsletters.

2. Grants Available for Projects that Enhance San Mateo County Waterways

Content: Details about the grant program, including application deadline, how to obtain an application, amount of funding, eligible entities, and type of projects.

Medium: Print and digital.
Date of publication: Released October 27, 2011.
As a result, one local print newspaper and three online newspapers ran stories informing County residents about the available funding.

3. San Mateo County Stormwater Guidebook Wins National ASLA Award

Content: Details about the Green Streets and Parking Lots Design Guidebook and the award, with a link to the guidebook's online version.
Medium: Print and digital.
Date of publication: Released October 28, 2011.
As a result, Businesswire and Reuters carried stories about the guidebook and the award, and several local non-profits added the guidebook link and description to their websites.

Regional Media Relations
SMCWPPP, as a member of BASMAA, participates directly with the BASMAA PIP subcommittee by attending all meetings, reviewing documents, and providing comments and feedback. During FY 2011-12, SMCWPPP took four BASMAA-generated press releases (see Appendix D) and developed them for local use:

- January 11, 2012: "Winter Rains Wash Pollutants into Local Waters"
- February 2, 2012: "Survey Calculates Bay Area Litter Problem Reaches up to 1.6 million Gallons Annually"
- June 1, 2012: "Wash Your Car the Smart Way this Summer"
- June 14, 2012: "Proper Pool Maintenance Means You Can Dive Into A No Pollution Summer"

The following report developed by BASMAA summarizes the regional media relations efforts conducted during FY 2011-12, and includes a full description of the above-mentioned press releases, as well as others that were released regionally:

- BASMAA Media Relations Final Report FY 11-12 (see Appendix F)

Provision C.7.d Stormwater Point of Contact

The SMCWPPP website (www.flowstobay.org) and phone number (650-372-6200) are publicized on outreach materials and maintained by SMCWPPP. Member agency points of contact are publicized on the website. The website address and program phone number have not changed since the last Annual Report.

Website Statistics
The total number of people visiting www.flowstobay.org during FY 2011-12 was 52,839, which represents a slight increase over last year. Certain web pages have a subscription service, Gov Delivery, which sends updates to a given page to subscribers via email. Statistics for Gov Delivery are shown in Table 5-1. The website continues to be promoted during outreach events and citizen involvement activities, as well as through media advertising, promotional items, and literature. New web pages and features added this year include:

- Spring Cleaning SMC, a page devoted to spring cleanups around the county (See Appendix D)
- A Spanish-Language page outlining stormwater pollution prevention (see Appendix D)
- A Chinese-Language page outlining stormwater pollution prevention (See Appendix D)

- Additional button on the home page leading to stormwater inspectors for those who wish to report illegal dumping.
- Redesigned Litter Reduction and Coastal Cleanup Day pages

Gov Delivery emails were sent out to the list of subscribers whenever there were updates added to any of these pages. Subscribers include local news media. Table 5-1 shows an increase in subscriptions in 2012 from the previous year.

Table 5-1 Gov Delivery Subscribers

Web Page with Gov Delivery Option	Subscriber Numbers June 30, 2012	Subscribers Numbers June 30, 2011
Community Events	293	181
New Information	230	144
Resources for Teachers and Schools	211	129
Community Action Grant	227	135
Litter Reduction & Coastal Cleanup Day	324	159
Newsletter: Pollution Prevention Post	941	876
Less Toxic Pest Control	206	128
Press Room/ In the News	240	149
Green Streets and Parking Lots	124	Unavailable*

*During a Gov Deliver software upgrade during FY 11-12, it was discovered that the number of subscribers for Green Streets and Parking Lots reported in 2010-11 was inaccurate due to a glitch in the software subscription feature for that page. Previous data was accidentally lost in the upgrade, so actual numbers for 2010-11 are no longer available. However, 2011-12 subscriber numbers are accurate.

Top four web pages viewed in 2010-11, spanning all months in the year:

1. 18,312 views: Sustainable Streets
2. 13,940 views: Calendar of Events
3. 13,110 views: Community Action Grant
4. 7,271 views: Resources for Teachers and Schools

Top four document downloads in a single month

1. 266: Cigarette Butt Reduction Pilot Study, Municipalities Section, December 2011
2. 195: Cigarette Butt Reduction Pilot Study, Municipalities Section, November 2011
3. 170: Sustainable Streets Title Page, Municipalities Section, July 2011
4. 134: Sustainable Streets Book Layout, Municipalities Section, October 2011.

Social Media

In addition to the web page, there are also established YouTube and Twitter accounts for flowstobay, which are used to inform the public of outreach events and stormwater messages. These accounts continued to be used and maintained throughout the fiscal year. In FY 2011-12, a Facebook page was established for flowstobay and linked to the Regional Youth Litter Campaign Facebook page. In addition, a QR scanning code was developed so smart phone users can go directly to flowstobay when the code is scanned. The code will be used at outreach events as an additional promotional tool.

Presentations

SMCWPPP conducted a presentation of the function of the PIP committee in stormwater outreach to the Bay Area Pollution Prevention Group on December 7, 2011.

Provision C.7.e Public Outreach Events

Coordination of California Coastal Cleanup Day in San Mateo County

See section C.7.g, as this event contributes to compliance with both C.7.e and C.7.g.

San Mateo County Fair, June 9-17, 2012

SMCWPPP conducted a county-wide outreach event at the San Mateo County Fair, June 9-17, 2012. A booth was set up as part of the Sustainable Living Exhibit, which was dedicated to presenting projects, organizations, products, and services focused on pollution prevention, energy efficiency, recycling and creative re-use. SMCWPPP placed advertisements in local papers promoting the event and developed a promotional poster that was provided to all jurisdictions in the county to use for local promotion.

The booth was located in Redwood Hall, which was open to the public for a total of 95 hours during the nine days. Staff from nine jurisdictions and County Environmental Health worked at the booth at select times each day for a total of 57 hours of staffed time for the week. The booth was unstaffed for the remaining 38 hours, including night time when most of the public were at concerts and shows. Representative sampling of the number of people spoken to was taken at different times throughout the week. Based on the sampling, it was calculated that an average of 34 people per hour were spoken to during the hours that volunteers were present. Using this averaging, it is estimated roughly 1,938 people were directly contacted during the 57 staffed hours. Countless others had access to the booth during unstaffed times, and were guided by signs and posters to help themselves to outreach materials. The public was introduced to the “Be the Street” litter campaign. During the event, 81 people signed up for the campaign e-newsletter.

Outreach Materials and Giveaways

The following SMCWPPP items are given out at outreach events and by request to jurisdictions, organizations, and residents in San Mateo County (does not include the less toxic pest control items listed in section C.9.h.ii):

- "You're the Solution" storm water brochure, English and Spanish
- Pocket Ashtray
- 5 children’s activity books: Pest or Pal, Watershed Protection, Healthy Water/People, Stormwater, and Don't Be a Litterbug
- Children’s promotional materials with SMCWPPP logo/messages: fish sponge, bookmark, pencils, fish eraser, crayons
- Car Wash Discount Cards
- SMCWPPP Paper bags
- New outreach materials listed below

New Outreach Materials Developed This Year

- Flowstobay.org Banner

- Flowstobay.org Business Card
- Car Wash Tip Card with updated discount card attached
- Flowstobay reusable bag

In addition, the following materials developed by San Mateo County Environmental Health related to household hazardous waste are provided at outreach events, and also supplied to jurisdictions, organizations, and the public:

- Household Hazardous Waste brochure and business card
- Very Small Quantity Generator brochure for hazardous waste disposal for small businesses
- Used Oil Recycling brochure
- Used Oil Recycling children's coloring book
- Used Oil Curbside Options card
- Less Toxic Cleaning Alternatives recipes (in card and sheet form)
- Newsletter: Pollution Prevention Post (see below)

Newsletter

Issues of the "P3: Pollution Prevention Post" newsletter were published in September 2011 and April 2012 to coincide with Pollution Prevention Week and Earth Day, respectively. Both issues are provided in Appendix D. Newsletter topics included: Coastal Cleanup Day, community action grants, curbside HHW services, Earth Day information, less toxic cleaning recipes, oil changes and your car's maintenance schedule, Styrofoam container ban, Spring Cleaning SMC, green shopping, less toxic pest control, school outreach programs, car wash discount card information, and recycling used tires. A total of 6,000 hard copies were distributed at libraries, city halls, community centers, organizations, and outreach events. The newsletter is also available on the website with total views of:

- 3,422 for Fall 2011 issue
- 2,886 for Spring 2012 issue

Currently there are 448 residents who receive the newsletter by mail and 941 residents who receive it by email.

Car Wash Outreach

As specified in section C.7.e of the MRP, SMCWPPP has developed specific outreach materials and efforts related to educating the public on car wash best practices. In FY 2010-11, a car wash discount program was established in which SMCWPPP partnered with 11 car washes located throughout the county. Discount coupons were developed and handed out at outreach events to facilitate a discussion of the topic with the public. In FY 2011-12, the informational tip card was redesigned to incorporate a new discount card (see Appendix D) and the partnerships with commercial car washes were maintained. Advertisements were also placed in local newspapers promoting car wash best practices and the discount program.

Also in FY 2011-12, SMCWPPP partnered with one commercial car wash to pilot a school fundraising program in which schools would sell discount cards to raise funds, and in the process would learn about car washing and be encouraged to stop holding car washes to raise money. The pilot program was not successful due to lack of interest from the schools, but one school did participate in educating their students. Bayside S.T.E.M. Middle School in San Mateo was given a pre-and post survey to gauge the effectiveness of the education effort, which involved reviewing the tip card and holding a T-shirt contest. The results of the pre-surveys are as follows:

- 75% were aware that storm drains flow directly to the bay or ocean, 22% thought stormwater gets treated first.
- 48% said their families wash their cars at home, 39% said they go to a car wash.
- Pertaining to the question of what is the best way to protect the environment when washing a car, 35% chose washing at home with biodegradable soap, 22% preferred no soap, 28% opted to park the car on the lawn when washing, and 15% said to take it to a car wash.

For the post-survey:

- 41% claimed they learned something new about where storm drains flow.
- 67% learned that car wash pollution ends up in the bay or ocean.
- 43% claimed they would encourage their family to change the way cars are washed.
- 41% said they would tell others of what they learned.

Provision C.7.f Watershed Stewardship Collaborative Efforts

<u>Environmental Resource Guide of Groups and Organizations in San Mateo County with Watershed Stewardship Efforts</u>

SMCWPPP updated the online Resource Guide, created in 2009, of groups and organizations in San Mateo County that focus on watershed stewardship and encourage public involvement in watershed volunteer efforts. All groups were contacted to verify and update their information. Two new groups were added to the guide: Burlingame Citizen Volunteers and Redwood Creek Preservation Trust. There are now a total of 42 groups listed on the online guide, which is accessible to the public from the home page and is located at www.flowstobay.org/cs_env_resource_guide.php. Groups are searchable by city or topic of interest. In addition, information on how to form a watershed group is available for interested residents, to encourage formation of groups in areas that do not currently have a local group.

<u>Spring Cleanup Promotional Program</u>

In FY 2011-12, SMCWPPP launched “Spring Cleaning SMC” a new annual promotional campaign designed to provide an outlet for watershed stewardship groups and jurisdictions to promote small local cleanup events. It is promoted from March 21 to June 21 as a cleanup “season,” including all Earth Day events that take place in late April. SMCWPPP developed a web page on www.flowstobay.org dedicated to posting cleanup events during this time period. Promotional newspaper advertisements and bus ad cards were developed and placed in newspapers and busses throughout the county, directing the public to the web page. A total of 18 spring cleanup events were posted during the spring season. The page had 205 visits in March, 327 visits in April, 100 visits in May, and 39 visits in June.

Groups and jurisdictions were asked to report back on the success of their efforts. Reports showed a total number of 385 volunteers who picked up 1,225 pounds of trash, and an additional report of 672 gallons. The actual numbers are likely to be higher, as some groups never reported back.

Provision C.7.g Citizen Involvement Events

Coordination of California Coastal Cleanup Day, September 17, 2011

California Coastal Cleanup Day, held each year on the third Saturday in September, is the largest volunteer event in the state. The California Coastal Commission sponsors the event with the support of county and regional coordinators. For the sixth year, SMCWPPP coordinated the event for San Mateo County, recognizing that this event is a great opportunity to get many residents of all ages actively involved with the problems associated with litter. This event qualifies as both a Public Outreach Event (C.7.e.) and Citizen Involvement Event (C.7.g.). In preparation for the event:

- Outreach materials (i.e., posters and postcards) provided by the Coastal Commission were disseminated to public schools, libraries, community centers, non-profit organizations, churches, youth groups, site captains, and all jurisdictions within the County. These materials were also handed out at outreach events.
- An article was written in the San Mateo County Environmental Health newsletter, "Pollution Prevention Post" (Fall 2011) which informed residents about the event and where to find a location list of cleanup sites in San Mateo County. Approximately 3,000 copies were distributed throughout the County to libraries, residents, and local businesses.
- A press release was developed and sent out on August 29, 2011 describing the event and encouraging readers to go to www.flowstobay.org to find out how to participate. The following papers picked up the press release and ran articles or added the event to their public calendars (or both): *San Mateo Daily Journal*, *Half Moon Bay Review*, and *Coastsider*, plus nine local Patches (online news outlets by Patch.com, with a focus on a single city).
- The event was posted on the www.flowstobay.org web site home page, as well as in the online calendar. Several environmental groups included the event their on web calendars. SMCWPPP used Twitter to draw attention to the event as the date approached.
- All public schools were sent a memorandum which contained information about two ways that schools could support Coastal Cleanup Day. They included displaying posters on campus on the first day of school where staff, students, and parents would see them and participating in a school or classroom cleanup activity on Friday, September 16 - the day before Coastal Cleanup Day. Participating students were asked to pick up litter around campus and record what they found on data cards. All the supplies needed were provided, and the students were counted among the thousands that participated.
- A site captain's meeting was held to disseminate the latest information from the Coastal Commission to the site captains, along with materials that would be needed to conduct the event. They were trained in signing in volunteers and providing safety talks. There were three new sites established: Sequoia Yacht Club and Redwood High School in Redwood City, and Pilarcitos Creek/Downtown in Half Moon Bay.

On the actual day of the event, 32 site captains managed 54 sites throughout the county. There were 40 sites located on the coastal portion of the county (including 21 large and small sites in the City of Pacifica), and 14 sites were located bayside. A total of 4,178 volunteers were reported to have participated in the event. A total of 25,436 pounds of trash and 3,911 pounds of recyclables were gathered in the three- hour period of the event. A total of 73 miles of shoreline was cleaned.

Community Action Grant

Community Action Grants are awarded annually to volunteer groups, teachers, environmental organizations, and other local, not-for-profit associations interested in implementing projects that improve the quality of local creeks, the Bay or the Pacific Ocean. The Community Action Grant was advertised through postcards mailed to local nonprofit organizations and community groups, including home owners associations. The application was made available on www.flowstobay.org, along with award descriptions of previous projects that received funding. Six applicants were awarded a total of $15,000 in funding. A full description of their respective projects is available at http://flowstobay.org/cs_community_action.php. A summary of projects is as follows:

1. **Acterra: San Francisquito Creek Watershed Project [Year 12 of funding, Year 16 of Program / Project] Annually -** The goal of this project/ program is to offset impacts resultant from urbanization in floodplains and in areas adjacent to creeks and beneficial water bodies. This work is intended to benefit multiple species living in this creek including endangered and protected species (e.g., Steelhead Trout).
2. **Pacifica Beach Coalition: "Earth Day Pacifica 2012 ~ Another Day of Action" [Year 4- of funding, Year 8 of PBC event] -** Promote and coordinate day of action on Earth Day 2012 - April 21, 2012. The mission of this project, which is now in its eighth year, is to reach people who are still littering; engage, inspire, educate, and fortify the people to take environmental actions; and to unite all generations in solutions for a healthier environment. Engage the public, schools, community groups, families, individuals and businesses in picking up litter and enhancing our coastal environment city wide.
3. **Ocean Shore School Parent Teacher Association: "Oceans Explorers – Understanding the Impact on Coral Reefs" [Year 3] -** To teach students to appreciate, understand and protect our local Oceans / California Coastal Reefs (primarily rock) and learn how to protect Coral Reefs. The project has two areas of focus: 1) Ocean Shore Campus / Edgewater and Esplanade Watershed, and; 2) Pacifica State Beach / San Pedro Creek Watershed.
4. **San Mateo County Coast Natural History Association: "Half Moon Bay State Beach~ Habitat Restoration Program" [Year 8] -** Invasive plant removal and native planting at multiple Half Moon Bay State Beach locations and trash removal along these areas and within California State Parks managed beaches located in Half Moon Bay. Water quality enhancement, pollution prevention and an increased awareness of stormwater pollution are project goals.
5. **Marine Science Institute (MSI): "Earth Day on the Bay Celebration" [Year 5] -** MSI works with students from schools throughout the bay Area. Earth Day on the Bay is their biggest event of the year to increase attention of water issues in the environment and focus on the health of the Ocean and its inhabitants. Hands on activities, including a watershed-themed arts and crafts and a new plastics pollution education tent with various activities, are the main focus of the project. Within the plastics pollution education tent, whale feeding strategies will be discussed and the attendees are to attempt to eat in the same manner.
6. **Taylor Middle School [Year 1**] **-** Funding to purchase trash pickup devices for students to use during trash cleanup events.

Spring Cleaning SMC

See C.7.f Watershed Stewardship Collaborative Efforts, above.

Provision C.7.h School-Age Children Outreach

Banana Slug School Assembly Program

SMCWPPP contracted with the Banana Slug String Band (a two to four-person musical theatrical team that specializes in school assemblies) to develop and present interactive shows about stormwater. The show, entitled "We All Live Downstream," provides information about storm drains, watersheds, the marine environment, and tips to keep water clean, including litter prevention. The show uses songs and activities to engage students on the topic. The Banana Slug String Band performed 44 assemblies at 28 elementary schools across the county, reaching nearly 9,315 students (Table 5-2). Surveys of the performance and its effectiveness were sent to each school, and 21 schools responded with 1,216 student responses. The results indicated the following:

- 81% understood that stormwater flows directly into the bay or ocean.
- Paper and plastic were the top responses of the types of pollution that can enter the storm drain.
- Students cited sick or dying fish as the top effect of pollution in the water.
- Not littering and recycling was the top choice in ways to prevent pollution.
- 89% liked the presentation.

Table 5-2 Banana Slug String Band School Assembly Performances 2011-12

School	City	Date	Performances	Students
N. Shore Montessori	San Mateo	09/14/11	2	378
Foster City Elementary	Foster City	09/21/11	2	800
Serendipity School	Belmont	10/12/11	1	116
Laurel Elementary	San Mateo	10/12/11	2	322
Woodside Elementary	Woodside	10/14/11	1	140
Hilldale School	Daly City	10/17/11	1	78
Lincoln Elementary	Burlingame	10/17/11	2	440
John Muir Elementary	San Bruno	10/21/11	1	300
Redwood Shores Elementary	Redwood City	11/04/11	2	400
Lomita Park Elementary	San Bruno	11/09/11	2	320
Laurel School	Atherton	11/10/11	2	470
Brentwood Academy	East Palo Alto	12/09/11	2	600
Sunshine Gardens Elem.	S. San Francisco	12/20/11	2	400
German American School	Menlo Park	01/10/12	1	175
Ponderosa Elementary	S.San Francisco	01/10/12	2	425
Cabrillo Elementary	Pacifica	01/11/12	2	420
Woodland School	Portola Valley	01/12/12	1	120
Sea Crest School	Half Moon Bay	01/13/12	1	185
Pescadero Elementary	Pescadero	01/19/12	1	90
La Honda Elementary	La Honda	01/19/12	1	75
Crocker Middle	Hillsborough	02/07/12	2	160
Brittan Acres Elementary	San Carlos	02/10/12	2	476
Brisbane Elementary	Brisbane	02/24/12	2	250
Highlands Elementary	San Mateo	04/18/12	2	450
West Hillsborough	Hillsborough	04/19/12	1	460
Franklin Elementary	Burlingame	04/19/12	2	450
Adelante Elementary	Redwood City	05/10/12	1	415
Farallon View Elementary	Montara	05/10/12	1	400

Rock Steady Science High School Classroom Presentation

This year, SMCWPPP partnered with the County's Used Oil Recycling Program to bring a new classroom high school presentation to students in grades 10-12, called "Water Pollution Prevention and Your Car." The program is targeted at driving-age students in auto repair, science, and environmental science classes. There are four main topics of the presentation: sources of water pollution, watersheds and storm drains, car maintenance (proper oil changes/recycling and car washing), and Green Streets and Parking lots. The presentation consists of a PowerPoint section, a jeopardy game, and a group poster activity. The presentations began during the spring semester of the 2010-11 school year and continued through the 2011-12 fiscal/school year. A total of 50 presentations were given in 22 different schools located throughout the county, reaching over 1,350 students (Table 5-3). (Note: some cities in San Mateo County do not have high schools, and their students feed into high schools in neighboring cities. This was carefully accounted for in the planning of the performance schedule to ensure that students from every city in the County had access to the presentations. In some cases, presentations occurred in more than one school in a given city to accommodate this situation.)

A survey was handed out to the students at the end of each presentation. The survey results showed that:

- 89% stated they learned that cars can contribute to water pollution by way of the storm drain system.
- 76% learned about local watersheds and ways to protect them
- 84% would recommend the presentation to their peers.

Table 5-3 Rock Steady High School Presentations 2011-12

High School	City	Date	Presentations	Students
Migrant Youth Program	Redwood City	9/1/11	1	35
Peninsula High	San Bruno	11/28/11	2	60
Stanbridge Academy	San Mateo	12/14/11	2	30
Thornton High	Daly City	1/5/12	4	120
Hillsdale High	San Mateo	1/30/12	2	38
Burlingame High	Burlingame	2/6/12	1	40
Alma Heights Academy	Pacifica	2/7/12	1	50
South SF High	South SF	2/13/12	4	88
Regional Occ. Program	Burlingame	2/16/12	2	30
Menlo-Atherton High	Atherton	2/28/12	2	25
Oceana High	Pacifica	3/26/12	2	25
Jefferson High	Daly City	3/27/12	4	158
Half Moon Bay	HMB	3/30/12	2	50
El Camino High	South SF	4/9/12	4	102
Hillcrest School	San Mateo	4/11/12	4	130
Mercy High	Burlingame	5/3/12	2	40
Camp Glenwood	La Honda	5/4/12	2	24
Redwood High	Redwood City	5/7/12	2	17
Mills High	Millbrae	5/8/12	3	88
Peninsula High	San Bruno	5/9/12	2	50
Community North	South SF	5/11/12	1	20
Aragon High	San Mateo	5/21/12	4	134

Science Fair
On January 31, 2012 SMCWPPP representatives served as judges in the special awards category, reviewing more than 20 exhibits/projects in the category of Environmental Preservation.

A fifth grade student was selected to receive SMCWPPP's Water Quality Award for her project titled, "How Toxic is Your Child's Park?". SMCWPPP awarded Rebecca with a certificate and a bag of program promotional children's giveaway items.

IMPLEMENTATION OF MRP PROVISION C.9

Provision C.9.h.i and ii Public Outreach: Point of Purchase

Our Water, Our World Program
To coordinate the program within San Mateo County SMCWPPP participated in the regional effort for the "Our Water, Our World" program by attending all IPM partnership meetings with BASMAA and participating jurisdictions.

Local implementation of the *Our Water Our World* (OWOW) partnership continued with participation from nineteen San Mateo County stores (Table 5-4). This is an increase in one store from last year, Wisnom's Hardware in San Mateo. SMCWPPP staff visited each store a minimum of twice during FY 2011-12, once in the fall and again in the spring. Several larger stores (e.g., Home Depot) were visited more frequently. During each visit, communication with the store managers and employees was maintained, store displays were updated, and fact sheets restocked. Staff also noted any new less toxic products to report to BASMAA for investigation and inclusion on the master products list.

Table 5-4 San Mateo County "Our Water, Our World" Partnership Stores FY 2011-12

Brisbane Hardware	1 Visitacion Ave	Brisbane
Carlmont Ace Hardware	1029 Alameda De Las Pulgas	Belmont
Carlmont Nursery	2029 Ralston	Belmont
Golden Nursery	1122 2nd Ave	San Mateo
Half Moon Bay Nursery	11691 San Mateo Rd.	Half Moon Bay
Home Depot	2 Colma Blvd	Colma
Home Depot	303 E. Lake Merced Blvd.	Daly City
Home Depot	1781 East Bayshore Road	East Palo Alto
Home Depot	1125 Old County Rd	San Carlos
Home Depot	2001 Chess Drive	San Mateo
Linda Mar Hardware	560 San Pedro Ave	Pacifica
Ocean Shore Hardware	111 Main Street	Half Moon Bay
Orchard Supply Hardware	1010 Metro Center Blvd	Foster City
Orchard Supply Hardware	900 El Camino Real	Millbrae
Orchard Supply Hardware	2110 Middlefield Road	Redwood City
Orchard Supply Hardware	2245 Gellert Blvd	South San Francisco
Roger Reynolds Nursery	133 Encinal Ave	Menlo Park
Wegman's Nursery	492 Woodside Rd	Redwood City
Wisnom's Hardware	545 First Ave.	San Mateo

To promote the program, SMCWPPP conducted the following outreach during FY 2011-12:

- Staffed a booth at the NorCal Spring Trade Show, February 16, 2011 at the San Mateo Event Center. This trade show is attended by professional landscapers and retail nursery owners and staff.
- Partnered with County RecycleWorks to use and distribute fact sheets and Bay Friendly Gardening guides in their popular Master Composter trainings and series classes. Additional materials were given out at events that RecycleWorks staffed throughout the year.
- Participated in the IPM advocates training program in which two local stores, Home Depot in Colma and Orchard Supply Hardware in South San Francisco, received staff training by the IPM advocate intern. The intern also maintained working relationships with those store managers and continued to update the established program.
- Conducted an outreach tabling event with the IPM advocate at Orchard Supply Hardware in South San Francisco on March 10, 2012. The IPM advocate did additional tabling events at this store on April 22 and May 5, 2012.
- Provided materials and information at the other outreach tabling events hosted throughout the year.
- Developed a new OWOW label specifically for Home Depot to accommodate the unique needs of the store pricing system.
- Developed bus ad cards in English and Spanish to be posted at the beginning of the FY 2012-13.
- Provided materials and information at the other outreach tabling events hosted throughout the year.
- Maintained distribution of materials through partner stores by purchasing the OWOW fact sheets, brochures, booklets, children's activity books, pocket guides, and business cards available from BASMAA.

Provision C.9.h.v and vi Public Outreach: Pest Control Operators

SMCWPPP contacted the local Agricultural Commissioner to obtain a list of Pest Control Operators in San Mateo County. Using this list, a packet was sent to pest control operators with a cover letter explaining basic IPM and encouraging them to become IPM-certified by either:

- Attending the Pesticide Applicators Professional Association seminar for landscape pest control operators on February 28, 2012 in San Jose (a flyer for this seminar was included in the packet); or,
- Participating in an online training course by EcoWise, designed for structural pest control operators. A flyer for this program was also included in the packet.

The packet was sent on January 19, 2012. In the cover letter, the operators were encouraged to become IPM-certified, and to contact SMCWPPP to be part of a new web page dedicated to helping the public find IPM-certified contractors on www.flowstobay.org.

FUTURE ACTIONS

SMCWPPP staff plan to conduct the following PIP activities during FY 2012-13:

- Hold PIP Subcommittee meetings every other month.
- Act as Chair of the BASMAA PIP subcommittee.
- Support and participate in the development of the Regional Ad Campaign and regional media relations pitches.
- Support and participate in the development of the San Francisco Bay Partnership and Behavior Change Campaign to develop a region-wide brand and collaborate on related outreach activities.
- Conduct a minimum of two local media relations pitches.
- Maintain the www.flowstobay.org website, with a re-design and upgrade of the content management system.
- Maintain social media outlet accounts with Twitter and Facebook.
- Increase quantity of Spanish and Chinese language web pages on www.flowstobay.org.
- Staff local public outreach events, including one countywide event.
- Maintain stock of outreach materials and provide to jurisdictions and public on request.
- Maintain the existing outreach campaign that partners with commercial car wash businesses to promote use by residents.
- Maintain and update the Environmental Resource Guide.
- Continue Spring Cleaning SMC with stewardship groups to coordinate spring cleanup events.
- Coordinate the Coastal Cleanup Day event in San Mateo County.
- Offer school assemblies to K-5th graders.
- Re-develop the Jr. High and High School Outreach Program.
- Continue the IPM “Our Water Our World” partnership campaign.
- Continue outreach and education for pest control operators.

6
Watershed Assessment and Monitoring

INTRODUCTION

SMCWPPP's Watershed Assessment and Monitoring (WAM) component assists member agencies to achieve compliance with MRP provisions related to water quality monitoring (Provision C.8) and certain water quality pollutants of concern (Provisions C.11, C.12, C.13.c and e, and C.14). Much of this work is accomplished through participation in BASMAA regional projects. SMCWPPP staff helps implement and oversee these regional projects by participating in the activities of a number of regional committees and work groups, including the BASMAA Monitoring and Pollutants of Concern Committee (BASMAA MPC), the Regional Monitoring Coalition (BASMAA RMC) Work Group, the Clean Watersheds for a Clean Bay Project Management Team, and the Regional Monitoring Program (RMP) Small Tributaries Loading Strategy (STLS) Work Group.

Through the BASMAA MPC, SMCWPPP staff helped to develop and implement regional project work plans, scopes of work, schedules, and associated budgets. The status and results of these BASMAA regional projects are described in detail in the *Regional Pollutants of Concern Report for FY 2011-2012 and Regional Monitoring Coalition Monitoring Status Report for February-June 2012* (Appendix F), hereinafter referred to as the POC and Monitoring Regional Supplement. SMCWPPP staff authored some sections of this report and reviewed and edited the entire document. The POC and Monitoring Regional Supplement report provides detailed descriptions of how member agencies and other MRP Permittees complied with reporting requirements related to water quality monitoring and certain pollutants of concern.

SMCWPPP's assistance with the WAM component's activities is coordinated through the WAM Subcommittee. Dermot Casey from the County of San Mateo Health Services Agency, Environmental Health Services Division continued to chair the WAM Subcommittee during FY 2011-12. SMCWPPP staff facilitated three meetings of the WAM Subcommittee during FY 2011-12 to inform member agency staff of WAM component work and to gather their input on specific issues. A FY 2011-12 subcommittee attendance list is included in Appendix E. A majority of the subcommittee's three meetings was attended by staff from the Cities of Brisbane, Burlingame, Daly City, East Palo Alto, Pacifica, San Mateo, and South San Francisco, and the County of San Mateo.

WAM component accomplishments in FY 2011-12 included the following:

- SMCWPPP supported the BASMAA RMC through its continued participation in all activities of the BASMAA MPC and a work group of this committee referred to as the BASMAA RMC Work Group. This included participation by SMCWPPP staff in monthly meetings of the BASMAA MPC and the BASMAA RMC Work Group.

- In coordination with other BASMAA agencies, SMCWPPP continued to contribute funding to the San Francisco Estuary Regional Monitoring Program, participate in selected RMP committees and work groups, and providing input to related work plans and reports.
- Through the BASMAA RMC, SMCWPPP staff helped finalize several documents critical to support water quality monitoring and compliance with Provision C.8.c. – Creek Status Monitoring / Rotating Watersheds. SMCWPPP staff also assisted the BASMAA RMC to evaluate database platforms to house the RMC water quality monitoring data and contract with a database developer in June 2012 to begin development of the RMC Information Management System using Microsoft Access.
- Field monitoring required by MRP Provision C.8.c was initiated in San Mateo County during the FY 2011-12 wet weather season and involved sampling the suite of parameters listed in Table 8.1 of the MRP at multiple sites.
- Through the RMP STLS Work Group, SMCWPPP staff helped to select and initiate monitoring for pollutants of concern, in compliance with MRP Provision C.8.e, at four stations in the RMC area. The STLS Work Group identified two additional monitoring sites that will be sampled in FY 2012-13 to fully comply with MRP Provision C.8.e. One of these sites is located at the Pulgas Creek Pump Station in the City of San Carlos.
- To encourage citizen monitoring, SMCWPPP staff coordinated with Acterra on several issues: 1) discussed water quality conditions at their restoration site in San Mateo County on Arroyo Ojo de Agua Creek 2) discussed providing in-kind technical support for water quality methods including toxicity and pathogen indicator sampling; 3) encouraged them to submit a grant to USEPA to expand their Riparian Restoration/Water Quality Outreach and Monitoring Program; 4) provided contacts to other watershed groups conducting monitoring in San Mateo County and encouraged them to also contact these groups for technical advice and as potential collaborators in monitoring and grant applications.
- Provisions C.11 and C.12 implement stormwater runoff-related actions required by the mercury and PCBs Total Maximum Daily Load (TMDL) water quality restoration programs. During FY 2011-12, SMCWPPP staff participated in a number of BASMAA regional projects that address mercury and PCBs in stormwater runoff, including the EPA grant-funded project entitled Clean Watersheds for a Clean Bay (CW4CB) and the PCBs in Caulk project, which is funded by the federal stimulus program (American Recovery and Reinvestment Act). The POC and Monitoring Regional Supplement report contains further details about these projects and their status.
- SMCWPPP staff worked with BASMAA to develop a spreadsheet entitled "FY 11-12 Estimated Mass of Mercury Collected Calculator (Version 1.0)" and used the calculator to estimate the mass of mercury collected by the San Mateo County Household Hazardous Waste Program during FY 2011-12.
- SMCWPPP staff prepared a project work plan for the Pulgas Creek Pump Station pilot diversion project and submitted to Regional Water Board staff in May 2012. SMCWPPP staff also obtained a wastewater discharge permit from SBSA and began identification and mobilization of equipment needed for the pilot diversion project.
- Provision C.13.c. (Copper Controls - Vehicle Brake Pads) requires Permittees to participate in the Brake Pad Partnership (BPP) process to develop California legislation phasing out copper from certain automobile brake pads sold in California. Provision C.13.e (Copper Controls - Studies to Reduce Uncertainties) 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. During FY 2011-12, SMCWPPP staff participated in BASMAA regional projects that address these provisions. The POCs and Monitoring Regional Supplement contains further details.

- MRP Provision C.14 requires San Mateo County and other MRP Permittees to work collaboratively to begin identifying, assessing, and managing controllable sources of the following lower priority pollutants that have been found in stormwater runoff: polybrominated diphenyl ethers (PBDEs), legacy pesticides, and selenium. During FY 2011-12, SMCWPPP staff participated in a BASMAA regional project that addresses this provision. The POCs and Monitoring Regional Supplement report provides further details about this project and its status.

IMPLEMENTATION OF MRP PROVISIONS

The following sections briefly describe the activities implemented through the WAM component during FY 2011-12 to comply with MRP Provisions related to water quality monitoring (Provision C.8) and certain water quality pollutants of concern (Provisions C.11, C.12, C.13.c and e, and C.14).

Provision C.8 Water Quality Monitoring

MRP Provision C.8 requires a number of activities related to monitoring water quality in stormwater runoff receiving waters. All activities related to compliance with Provision C.8 are coordinated through a monitoring collaborative (i.e., BASMAA RMC) which includes SMCWPPP and other Bay Area stormwater programs. During FY 2011-12, SMCWPPP supported the RMC through its continued participation in all activities of the BASMAA MPC and a work group of this committee referred to as the BASMAA RMC Work Group. This included participation by SMCWPPP staff in monthly meetings of the BASMAA MPC and the BASMAA RMC Work Group.

<u>Provision C.8.b – San Francisco Estuary Receiving Water Monitoring</u>

MRP Provision C.8.b requires that Permittees participate in a San Francisco Estuary receiving water monitoring program, at a minimum equivalent to the San Francisco Estuary Regional Monitoring Program (RMP). In coordination with other BASMAA agencies, SMCWPPP continued to contribute funding to the RMP, participate in selected RMP committees and work groups, and providing input to related work plans and reports.

<u>Provision C.8.c – Status Monitoring / Rotating Watersheds</u>

Through the BASMAA RMC, SMCWPPP staff helped finalize several projects/documents critical to support water quality monitoring and compliance with Provision C.8.c. These are briefly described below. The POC and Monitoring Regional Supplement contains further details about these projects/documents and their status.

- <u>RMC Multi-Year Work Plan</u>: An overview of the approach to plan monitoring activities in compliance with MRP Provision C.8. This document was developed by the RMC over several years and finalized in 2011.

- <u>RMC Creek Status and Long-Term Trends Monitoring Plan (RMC Monitoring Plan)</u>: A road map to the monitoring activities implemented by Bay Area stormwater programs and associated Permittees participating in the RMC to comply with MRP Provision C.8.c

- Creek Status Monitoring Program Quality Assurance Project Plan (QAPP): A description of the procedures that will be implemented to ensure that samples, data, and subsequent reports are of high enough quality to meet BASMAA RMC objectives.
- Creek Status Monitoring Program Standard Operating Procedures (SOP): Complementary documentation to the QAPP to establish a common basis for application of consistent monitoring protocols across jurisdictional boundaries.
- RMC Creek Status Fact Sheet: a one-page overview of the BASMAA RMC and the Creek Status and Long-Term Trends Monitoring Program.
- Information Management System: The BASMAA RMC evaluated different platforms available for building the RMC Information Management System (IMS) and contracted with a database developer in June 2012 to begin development of the RMC IMS using Microsoft Access.

In addition to helping finalize the necessary guidance documents to support water quality monitoring through a regional collaboration, SMCWPPP staff initiated the first year of water quality monitoring in San Mateo County under the RMC Monitoring Plan. This involved sampling the following suite of parameters at multiple sites (see below). Monitoring data and analyses will be reported in compliance with MRP Provision C.8.g.

- Bedded Sediment Toxicity – two sites
- Bedded Sediment Pollutants – two sites
- Water Toxicity – two sites in the dry season and during a winter storm event
- Pathogen Indicators – five sites in the summer
- Biological Assessment of Benthic Macroinvertebrates, associated habitat, Algae, chlorine and selected nutrients and water quality parameters – ten sites in the spring
- Continuous water temperature – four sites from spring through fall
- General water quality parameters – two sites in spring and fall

Provision C.8.d – Monitoring Projects

SMCWPPP staff began planning approaches to comply with MRP Provisions C.8.d.ii (BMP Effectiveness Investigation) and C.8.d.iii (Geomorphic Projects). Implementation of these approaches will commence in FY 2012-13. SMCWPPP staff will coordinate through the RMC to plan an approach to MRP Provision C.8.d.i once the FY 2011-12 field data collection has been completed and the data quality assurance and quality control procedures have been fully implemented.

Provision C.8.e – Pollutants of Concern and Long-term Trends Monitoring

Through the RMP STLS Work Group, SMCWPPP staff helped to select and initiate monitoring for pollutants of concern, in compliance with MRP Provision C.8.e, at four stations in the RMC area. Monitoring data and analyses for these sites will be reported in compliance with MRP Provision C.8.g. The STLS Work Group identified two additional monitoring sites that will be sampled in FY 2012-13 to fully comply with MRP Provision C.8.e. One of these sites is located at the Pulgas Creek Pump Station in the City of San Carlos.

Provision C.8.f – Citizen Monitoring and Participation

SMCWPPP staff reviewed multiple sources of water quality data collected by organizations that incorporate citizen monitoring data to identify areas most suitable for monitoring several C.8.c parameters: pathogen indicators, water temperature, and water quality. These organizations included the San Mateo County Resource Conservation District, Monterey Bay National Marine Sanctuary, Surfrider Foundation San Mateo County Chapter, San Pedro Creek Watershed Coalition, San Gregorio Environmental Resource Center, Pacifica Beach Coalition, Half Moon Bay Coastside Foundation, San Mateo County Department of Health Services, and Acterra. SMCWPPP staff focused on Pilarcitos Creek for monitoring temperature and water quality and coordinated with the Pilarcitos Creek Restoration Workgroup to identify appropriate monitoring locations. SMCWPPP staff coordinated with Acterra on several issues: 1) discussed water quality conditions at their restoration site in San Mateo County on Arroyo Ojo de Agua Creek - this site was selected as a pathogen indicator monitoring site; 2) discussed providing in-kind technical support for water quality methods including toxicity and pathogen indicator sampling; 3) encouraged them to submit a grant to USEPA to expand their Riparian Restoration/Water Quality Outreach and Monitoring Program; 4) provided contacts to other watershed groups conducting monitoring in San Mateo County and encouraged them to also contact these groups for technical advice and as potential collaborators in monitoring and grant applications.

Provisions C.11/12 Mercury/PCBs Controls

Provisions C.11 and C.12 implement stormwater runoff-related actions required by the mercury and PCBs Total Maximum Daily Load (TMDL) water quality restoration programs. During FY 2011-12, SMCWPPP staff participated in a number of BASMAA regional projects that address mercury and PCBs in stormwater runoff, including the EPA grant-funded project entitled Clean Watersheds for a Clean Bay (CW4CB) and the PCBs in Caulk project, which is funded by the federal stimulus program (American Recovery and Reinvestment Act). This included participation by SMCWPPP staff in several periodic meetings including the CW4CB Project Management Team, the CW4CB Retrofit Work Group, and teleconferences and a stakeholder meeting for the PCBs in Caulk project. The POC and Monitoring Regional Supplement report contains further details about these projects and their status.

Provisions C.11.a – Mercury Collection and Recycling Implemented throughout the Region

Provision C.11.a.i requires member agencies to promote, facilitate and/or participate in collection and recycling of mercury-containing devices and equipment at the consumer level (e.g., thermometers, thermostats, switches, bulbs). To help meet this requirement, member agencies continued to participate in San Mateo County Health Department's Household Hazardous Waste Program (HHW Program) and Very Small Quantity Generator Business Collection Program (VSQG Program) during FY 2011-12. The HHW Program offers residents the opportunity to drop-off mercury-containing devices and equipment and other hazardous wastes at designated drop-off points or drop-off events free of charge. The VSQG Program provides an inexpensive hazardous waste disposal option to eligible businesses, non-profits, and other government agencies that generate less than 100 kilograms of waste per month. It operates by appointment only and charges a fee to cover the cost of transportation and disposal. Many member agencies promote the availability of the HHW Program and VSQG Program on their agency websites. A description of member agency efforts to promote, facilitate and/or participate in collection and recycling of mercury-containing devices and equipment during FY 2011-12 are provided in their individual Annual Reports.

Based on information provided by HHW and VSQG Program staff, the combined Programs collected a total of 20,784 linear feet of fluorescent lamps and 1,051 compact fluorescent lamps. In addition, the combined Programs also collected the following mercury-containing devices and equipment:

- 750 pounds[1] of household batteries;
- 1,019 pounds[2] of crushed fluorescent tubes; and
- 4 thermostats.

Provision C.11.a.ii requires member agencies to include an estimate of the mass of mercury collected. To assist with calculating the mass of mercury collected during FY 2011-12 by the HHW and VSQG Programs, SMCWPPP staff worked with BASMAA to develop a spreadsheet entitled "FY 11-12 Estimated Mass of Mercury Collected Calculator (Version 1.0)." The estimated mass of mercury collected is based on the total amount of mercury-containing devices and equipment collected and calculated using the best available information from manufacturers and trade organizations regarding the amount of mercury in devices and equipment of interest. The estimated mass of mercury collected by both Programs during FY 2011-12 is provided in Table 6-1.

Table 6-1. Estimated mercury mass collected by the HHW and VSQG Programs in FY 2011-12.

Mercury Containing Device/Equipment	Total Devices/Equipment Collected	Estimated Mass of Mercury Collected (kg)
Fluorescent Lamps (linear feet)[3]	20,784	0.0431
CFLs (each)[4]	1,051	0.0047
Thermostats (each)[5]	4	0.016
Total Mass of Mercury Collected During FY 2011-12:		**0.0638**

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

This section describes the pilot feasibility study to evaluate the diversion of dry weather and first flush flows of stormwater from the Pulgas Creek Pump Station to the sanitary sewer collection system served by the South Bayside System Authority's (SBSA) regional wastewater treatment plant. As described in last fiscal year's annual report, SMCWPPP selected the City of San Carlos' Pulgas Creek Pump Station watershed for the pilot diversion project and other CW4CB studies because of the relatively high concentrations of PCBs found in pump station and storm drain sediments. The approximately 330-acre watershed draining to the Pulgas Creek Pump Station is comprised of current and historic industrial land uses.

As an overview, in FY 2012/13 the planned pilot diversion project will include conducting one dry weather and four wet weather pilot scale diversions of urban runoff from the north Pulgas Creek storm drain line. A flow meter and turbidity sensor will be installed in the north Pulgas Creek storm drain line man-

[1] The weight of household batteries includes the weight of the drum shipped off-site for proper recycling. The majority of household batteries do not contain mercury. As a result, they are not included in the estimated mass collected calculation.

[2] The weight of crushed fluorescent lamps includes the weight of the container shipped off-site for proper recycling. Since the fluorescent lamps are crushed, they are not currently included in the estimated mass collected calculation since the linear foot of lamp collected is unknown and the fate of the mercury is also unknown.

[3] The average mercury content for a four-foot linear fluorescent lamp is 8.3 milligrams (mg). This is equal to 2.075 mg (2.075 X 10 -6 kilograms (kg)) per linear foot. Source: NEMA 2005. Fluorescent and Other Mercury-Containing Lamps and the Environment: Mercury Use, Environmental Benefits, Disposal Requirements. National Electrical Manufacturers Association. March 2005. 14p.

[4] The National Electrical Manufacturers Association (NEMA) announced that under the new voluntary commitment, effective October 1, 2010, participating manufacturers will cap the total mercury content in CFLs that are under 25 watts at 4 mg per unit, and CFLs that use 25 to 40 watts of electricity will be capped at 5 mg per unit. Each CFL recycled is assumed to have an average mass of 4.5 mg (4.5 X 10 -6 kg). New CFLs are also assumed to have 4.5 mg on average. Source: NEMA 2010. NEMA Lamp Companies Agree to Reduction in CFL Mercury Content Cap. Available at http://www.nema.org/media/pr/20101004a.cfm. Accessed April 11, 2012.

[5] The amount of mercury in a thermostat is determined by the number of ampoules. There are generally one or two ampoules per thermostat (average is 1.4) and each ampoule contains an average of 2.8 grams (g) of mercury. Therefore, each thermostat recycled is assumed to contain approximately 4.0 g (0.004 kg) of mercury. Source: TRC 2008. Thermostat Recycling Corporation's Annual Report for the U.S. Prepared by the Thermostat Recycling Corporation. http://www.thermostat-recycle.org/files/u3/2008 TRC Annual Report.pdf.

hole, located immediately upstream from the pump station. Water will be collected for diversion through a small submersible pump that will send water through a flexible conduit to a 500 gallon storage tank located in the yard adjacent to the pump station. Water from the storage tank will be collected and transported by the City of San Carlos' vactor truck for disposal through a sanitary sewer connection at the City of San Carlos' corporation yard.

During each of the four storm events targeted for testing it is planned that four discrete water quality samples will be collected from the north Pulgas Creek storm drain line and tested for PCBs, mercury, and suspended sediment concentrations. In addition, as required by SBSA, testing will also be conducted during disposal of diverted stormwater collected during two of the stormwater events. These samples will be collected from the vactor truck discharge to the corporation yard's sanitary sewer connection. Testing of these samples will be for copper, mercury, and PCBs as the total of 40 congeners.

The pilot diversion project will also evaluate the projected costs and benefits of a larger scale and more permanent dry and/or wet weather diversion at the Pulgas Creek Pump station in order to have the technical information needed to evaluate the feasibility of diversions as part of future stormwater NPDES permit terms. The evaluation will also include how to coordinate possible plans for a long-term, more permanent sewer diversion with the City of San Carlos' planned upsizing of sewer pipelines along Industrial Road and Brittan Road in the vicinity of the Pulgas Creek Pump Station. One of the major problems with trying to divert stormwater to the sanitary sewer system in the Pulgas Creek Pump Station drainage area is that the sewer system is undersized in the Pulgas Creek Pump Station area, and the City of San Carlos is already at its maximum capacity for discharging wastewater to SBSA.

During February and March 2011 the San Francisco Estuary Institute measured the concentrations of PCBs in stormwater from the two storm drain lines that flow to the Pulgas Creek Pump Station. The testing results (Table 6-2) show that the stormwater contained between about 19,000 and 84,500 pg/l of total PCBs, which is relatively elevated compared to the 886 pg/l Event Mean Concentration of total PCBs calculated by SFEI as part of testing stormwater runoff from a parking lot and recreation area in Daly City.

Table 6-2. Total PCBs in stormwater runoff to the Pulgas Creek Pump Station.

Date	North Pulgas Creek Storm Drain Line	South Pulgas Creek Storm Drain Line
Feb. 17, 2011	46,896	53,894
Feb. 17, 2011	43,339	19,060
March 18, 2011	84,490	31,043
March 18, 2011	66,554	21,883
Average	60,320	31,470

All results in pg/l (total of 40 congeners). Samples collected on the same dates were collected at different times.

The data also show that the concentrations of total PCBs from the north Pulgas Creek storm drain line appear to be higher than those found in the south Pulgas Creek storm drain line.

SMCWPPP prepared and on May 4, 2012 submitted to Regional Water Board staff a project work plan titled "Pulgas Creek Pump Station Pilot Urban Runoff Diversion Evaluation." This work plan describes the current approach for how the pilot diversion project will be implemented. The work plan describes the project background, objectives, tasks, implementation, and schedule. This work plan may be modified iteratively in order to take advantage of new information as it is developed.

One of the essential requirements of the pilot diversion project is to be able to dispose diverted dry weather urban runoff and stormwater to the City of San Carlos' sanitary sewer system. From the city's collection system flows continue to SBSA's collection system for treatment at SBSA's regional wastewater treatment plant. SMCWPPP staff worked with SBSA and City of San Carlos' staff to obtain a wastewater discharge permit for the City of San Carlos.

In June 2012 SBSA staff distributed a draft permit, and based on discussions among City of San Carlos, SBSA, and SMCWPPP staff, modifications to the draft were proposed and accepted. The final permit was executed during the first half of July 2012 when it was signed by SBSA's Plant Manager and the City of San Carlos' acting City Engineer. The permit authorizes the diversion of limited volume of dry weather urban runoff and stormwater for a one-year period between July 1, 2012 and June 30, 2013. The permit describes discharge, monitoring, and reporting requirements, and it incorporates as an attachment A the project work plan. The discharge permit is subject to revision at any time for the purposes of protecting the sanitary sewerage facilities and workers and to accommodate new regulations and NPDES permit requirements that may be imposed on SBSA.

The equipment that will be needed to implement the pilot diversion project has been identified and is in the process of being procured and installed so that the project may be initiated with the first dry weather testing occurring during late summer/fall of 2012.

Provision C.13.c (Vehicle Brake Pads) and C.13.e (Studies to Reduce Uncertainties)

Provision C.13.c. (Copper Controls - Vehicle Brake Pads) requires Permittees to participate in the Brake Pad Partnership (BPP) process to develop California legislation phasing out copper from certain automobile brake pads sold in California. Provision C.13.e (Copper Controls - Studies to Reduce Uncertainties) 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. During FY 2011-12, SMCWPPP staff participated in BASMAA regional projects that address these provisions. The POCs and Monitoring Regional Supplement contains further details.

Provisions C.14 Polybrominated Diphenyl Ethers (PBDEs), Legacy Pesticides and Selenium

Provision C.14 requires member agencies and other MRP Permittees to work collaboratively to begin identifying, assessing, and managing controllable sources of the following lower priority pollutants that may be found in stormwater runoff: polybrominated diphenyl ethers (PBDEs), legacy pesticides, and selenium. During FY 2011-12, SMCWPPP staff participated in a BASMAA regional project that addresses this provision. The POCs and Monitoring Regional Supplement contains further details about this project and its status.

FUTURE ACTIONS

SMCWPPP activities that are planned for FY 2012-13 to assist member agencies comply with MRP requirements in MRP Provisions C.8, C.11, C.12, C.13.c and e, and C.14. include the following:

- Hold three WAM Subcommittee meetings.
- Work with the BASMAA RMC to continue refining its multi-year work plan, participate in BASMAA regional projects related to water quality monitoring, and continue implementing field monitoring activities in San Mateo County during FY 2012-13, including a new pollutant loading station in San Carlos (see the POCs and Monitoring Regional Supplement report in Appendix F for further details).

- Continue to encourage citizen monitoring in San Mateo County.
- Continue to facilitate the SMCWPPP's participation in BASMAA regional projects that focus on pollutants of concern and TMDL implementation, including Clean Watersheds for a Clean Bay, PCBs in Caulk, and a number of other projects described in the POCs and Monitoring Regional Supplement.
- Refine methods and estimate the mass of mercury collected by San Mateo County Permittees during FY 2012-13.
- Continue implementing the project work plan for the Pulgas Creek Pump Station pilot diversion project, including conducting dry and wet weather diversion and monitoring.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix A

- Municipal Maintenance Subcommittee – Attendance List– FY 2011-12
- Parks Maintenance & IPM Work Group – Attendance List– FY 2011-12
- Integrated Pest Management Workshop – February 28, 2012
  - Agenda
  - Attendance List
  - Summary of workshop evaluations
- Structural IPM Workshop – November 9, 2011
  - Agenda
  - Attendance list
  - Summary of workshop evaluations
- Trash Work Group – Attendance List– FY 2011-12

Municipal Maintenance Subcommittee Meetings - FY 2011/12

NAME	MUNICIPALITY	EMAIL	Aug. 24	Oct. 26	Jan. 25	Mar. 28
Bill Butler	Atherton	bbutler@ci.atherton.ca.us	√	√		
David Huynh	Atherton			√		
Eddie Lopez	Atherton		√			
Javier Andrade	Atherton		√			
Mike Anderson	Atherton		√			
Steve Tyler	Atherton	styler@ci.atherton.ca.us	√	√	√	√
Randy Ferrando	Belmont	rferrando@belmont.gov	√	√	√	√
Tim Murray	Belmont	tmurray@belmont.gov	√		√	√
Dale Allen	Brisbane	dallen@ci.brisbane.ca.us	√	√	√	
Keegan Black	Brisbane	kblack@ci.brisbane.ca.us				√
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John Baack	Burlingame	JBaack@burlingame.org		√		
~~Kiley Kinnon~~	~~Burlingame~~	~~kiley.kinnon@veoliawaterna.com~~	√			
Peter Gaines	Burlingame	PGaines@burlingame.org		√	√	
Randall Hayes	Burlingame				√	
Steve Daldrup	Burlingame	stephen.daldrup@veoliawaterna.com			√	√
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Louis Gotelli	Colma	LGotelli@colma.ca.gov	√	√	√	√
Muneer Ahmed	Colma	muneer.ahmed@colma.ca.gov				
Phil Scramaglia	Colma	phil@csgengr.com				
Jesse Myott	Daly City	jmyott@dalycity.org				
~~John Peterson~~	~~Daly City~~	~~jpeterson@dalycity.org~~				
~~Michael Peterson~~	~~Daly City~~	~~mpeterson@dalycity.org~~				
~~Pat Kelly~~	~~Daly City~~	~~pkelly@dalycity.org~~				
James McCarty	East Palo Alto			√		
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Norm Dorais	Foster City	ndorais@fostercity.org				
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Gary Francis	Hillsborough	gfrancis@hillsborough.net			√	√
Dimitri Kataros	Menlo Park		√			
Irv Meachum	Menlo Park	immeachum@menlopark.org	√	√	√	√
Joe Pimentel	Menlo Park	jppimentel@menlopark.org	√	√	√	√
~~Julie Robinson~~	~~Menlo Park~~	~~JARobinson@menlopark.org~~				
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~~Martin Crean~~	~~Millbrae~~	~~mcrean@ci.millbrae.ca.us~~				
Michael Killigrew	Millbrae	mkilligrew@ci.millbrae.ca.us			√	√
Russ Clark	Millbrae		√	√	√	√

Municipal Maintenance Subcommittee Meetings - FY 2011/12

NAME	MUNICIPALITY	EMAIL	Aug. 24	Oct. 26	Jan. 25	Mar. 28
Dustin Cohn	Pacifica		√		√	
Eric Steele	Pacifica	Steelee@ci.pacifica.ca.us	√			
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Bernie Mau	Pacifica	Steelee@ci.pacifica.ca.us				√
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~~Josh Maierle~~	~~Portola Valley~~	~~JMaierle@portolavalley.net~~				
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Eddy Lopez	Redwood City	ELopez@redwoodcity.org	√		√	√
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Rich Del Ben	Redwood City	rdelben@redwoodcity.org		√	√	
Terrance Kwan	Redwood City		√			
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Frank Amoroso	San Carlos	famoroso@cityofsancarlos.org		√		
Lou Duran	San Carlos	lduran@cityofsancarlos.org		√	√	√
Paul Baker	San Carlos	pbaker@cityofsancarlos.org	√	√		√
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Dermot Casey	San Mateo County	djcasey@co.sanmateo.ca.us				
Diana She	San Mateo County	dshu@co.sanmateo.ca.us				
Ed Vigil	San Mateo County	evigil@cityofsanmateo.org				
Julie Casagrande	San Mateo County	jcasagrande@co.sanmateo.ca.us				
Matt Fabry	San Mateo County	mfabry@smcgov.org	√			
Sarah Schrader	San Mateo County	sschrader@co.sanmateo.ca.us				
Stephen Fischer	San Mateo County	sfischer@co.sanmateo.ca.us				√
Tim Stanfield	San Mateo County	tstanfield@co.sanmateo.ca.us				
Timothy Swillinger	San Mateo County	tswillinger@co.sanmateo.ca.us				√
Shelli St.Clair	San Mateo, City of	SStClair@cityofsanmateo.org			√	√
Cassie Prudhel	South San Francisco	cassie.prudhel@ssf.net				√
James Hardie	South San Francisco	james.hardie@ssf.net				√
Marissa Garren	South San Francisco	Marissa.garren@ssf.net				√
~~Mike Charan~~	~~South San Francisco~~	~~mike.charan@ssf.net~~				
~~Rosa Acosta~~	~~South San Francisco~~	~~Rosa.Acosta@ssf.net~~				
Gratien Etchabelere	Woodside	GEtchebehere@woodsidetown.org	√		√	
~~James Counts~~	San Mateo County	~~james@smcmad.org~~		√		
~~Lou Duran~~	Mosquito & Vector			√	√	
Fred Jarvis	EOA, Inc.	fejarvis@eoainc.com	√	√		√
Jon Konnan	EOA, Inc.	jkonnan@eoainc.com				

Municipal Maintenance Subcommittee Meetings - FY 2011/12

NAME	MUNICIPALITY	EMAIL	Aug. 24	Oct. 26	Jan. 25	Mar. 28
Kristin Kerr	EOA, Inc.	kakerr@eoainc.com		√	√	
Sue Ma	Regional Board	SMa@waterboards.ca.gov				

San Mateo Countywide Water Pollution Prevention Program
Parks Maintenance & IPM Work Group Attendance List FY 2011/12

MUNICIPALITY	REPRESENTATIVE	Contact Information Email	Phone	Attendance		
				8/23/2011	1/9/2012	4/24/2012
Atherton	Mike Anderson	manderson@ci.atherton.ca.us	650/752-0541			
Belmont	Daniel Ourtiague	dourtiague@belmont.gov	650/595-7441			
Brisbane	Don McClymond	dmcclymond@ci.brisbane.ca.us	415/716-0105	✓	✓	✓
Burlingame	Greg Foell	gfoell@burlingame.org				
Colma	Phil Scramaglia	phil@csgengr.com				
	Louis Gotelli	Louis.Gotelli@colma.ca.gov	650/333-0295	✓	✓	✓
	Paul Vershull			✓		
Daly City	Paul Thompson	pthompson@dalycity.org	650/991-8006	✓	✓	✓
East Palo Alto	Jay Farr	jfarr@cityofepa.org	650/853-3105			
Foster City	Dorte Drastrup	ddrastrup@fostercity.org	650/286-3553	✓	✓	✓
Half Moon Bay	Larry Carnahan	larryC@hmbcity.com	650/726-7177		✓	✓
Hillsborough	Gary Francis	gfrancis@hillsca.org	650/375-7506			
Menlo Park	David Mooney	damooney@menlopark.org	650/330-6794	✓		
Millbrae	Russell Clark		650/259-2481			
Pacifica	Ron Fascenda	fascendar@ci.pacifica.ca.us	650-738-3760		✓	✓
		clarka@ci.pacifica.ca.us				
Portola Valley	Howard Young	hyoung@portolavalley.net	650/851-1700, Ext.214			
Redwood City	Valerie Matonis	vmatonis@redwoodcity.org	650/780-7280	✓	✓	✓
	~~Beth Ross~~	~~bross@redwoodcity.org~~	~~650/780-5917~~			
San Bruno	Rene Walsh	rwalsh@ci.sanbruno.ca.us	650/616-7193			
	Jeff Madonich	jmadonich@sanbruno.ca.gov	650/616-7194	✓	✓	✓
San Carlos	Guy Wallace	gwallace@cityofsancarlos.org	650/802-4144			
	Frank Rivera					
San Mateo	~~Vern Bessey~~	~~vbessey@cityofsanmateo.org~~	~~650/522-7342~~			
	Shelli St. Clair	sstclair@cityofsanmateo.org	650/522-7342	✓		
	Debra Bickel	alternate				✓
	Mike Blondino	mblondino@cityofsanmateo.org				
San Mateo Co. Parks	Pamela Noyer	pnoyer@co.sanmateo.ca.us				
	Jeff Pacini					
Agriculture Weights and Measures	Ronald Pummer	rpummer@co.sanmateo.ca.us	650/363-4700			
	Jeremy Eide	jeide@co.sanmateo.ca.us	650/363-4700	✓		✓
	Ricard Garcia	rgarcia@smc.gov.org or rgarcia@co.sanmateo.ca.us				✓
	Koren Widdel	kwiddel@smc.gov.org			✓	
Public Wks	Steve Fischer					
	Jeff Pacini	JPacini@co.sanmateo.ca.us				
South San Francisco	Donald Louie	donald.louie@ssf.net	650/829-3837		✓	
	Eric Witkowski	eric.witkowski@ssf.net	650/829-3837		✓	
	Norman Gok					
	Brian Brunelli	brian.brunelli@ssf.net	650/829-3837		✓	✓
Woodside	Eunejune Kim	EKim@woodsidetown.org	650/851-6790			
Regional Bd	Janet O'Hara	JOhara@rb2.swrcb.ca.gov	510/622-5681			

San Mateo Countywide Water Pollution Prevention Program
Parks Maintenance & IPM Work Group Attendance List FY 2011/12

MUNICIPALITY	REPRESENTATIVE	Contact Information Email	Phone	Attendance 8/23/2011	1/9/2012	4/24/2012
SFEP	Athena Honore			✓		
EOA	Fred Jarvis	fejarvis@eoainc.com	510/832-2852 x111	✓		
	Kristin Kerr	kakerr@eoainc.com	510/832-2852 x122		✓	✓
	Vishakha Atre	vatre@eoainc.com	408/720-8811		✓	
Program	Matt Fabry	mfabry@smcgov.org	415/508-2134	√		

Notes:
[1] Number indicates number of attendees from jurisdiction at the workshop.

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SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program
Clean Water. Healthy Community.

AGENDA

Integrated Pest Management Workshop

SMCWPPP Parks Maintenance and IPM Subcommittee
Mission Blue Center
475 Mission Blue Drive, Brisbane, CA
Tuesday, February 28, 2012
11:00 a.m. – 3:00 p.m.

Lunch *Registration*	11:00 – 11:30
Welcoming Remarks	11:30 – 11:35
Gopher, Squirrel and Rat Control Steven Hebert, *Swat Pest Control*	11:35 – 12:15
Organic Products for Weed Control Nancy Voorhees, *Target Specialty*	12:15 – 12:45
Healthy Soil, Healthy Plants Theresa Lyngso, *Lyngso Garden Materials*	12:45 – 1:25
Break	1:25 – 1:35
Making Every Drop Count Tom Bressan, *Urban Farmer*	1:35 – 2:00
Respirator Regulatory Refresher and Online Pesticide Use Reporting Jeremy Eide, *San Mateo County Agricultural Weights and Measures*	2:00 – 3:00
Closing Remarks	3:00

SMCWPPP Parks Maintenance & IPM Subcommittee
Landscape IPM Workshop
February 28, 2012
Final Attendance List

	Last Name	First Name	Municipality
1	Aizawa	Brian	City of Redwood City
2	Avtonomoff	Brad	City of Pacifica
3	Barros	Dan	City of San Bruno
4	Baston	Linda	City of Brisbane
5	Bergstrom	Paul	Loral Landscaping, Inc.
6	Brass	Kelly	City of Daly City
7	Bravo	Omar	City of Redwood City
8	Bustos	Dave	City of Daly City
9	Cardenas	Jorge	Loral Landscaping, Inc.
10	Cerini	Larry	City of San Bruno
11	Daher	Michele	City of East Palo Alto
12	DelCruz	Jessy	City of Daly City
13	Drastrup	Dorte	City of Foster City
14	Elissetche	J.P.	City of Pacifica
15	Farias	Jose	City of Redwood City
16	Fascenda	Ron	City of Pacifica
17	Francis	Gary	Town of Hillsborough
18	Friars	Joe	City of Brisbane
19	Fukudome	Glenn	City of Redwood City
20	Garcia	Luis	City of Redwood City
21	Gomba	Bill	City of Foster City
22	Gostisha	Sheila	San Mateo County Parks
23	Gotelli	Louis	Town of Colma
24	Gotthardt	Garrett	City of Foster City
25	Grunwald	Kingsley	City of San Mateo
26	Harrison	Robin	City of Foster City
27	Herbert	Dominique	City of Redwood City
28	Hernandez	Martin	City of Redwood City
29	Hollis	Mike	City of Redwood City
30	Jimenez	Oz	City of Foster City
31	Kraemer	Stephen	San Mateo County Parks

	Last Name	First Name	Municipality
32	Madonich	Jeff	City of San Bruno
33	Matonis	Valerie	City of Redwood City
34	Mc Clymond	Don	City of Brisbane
35	Meigar	Juan	City of Daly City
36	Mitchell	Cynthia	City of Redwood City
37	Moreno	Leonardo	City of Redwood City
38	Nicholls	Ed	City of San Bruno
39	Ochoa	Jesus	City of Redwood City
40	Ortiz	Andres	City of San Mateo
41	Palmini	Mari	City of San Bruno
42	Penisini	Sharom	City of Redwood City
43	Perez Rubio	Elga	City of San Mateo
44	Pulido	Mario	City of East Palo Alto
45	Reed	Bruce	City of San Mateo
46	Rosewicz	John	City of San Bruno
47	Ryan	Matthew	City of Foster City
48	Schaffer	Kurt	City of Foster City
49	Schroeder	Nazmeen	City of Foster City
50	Shoblo	Dolan	City of Brisbane
51	Soulard	Mark	City of San Mateo
52	Stipp	Randy	City of Daly City
53	Thompson	Tim	City of San Bruno
54	Thompson	Paul	City of Daly City
55	Trewin	John	San Mateo County Parks
56	Tyler	Steve	Town of Atherton
57	Valencia	Mighuel	City of East Palo Alto
58	Venezia	Daniel	City of Redwood City
59	Vetter	Steve	City of San Bruno
60	Walsh	Renee	City of San Bruno
61	Wheeler	Howard	Loral Landscaping, Inc.
62	Wilson	Jerry	City of San Bruno
63	Zumba	Tony	City of San Mateo

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Evaluation Form Summary

Integrated Pest Management Workshop
SMCWPPP Parks Maintenance and IPM
Tuesday, February 28, 2012
11:00 a.m. – 3:00 p.m.

What Did You Think of the Following Presentations and Activities?

1. **Gopher, Squirrel and Rat Control** – *Steven Hebert, Swat Pest Control*

   26 very helpful **4** somewhat helpful **0** not helpful

2. **Organic Options for Controlling Weeds, Insects and Plant Diseases** – *Nancy Voorhees, Target Specialty*

   13 very helpful **12** somewhat helpful **4** not helpful

3. **Healthy Soil, Healthy Plants** – *Theresa Lyngso, Lyngso Garden Materials*

   18 very helpful **12** somewhat helpful **0** not helpful

4. **Making Every Drop Count**– *Tom Bressan, Urban Farmer*

   18 very helpful **7** somewhat helpful **1** not helpful

5. **Respirator Regulatory Refresher and Online Pesticide Use Reporting** – *Jeremy Eide, San Mateo County Agricultural Weights and Measures*

   20 very helpful **0** somewhat helpful **0** not helpful

Did this workshop meet your expectations? **27** Yes **0** No

Suggestions for future workshop topics:

- Goose & raccoon control.
- Information/speakers on bioswales, native grasses, etc.
- Methods for landscape maintenance with limited workforce (budget cuts).
- More on organics.
- Give more breaks between every subject.

General Comments:

- Pasta, burgers for lunch.
- Steve H. is always welcome; someone that is good at what he does.
- Thank you!
- Better sound system.
- Close the blinds.
- Great!

- Great program. Keep up the good work!
- Good lunch.
- Keep it up…nice work.
- Thank you for putting it together and thanks to speakers.
- Need to be able to see slides better by blocking the light in the doorways.
- Sandwiches were not good.
- Very good!!
- Sun glare on screen made it hard to view part of the presentations.
- Good timing for this workshop.

Draft Agenda
Structural IPM Workshop
San Mateo County—November 9, 2011, 11:00-2:30pm
Recreation Center's Mist Room, 650 Shell Blvd., Foster City

Time	Session	Target Audience	Speaker
10:30 - 11:00	*Registration and Pick Up Lunch (Provided)*		
11:00-11:05 11:05-11:10 11:10-11:45	Welcome Pesticides and water quality introduction Principles and Practices of Structural IPM	• Municipal and county staff, including IPM coordinators, those who apply pesticides in structures (ants, rodents, etc.), and maintenance staff	Athena Honore, UP3 Project Manager Luis Agurto Jr., Pestec IPM Services (EcoWise and Green Shield certified company)
11:45-11:50	*SHORT BREAK to stretch, Lunch provided*		
11:50-12:30	Clean Water Requirements for Pesticides and MRP Reporting • Pesticides and storm water/creeks • MRP requirements • Q & A	• City and county IPM coordinators and those who prepare the pesticide section of stormwater annual reports	Fred Jarvis , EOA/San Mateo Countywide Water Pollution Prevention Program
12:30-12:40	*BREAK*		
12:40-1:40	Panel: Roads to Successful IPM Programs • Role of facilities manager in IPM • Monitoring your contractor/benefits of an IPM Program • Pest prevention BMPs in structures; employee education; how landscape practices affect structures • Success stories • Q & A	• Municipal and county staff who will hire and/or oversee structural IPM contractors • Municipal facilities managers	Mike Wong, City of Palo Alto Julie Weiss, City of Palo Alto Luis Agurto Jr., Pestec IPM Services Richard Estrada, Atco Pest Control (EcoWise Certified company)
1:40 - 2:30	The Ins and Outs of Contracting for Structural IPM Pest Control • IPM Certification Programs—brief overview • How to add IPM language to an RFP/Contract—model language, process, forms, building walk-through, interview, EcoWise Contracting Toolkit • Intro to EcoWise IPM Process—this can be used as contract language, especially if the contractor is not IPM certified	• Municipal and county staff who will hire and/or oversee structural IPM contractors • Municipal facilities managers • Purchasing agents	Tanya Drlik, Contra Costa County IPM Coordinator Bart Brandenburg, IPM Consultant
2:30	*ADJOURN*		

San Mateo Countywide Water Pollution Prevention Program

Structural IPM Workshop
Attendees - November 9, 2011

San Francisco Estuary Partnership

Last Name	First Name	Municipality	Email Address	Phone	Attended
Adams	Don	City of Daly City			X
Arnott	Greg	County of San Mateo	garnott@co.sanmateo.ca.us	650-363-1870	
Arzaga	Andrew	City of South San Francisco			
Baston	Linda	City of Brisbane		415-939-8627	X
Behrens	Gary	County of San Mateo	gbegrebs@co.sanmateo.ca.us	650-363-1875	
Brunelli	Brian	City of South San Francisco			X
Burton	Daniel	City of Redwood City	dburton@redwoodcity.org	650-780-7268	X
Cohn	Dustin	City of Pacifica			X
De La Fuente	Ivan	City of San Mateo	delafuente@cityofsanmateo.org	650-522-7363	
Delaney	James	City of Burlingame			X
Delfin	Geraldo "JR"	City of Foster City		650-787-8036	X
Dran	Lou	City of San Carlos	lduran@cityofsancarlos.org	650-863-6782	X
Drastrup	Dorte	City of Foster City	ddrastrup@fostercity.org	650-286-3553	X
Espinoza	Fancisco	City of Redwood City	fespinoza@redwoodcity.org	650-780-7441	X
Estrada	Richard	Atco Pest Control			X
Fescenda	Ron	City of Pacifica	fescendar@ci.pacifica.ca.us	650-738-3762	X
Forster	Robert	City of San Mateo	rforster@cityofsanmateo.org	650-522-7364	X
Francis	Gary	Town of Hillsborough	Gfrancis@Hillsborough.net	650-375-7506	X
Friars	Joe	City of Brisbane			X
Gostisha	Sheila	County of San Mateo	sgostisha@co.sanmateo.ca.us	650-573-2592	X
Gotelli	Louis	Town of Colma	louis.gotelli@colma.ca.gov	650-757-8888	
Gotthardt	Garrett	City of Foster City			X
Hernandez	Manuel	City of Foster City	mhernandez@fostercity.org	650-286-3386	X
Herzberg	Sam	County of San Mateo	sherzberg@co.sanmateo.ca.us	650-363-1823	X
Holtz	Richard	City of Burlingame	Rholtz@burlingame.org		X
Justimbaste	Eva	City of Burlingame	eva.justimbaste@veoliawaterna.com	650-342-3727	X
Kerr	Kristin	EOA	kakerr@eoainc.com	510-832-2852	X
Macias	T	Town of Portola Valley	tmacias@portolavalley.net	650-333-9632	X
Madonich	Jeff	City of San Bruno	jmadonich@sanbruno.ca.gov	650-616-7194	X
Mailan	Paul	City of Burlingame			X
Matonis	Valerie	City of Redwood City	vmatonis@redwoodcity.org	650-780-7280	X
Mayer	Kelly	County of San Mateo	kmayer@co.sanmateo.ca.us	650-363-4700	X
McClymond	Don	City of Brisbane	dmcclymond@ci.brisbane.ca.us	415-508-2130	
Medina	Marty	City of San Bruno	mmedina@sanbruno.ca.gov	650-616-7065	
Moll	Karl	City of Daly City			X
Ng	Vivian	City of San Mateo	ng@cityofsanmateo.org		
Neily	Paul	City of Millbrae	despinoza@ci.millbrae.ca.us	650-259-2342	X
Ranson	Greg	City of Daly City			X
Reyes	Rico	City of South San Francisco			
Sadiq	Nazmeen	City of Foster City			X
Scott	Kevin	County of San Mateo	kpscott@co.sanmateo.ca.us	650-355-8289	X
Shoblo	Dolan	City of Brisbane			X
St. Clair	Shelli	City of San Mateo	sstclair@cityofsanmateo.org	650-522-7342	X
St. Martin	Jean	City of San Carlos			X
Thomas	Carl	City of Menlo Park			X
Trewin	John	County of San Mateo	jtrewin@co.sanmateo.ca.us	650-851-1210	X
Tyler	Steve	Town of Atherton	styler@ci.atherton.ca.us	650-752-0541	X
Walsh	Rene	City of San Bruno	rwalsh@sanbruno.ca.gov	650-616-7193	X
Weber	Scott	Town of Portola Valley	sweber@portolavalley.net	650-851-1700	X
Weiss	Julie	City of Palo Alto			X
Wong	Mike	City of Palo Alto			X
Yuen	Ione	City of Redwood City	iyuen@co.sanmateo.ca.us	650-363-4700	X
Zander	Kurt	City of Foster City			X
Zuker	Albert	County of San Mateo	azuker@co.sanmateo.ca.us	650-740-7847	X

Structural IPM Training Workshop
November 9, 2011
San Francisco Estuary Partnership and
San Mateo Countywide Water Pollution Prevention Program

SUMMARY OF WORKSHOP EVALUATIONS

Total Number of Evaluations: 31 (57% response) **Total Number of Attendees: 54***
**Number includes speakers/staff.*

What did you think of the following presentations?

Pesticides and Water Quality –
Athena Honore

16-Very helpful 15-Somewhat helpful 0-Not helpful 0-No answer

Principles and Practices of Structural IPM –
Luis Agurto Jr.

22-Very helpful 9-Somewhat helpful 0-Not helpful 0-No answer

Clean Water Requirements for Pesticides and MRP Reporting –
Fred Jarvis

16-Very helpful 13-Somewhat helpful 0-Not helpful 2-No answer

Panel: Roads to Successful IPM Programs –
Mike Wong, Julie Weiss, Luis Agurto, Jr., and Richard Estrada

22-Very helpful 9-Somewhat helpful 0-Not helpful 0-No answer

Ins and Outs of Contracting for Structural Pest Control –
Bart Brandenburg and Tanya Drlik

15-Very helpful 10-Somewhat helpful 2-Not helpful 4-No answer

Did this workshop meet your expectations?
Yes: 25
No: 1
No Answer: 5

Suggestions for future workshop topics
Present to private pest controllers.
More information about costs of using IPM.
Video of actual IPM customers and areas before and after treatment.
Practical examples of alternative weed abatement (landscape).
Gopher control.
Provide hands on class.

Samples of or pictures of pests
IPM around schools/playgrounds, yellow jackets on trails/picnic areas, managing invasives in grasslands.
Information on how recycled water affects water quality and surrounding areas.

General Comments
Very good information.
Really educational and informative.
Enjoyed and learned a lot.
Very helpful workshop.
Excellent speakers and program.
Exceeded my expectations.
This workshop was most valuable – we all need our building maintenance staff to be up to speed.
Thanks (3).
Need larger facility (3).
Need microphone (2).
Look forward to IPM workshop for landscape.
Obtain CEUs from Department of Pesticides Regulation for these trainings.
Like this length of workshop.
Information could be coupled with county ag's IPM licensee requirements/information.
Include speakers' information as a handout.
Add an additional break if lunchtime occurs during presentations.
Room too warm at times.
Food and coffee good.
Stick to schedule.

Trash Work Group Meeting Attendance – FY 2011/12

Name	Agency	PHONE	E-Mail	Sep 29	Dec 6	Jan 25	Mar 28	June 27
Steve Tyler	City of Atherton		styler@ci.atherton.ca.us			X		
Randy Ferrando	City of Belmont		rferrando@belmont.gov	X		X	X	X
Tim Murray	City of Belmont	(650) 222-6460	tmurray@belmont.gov	X	X	X	X	X
Leticia Alvarez	City of Belmont		lalvarez@belmont.gov		X			
Alberto d'Jovza	City of Belmont							
Matt Fabry	SMCWPPP Program Coordinator	(650) 599-1410	mfabry@co.sanmateo.ca.us		X			
Dale Allen	City of Brisbane	(415) 508-2130	dallen@ci.brisbane.ca.us	X	X			
Shelley Romriell	City of Brisbane					X		X
Keegan Black	City of Brisbane						X	
Vincent Falzon	City of Burlingame	(650) 558-7679	vfalzon@burlingame.org		X	X	X	X
Peter Gaines	City of Burlingame	(650) 558-7672	pgaines@burlingame.org					
John Baack	City of Burlingame		JBaack@burlingame.org					
Kiley Kinnon	City of Burlingame	(650) 342-3727	kiley.kinnon@veoliawaterna.com	X				
Stephen Daldrup	City of Burlingame		Stephen.dalrup@ veoliawaterna.com			X	X	X
Rob Mallick	City of Burlingame	(650) 558-7673	rmallick@burlingame.org					X
Eva Justimbaste	City of Burlingame	(650) 342-3727	eva.justimbaste@veoliawaterna.com					X
Louis Gotelli	City of Colma	(650) 333-0295	louis.gotelli@colma.ca.gov	X	X	X	X	X
Phil Scramaglia	City of Colma		phil@csgengr.com					
Jesse Myott	City of Daly City	(650) 991-8054	jmyott@dalycity.org	X	X	X	X	X
John Fuller	City of Daly City	(650) 991-8039	jfuller@dalycity.org	X				X
Michelle Daher	City of East Palo Alto	(650) 853-3197	mdaher@cityofepa.org	X	X	X	X	X
Jay Farr	City of East Palo	(650) 853-3105	jfarr@cityofepa.org					
Norm Dorais	City of Foster City	(650) 286-3279	ndorais@fostercity.org					X
Larry Carnahan	City of Half Moon Bay	(650) 636-3753	larryc@hmbcity.com	X	X	X	X	X
Mo Sharma	City of Half Moon Bay		mosharma@hmbcity.com					
Gary Francis	Town of Hillsborough		gfrancis@hillsborough.net			X	X	
Dave Bishop	Town of Hillsborough		dbishop@hillsborough.net			X		
Catherine Chan	Town of Hillsborough	(650) 579-3353	cchan@hillsborough.net			X	X	
Rebecca Fotu	City of Menlo Park		rfotu@menlopark.org	X		X	X	X
Craig Centis	City of Millbrae	(650) 259-2369	ccentis@ci.millbrae.ca.us	X				
Mike Killigrew	City of Millbrae		mkilligrew@ci.millbrae.ca.us				X	
Raymund Donguines	City of Pacifica	(650) 738-3767	donguinesr@ci.pacifica.ca.us					X
Elizabeth Claycomb	City of Pacifica		Claycombe@ci.pacifica.ca.us					
Ron Fascenda	City of Pacifica	(650) 738-3762	Fascendar@ci.pacifica.ca.us				X	X
Bernie Mau	City of Pacifica		steele@ci.pacifica.ca.us				X	X
Howard Young	Town of Portola Valley		hyoung@portolavalley.net					
Leslie Lambert	Town of Portola Valley		llambert@portolavalley.net					
Ray Bartolo	City of Redwood City		rbartolo@redwoodcity.org			X		
Marilyn Harang	City of Redwood City	(650) 780-7477	MHarang@redwoodcity.org					
Gino Quinn	City of San Bruno	(650) 616-7160	gquinn@sanbruno.ca.gov			X		X
Robert Howard	City of San Bruno	(650) 616-7160	rhoward@sanbruno.ca.gov					

Name	Agency	PHONE	E-Mail	Sep 29	Dec 6	Jan 25	Mar 28	June 27
Paul Baker	City of San Carlos	(650) 802-4140	pbaker@cityofsancarlos.org		X	X	X	X
Ray Chan	City of San Carlos		rchan@cityofsancarlos.org					
Bera Bickel	City of San Mateo	(650) 522-7343	dbickel@cityofsanmateo.org			X	X	
Shelli St. Clair	City of San Mateo	(650) 522-7342	sstclair@cityofsanmateo.org	X	X	X		X
Rob Lecel	City of So. San Francisco	(650) 829-3882	rob.lecel@ssf.net		X		X	X
Cassie Prudhel	City of So. San Francisco	(650) 829-3840	cassie.prudhel@ssf.net		X	X		
Shoshana Wolff	City of So. San	(650) 829-3880	shoshana.wolff@ssf.net	X				
Gratien Etchebehere	Town of Woodside	(650) 851-6790	getchebehere@woodsidetown.org	X				
Kim Eunejune	Town of Woodside		ekim@woodsidetown.org					
Stephen Fischer	County of San Mateo - DPW	(650) 599-7281	SFischer@co.sanmateo.ca.us		X		X	
Julie Casagrande	County of San Mateo - DPW	(650) 599-1457	jcasagrande@co.sanmateo.ca.us	X	X	X	X	X
Diana Shu	County of San Mateo		dshu@co.sanmateo.ca.us					
Lillian Clark	County of San Mateo		lclark@co.sanmateo.ca.us			X		
Tim Swillinger	County of San Mateo-Environmental Health	(650) 372-6245	tswillinger@co.sanmateo.ca.us		X	X		
James Counts	SMC Mosquito and Vector Control District	(650) 642-4846	james@smcmad.org	X				
Chindi Peavey	SMC Mosquito and Vector Control District	(650) 344-8592	cpeavey@smcmad.org	X				
Dong Nguyen	Town of Woodside	(650) 851-6790	dnguyen@woodsidetown.org		X	X	X	
Monica Devincenzi	SBWMA/RethinkWaste	(650) 802-3509	lclark@co.sanmateo.ca.us			X		
Chris Sommers	EOA, Inc.	(510) 832-2852 X 109	csommers@eoainc.com	X	X	X	X	X
Fred Jarvis	EOA, Inc.	(510) 832-2852 X 111	fejarvis@eoainc.com	X				
John Fusco	EOA, Inc.	(510) 832-2852 X 130	jrfusco@eoainc.com			X	X	X
No. Attending				18	18	27	22	24

SAN MATEO COUNTYWIDE
Water Pollution
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Appendix B

- New Development Subcommittee – Attendance List– FY 2011-12
- New Development Workshop – October 6, 2011
  - Announcement flyer
  - Agenda
  - Attendance list
  - Summary of workshop evaluations
- LID Training Workshop – November 17, 2011
  - Announcement flyer
  - Agenda
  - Summary of workshop evaluations
- Infiltration/Harvesting and Use Feasibility Screening Worksheet
- Infiltration Feasibility Worksheet
- Rainwater Harvesting and Use Feasibility Worksheet
- Impervious Surface Data Collection Worksheet
- Summary of C.3. Stormwater Requirements Form and Stormwater Review Process Flow Chart
- C.3 and C.6 Data Collection Form
- Stormwater Requirements Checklist
- C.3 and C.6 Project Closeout Form
- Special Projects Worksheet
- Potential Special Projects Reporting Form
- C.3 Stormwater Technical Guidance: Cover and Table of Contents– December 5, 2011
- Flyer: New Stormwater Control Requirements Effective 12/1/12
- Template for Preparing Narrative Discussion of LID Feasibility or Infeasibility
- Government Certification for Non-LID Treatment Measures
- Construction Best Management Practices (BMPs)
- CalBIG Meeting Announcement: Stormwater Management and Inspections– August 10, 2011
- Construction Site Stormwater Compliance: One-Day Training for Municipal Inspectors Workshop– February 7 and February 8, 2012
  - Announcement flyer
  - Agenda
  - Attendance list
  - Summary of workshop evaluations
- Flyer: Requirements for Architectural Copper

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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New Development Subcommittee
FY 2011/12 Meeting Attendance

Representing	Name	Phone Number	Meetings Attended					
			Aug	Nov	Dec	Feb	Apr	Jun
Atherton	Duncan Jones	650/752-0532						
	David Huynh	650/752-0555	✓		✓	✓	✓	✓
Belmont	Gilbert Yau	650/595-7467	✓			✓	✓	
	Philip Esquboa			✓				
	Dalia Manaois	650/595-7468			✓			✓
Brisbane	Ken Johnson	415/508-2120		✓		✓		✓
	Matt Fabry (resigned)		✓					
Burlingame	Eva Justimbaste	650/342-3727		✓	✓	✓		
	Stephen Daldrup	650/342-3727				✓	✓	✓
	Kiley Kinnon (resigned)		✓					
Colma	Michael Laughlin	650/757-8896		✓	✓	✓	✓	✓
	Muneer Ahmed	650/757-8894	✓	✓	✓	✓	✓	✓
Daly City	Jeanne Naughton	650/991-8035	✓	✓	✓	✓	✓	✓
East Palo Alto	Michelle Daher	650/853-3197		✓		✓	✓	✓
EOA	Laura Prickett	510/832-2852 x 123	✓	✓	✓	✓	✓	✓
Foster City	Julia Molinex	650/286-3279						✓
Half Moon Bay	Muneer Ahmed	650/757-8894	✓	✓	✓	✓	✓	✓
Hillsborough	Catherine Chan	650/579-3353				✓	✓	✓
Menlo Park	Shaun Mao	650/330-6753	✓	✓	✓	✓	✓	
	Virginia Parks	650/330-6752						
Millbrae	Khee Lim	650/259-2347						
	Tanya Benedik							
Pacifica	Elizabeth Claycomb	650/738-7361	✓		✓		✓	
	Christina Horrisberger	650/738-7444						✓
Portola Valley	Leslie Lambert	650/851-1700 x12						
	Chey Anne Brown	650/851-1700			✓	✓		✓
Redwood City	Paul Willis (resigned)	650/780-7219			✓	✓		
	Kevin Fehr	650/780-5923						✓
	Jimmy Tan	650/780-7397					✓	
	Tanisha Werner	650/780-7366	✓	✓				
	Patti Schrobenboer	650/780-7368			✓		✓	
San Bruno	Laura Russell	650/616-7038	✓	✓	✓		✓	✓
	Marty Medina	650/616-7048		✓				
San Carlos	Gavin Moynahan	650/802-4267	✓	✓	✓	✓	✓	✓
San Mateo	Martin Quan	650/522-7330						
	Ken Pacini	650/522-7333		✓	✓			✓
County of San Mateo	Camille Leung	650/363-1826	✓	✓	✓	✓	✓	✓
	Diana Shu							
Countywide Program	Matt Fabry		✓	✓	✓		✓	✓
South S.F.	Cassie Prudhel	650/829-3840	✓	✓	✓	✓	✓	✓
	Daniel Fulford							
	Rob Lecel	650/829-3882						
Woodside	Gratien Etchebehere	650/851-6790						
Water Board	Sue Ma							

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Register now for the 2011 New Development Workshop!

Get Ready for Low Impact Development:

How to Implement the New "LID" Requirements

This workshop is for:
- ✓ Municipal Planners
- ✓ Municipal Engineers
- ✓ Architects and Landscape Architects[1]
- ✓ Developers & Consultants[1]

LID is coming – get ready!

Mission Blue Center
475 Mission Blue Drive, Brisbane

Thursday, October 6, 2011
8:00 am* – 3:30 pm

***8:00 a.m. start time for "Basic Training"** (for staff with little prior stormwater experience).*
9:00 a.m. start time for main workshop!

This is a free workshop. Breakfast and lunch will be served.

This rain garden/bioretention area on Donnelly Street in Burlingame meets the new definition of low impact development.

Workshop Highlights:

- *Explanation of new LID requirements that go into effect on **December 1, 2011**.*
- *Hands-on practice to:*
  - *Determine when the LID requirements apply to projects.*
  - *Evaluate feasibility of infiltration or rainwater harvesting (required starting December 1!)*
  - *Review project submittals.*
- *"Basic Training" for attendees with little or no experience with stormwater requirements for development projects (8:00 am start time).*

Register Now!

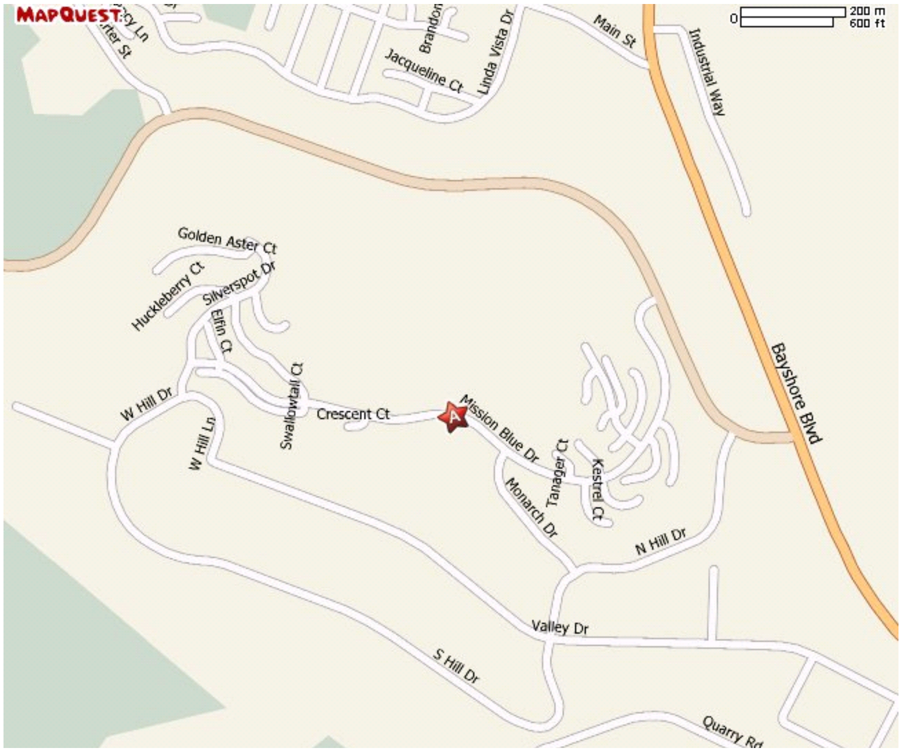
Staff from municipalities in San Mateo County may register immediately. Developers, builders and consultants working within the county may register beginning September 22, if space is available. Please complete the attached form to let us know you will attend. Please contact Melissa Morgan (510.832.2852, ext. 101, or melissa@eoainc.com) with any questions or for more information. We look forward to seeing you at the workshop!

The San Mateo Countywide Water Pollution Prevention Program is a partnership of the City/County Association of Governments (C/CAG), Atherton, Belmont, Burlingame, Colma, Daly City, East Palo Alto, Foster City, Half Moon Bay, Hillsborough, Menlo Park, Millbrae, Pacifica, Portola Valley, Redwood City, San Bruno, San Carlos, City of San Mateo, County of San Mateo, South San Francisco and Woodside.

[1] *Developers, builders and consultants working within the county may register beginning September 22, if space is available.*

2011 New Development Workshop:

Registration Form and Directions



475 Mission Blue Drive Brisbane

Directions from 101 Northbound

- Exit Bayshore Blvd. / Cow Palace.
- Merge onto Bayshore Blvd.
- Turn LEFT onto Guadalupe Canyon Pkwy.
- Turn LEFT onto Mission Blue Drive.

Directions from 101 Southbound

- Exit Third Street toward Cow Palace.
- Take Brisbane ramp and merge onto Bayshore Blvd. South
- Turn LEFT onto Guadalupe Canyon Pkwy.
- Turn LEFT onto Mission Blue Drive.

EMAIL TO: Melissa Morgan, melissa@eoainc.com or FAX TO: (510) 832-2856

Staff from municipalities in San Mateo County may register immediately. Developers, builders and consultants working within the county may register beginning September 22, if space is available.

Please email or fax this RSVP to Melissa Morgan at EOA, Inc., email: melissa@eoainc.com, fax: (510) 832-2856, by ***Thursday, September 29, 2011***. For additional information, contact Melissa at (510) 832-2852 ext. 101.

Municipality/Affiliation: ______________________________

Name/Title: ______________________________

Address: ______________________________

Phone: ______________ **Email:** ______________________________

Please pass this flyer along to appropriate staff within your organization, and developers or builders working in your jurisdiction – and don't forget to sign up yourself!

You will be sent a confirmation, including an agenda and directions, one week prior to the workshop.

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

2011 New Development Workshop

Get Ready for Low Impact Development:

How to Implement the New "LID" Requirements

Mission Blue Conference Center
475 Mission Blue Drive, Brisbane
Thursday, October 6, 2011

Agenda

	Early Registration for Basic Training (and Refreshments)	8:00 – 8:15
	**Basic Training on Stormwater Post-Construction Controls** *Learn (or refresh your memory) about long-standing stormwater requirements and key concepts* Laura Prickett – *EOA, Inc.*	8:15 – 9:00
	Registration and Refreshments (for registrants not attending Basic Training)	**9:00 – 9:20**
	Introductory Remarks Matt Fabry – *San Mateo Countywide Water Pollution Prevention Program*	9:20 – 9:30
	**How to Conduct C.3 Stormwater Review for a Proposed Project** Presentation Exercise: Identify the C.3 Requirements for Example Project Camille Leung – *San Mateo County* Laura Prickett – *EOA, Inc*	 9:30 – 10:00 10:00 – 10:30
	Introduction of Vendors/BREAK *Vendors will be at booths to display LID-related products.*	**10:30 – 10:45**
	**New Low Impact Development (LID) Requirements** Presentation Laura Prickett – *EOA, Inc.*	 10:45 – 11:30

How to Determine LID Feasibility and Infeasibility
Presentation — 11:30 – 12:15
Lisa Austin – *Geosyntec*

LUNCH - provided on site — **12:15 – 1:15**
Vendors will be at booths to display LID-related products.

Exercise: Using the New LID Feasibility Worksheets
Laura Prickett, EOA, Inc. — 1:15 – 2:30
Lisa Austin – *Geosyntec*

Break — **2:30 – 2:45**
Vendors will be at booths to display LID-related products.

Case Study: Pervious Paving Installation
Ryan Marlinghaus, *Earth Care Landscaping* — 2:45 – 3:15

Closing Remarks — 3:15 – 3:30
Matt Fabry – *San Mateo Countywide Water Pollution Prevention Program*

SMCWPPP 2011 LID WORKSHOP
SIGN-IN SHEET

X	Last Name	First Name	Municipality
X	Adams	Erica	County of San Mateo
	Addiego	Frank	City of San Bruno
X [illegible]	Ahmed	Muneer	Town of Colma
X	Ajello	Linda	City of South San Francisco
X BA	Albini	Bryan	County of San Mateo
X	Alvarez	Leticia	City of Belmont
X	Austin	Lisa	Geosyntec
X	Barber	Catherine	City of Millbrae
X	Beaudin	Gerry	City of South San Francisco
	Benedik	Tanya	City of Millbrae
X	Breault	Randy	City of Brisbane
X	Burlison	Summer	County of San Mateo
	Carlos	Hector	County of San Mateo
[illegible]	Chuck	Dennis	City of South San Francisco
	Claycomb	Elizabeth	City of Pacifica
DM	Corpus	Dalia	City of Belmont
✓	Daher	Michelle	City of East Palo Alto
[illegible]	Dahu	Nader	City of San Bruno
[illegible]	Delos Santos	Edrie	Town of Colma
	DiDonato	Damon	City of Belmont
✓	Etchebehere	Gratien	Town of Woodside
✓	Farbstein	Kathryn	City of Pacifica
✓	Forsell	Darcy	City of San Mateo
✓	Gross	Billy	City of South San Francisco
[illegible]	Haniger	Patrick	City of East Palo Alto
[illegible]	Horrisberger	Christina	City of Pacifica
[illegible]	Hurin	Ruben	City of Burlingame
[illegible]	Huynh	David	Town of Atherton
Ken	Johnson	Ken	City of Brisbane
[illegible]	Kalkin	Susy	City of South San Francisco
[illegible]	Kinnon	Kiley	City of Burlingame
MPL	Laughlin	Michael	Town of Colma
[illegible]	Lecel	Rob	City of South San Francisco
[illegible]	Lee	Richard	County of San Mateo
CML	Leung	Camille	County of San Mateo
[illegible]	Li	Wayland	City of East Palo Alto
Blake	Lyon	Blake	City of Redwood City
Shaun	Mao	Shaun	City of Menlo Park
	Marlinghaus	Ryan	Earth Care Landscaping
	Medina	Marty	City of San Bruno
	Mehra	Sailesh	City of Redwood City
[illegible]	Moloney	Julie	City of Foster City
[illegible]	Moynahan	Gavin	City of San Carlos
[illegible]	Munar	Kelvin	City of South San Francisco
[illegible]	Naughton	Jeanne	City of Daly City
[illegible]	Neuebaumer	Matt	City of San Bruno

	Nolfi	Mark	City of Belmont
	Olalla	Claudia	City of Redwood City
	Oscamou	Matt	City of Menlo Park
	Ouse	Andrea	City of Belmont
	Pacini	Ken	City of San Mateo
	Prudhel	Cassie	City of South San Francisco
	Rainone	Frank	City of East Palo Alto
	Russell	Laura	City of San Bruno
	Schaller	Michael	County of San Mateo
	Schrotenboer	Patti	City of Redwood City
	Scribner	Nathan	City of Menlo Park
	Sharma	Mo	City of Half Moon Bay
	Shu	Diana	County of San Mateo
	Truong	Sophie	City of Half Moon Bay
	Ward	Tonya	City of Half Moon Bay
	Wemmer	Andrew	City of South San Francisco
	Werner	Tanisha	City of Redwood City
	Willis	Paul	City Redwood City
	Wolff	Shoshana	City of South San Francisco
	Yau	Gilbert	City of Belmont
	Zack	Dan	City of Redwood City
	BROWN	CHEYANNE	TOWN OF PORTOLA VALLEY
	HOWARD	ROBERT	CITY OF SAN BRUNO
	Mo Sharma	Mo	" " Half Moon Bay
	COSTA SANDERS	LISA	ATHERTON

Robert Howard: Rhoward@ci.sanbruno.ca.us

Cheyanne Brown: Cbrown@portolavalley.net

For Lisa Costa Sanders, ask David Huynh to forward message.

2011 New Development Workshop: October 6, 2011 Workshop

Summary of Workshop Evaluations

Total Number of Evaluations: 31 (54% Response) Total Number of Attendees: 57

1) Was the material presented relevant to your job?

NO **YES**

1	**2**	**3**	**4**	**5**
0	**1**	**9**	**3**	**17**

2) Were the presentations clear and easy to follow?

NO **YES**

1	**2**	**3**	**4**	**5**
1	**1**	**10**	**15**	**3**

Some were great. I liked going through the worksheets. The county presentation needs work.

3) Was the pace of the presentations appropriate?

NO **YES**

1	**2**	**3**	**4**	**5**
2	**1**	**9**	**13**	**5**

Too much downtime. Like to cut back on breaks. Breaks too long.

4) Were the presenters knowledgeable about the material?

NO **YES**

1	**2**	**3**	**4**	**5**
0	**0**	**1**	**12**	**17**

5) Were the presenters wee-prepared?

NO **YES**

1	**2**	**3**	**4**	**5**
0	**2**	**6**	**10**	**13**

6) Did the presenters invite questions and participation?

NO **YES**

1	**2**	**3**	**4**	**5**
0	**0**	**1**	**7**	**22**

7) **Were the handouts informative and useful?**

NO **YES**

1	**2**	**3**	**4**	**5**
1	**2**	**3**	**15**	**10**

8) **Overall, how useful was this workshop?**

NO **YES**

1	**2**	**3**	**4**	**5**
1	**1**	**8**	**14**	**5**

9) **What was most valuable about today's training?**

LID worksheets.
Review current requirements, and challenges taking place.
LID Infeasibility exercises.
Going through worksheets.
Pervious pavement applicability; LID worksheet application.
Question from audience were practical and good.
LID Requirements; LID Feasibility/Infeasibility, case studies.
Case studies.
Using the worksheets to try to figure out what to do with projects.
Walking through forms.
Glossary. Examples (Case studies).
Feasibility/Infeasibility Implementation.
Voicing concerns about the issues related to infill and high density development.
N/A
Discussing and going over new C.3 requirements and worksheets.
It helped reinforce the picture of upcoming requirements.
First half, as I am in planning.

10) **What was the least valuable about today's training?**

Too many forms. Confusing.
It was all helpful.
All good.
A bit too fast paced.
San Mateo County process review.
The C.3 review. Presentations were disorganized, permeable paver guy.
Pervious pavement presentations.
4 to 3 case studies too many.
Had to speed through some information due to time constraints.
All of it.
Not enough information on the examples.
The PowerPoint slides were hard to follow. The final session on pervious concrete didn't seem to be on point. I'd prefer to see the session strictly a regulatory update.
LID Feasibility.

11) **Please offer suggestions for what could be improved.**

We need to rethink how this information is developed. We are exempting detached single-family homes, which is arguably the most detrimental land use pattern and adding a significant amount of forms, regulations, and requirements on infill & high density which is what we should be streamlining & promoting.
Shorter conference period.
The forms need to be much more user friendly...They take relatively simple requirements (to identify) and complicate them.
More time for case study application.
Go through new worksheet.
Room was comfortable, but too much echo. Made it a little hard to understand speaker, even with sound system.
Presentation LID Post Construction maintenance and inspection.
Presentations can be more concise. Put the paver presentation at the beginning. Finish all in the morning. Don't make partial day, or work through lunch! It was too long.
See screen better.
Maybe the training can be divided into those who help people fill out the forms to those who have to analyze the forms. AM/PM
Too many handouts. Couldn't quickly find the one I needed. Nothing was placed in context. I still don't understand when LID applies or what a LID treatment reduction credit means.
Examples are a great way to reinforce a concept. However, there were too many in the afternoon portion. May just one example would have allowed a thorough discussion.
Provide the PowerPoint slides at a scale that could be read! Reduce the amount of text where possible. Organize the case study materials better so it will be more clear which form goes with each cases study and provide a big picture chart (if possible) of why we have the different forms. I'm new to this so it may be more clear as I study this more.
Cater portions of day to specific groups so planners/engineers don't have to sit through the non-applicable portions.

12) **Please offer suggestions for future training topics.**

Go through new worksheets.
Check contrast on slides, many were too light.
Hydromodification Management.
Consider scaling the requirements to transect the more urban fewer requirements.
Slides were terrible, too much text, font was too small. It was often unreadable.

13) **General comments.**

No mayo on the sandwiches.
Good.
Fantastic. Thank you.
Overall useful, nice facilities.
Overall it was a good training. I learned about what I don't know and where to find the information. Thanks!
Next time suggest a more centralized location in the county. Look at The Oak Room in San Mateo City Library. They may not be open until 10AM but you could do a mid-day workshop that might be better in terms of staff schedules and commuting.
Some materials are too small to read.

Instead of or in addition to handing out hard copies of PowerPoints and forms, provide a CD with all forms electronically. Host the meeting in a more transit accessible location.
If this is what environmentalists are pushing for, the earth is doomed.
Thanks!
A software program to walk applicant thru would be really helpful. Thanks.

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community. www.flowstobay.org

Revised with 8:45 a.m. start time. Agenda attached!

Register now for this special training event!

How to Complete the New Low Impact Development (LID) Feasibility Worksheets:

A step-by-step practice session to evaluate LID Feasibility

This training is for:
- ✓ Municipal Planners
- ✓ Municipal Engineers
- ✓ Development review staff

Mission Blue Center
475 Mission Blue Drive, Brisbane

Thursday, November 17, 2011
8:45 am* – 12:00 noon

** Please arrive at 9:30 if you do not need an overview of LID feasibility requirements.*

This is a free training session. A light breakfast will be served.

Why Attend this Training?

Starting December 1, 2011, your municipality needs to implement new LID requirements!

If you missed the October 6 New Development Workshop, arrive at 9:00 am for the following topic:

- ✓ Overview of important LID feasibility requirements (this was covered on October 6).

Whether you attended on October 6 or not, the following should be useful:

- ✓ Overview of the Final LID Feasibility Screening Worksheet, with an explanation of how it differs from the draft worksheet presented on October 6.
- ✓ Overview of worksheets to be used if screening results show more evaluation is needed:
  - → Final Rainwater Harvesting Feasibility Worksheet
  - → Final Infiltration Feasibility Worksheet
- ✓ Practice filling out the Final LID Feasibility Screening Worksheet.

Email or fax this RSVP to Melissa Morgan, melissa@eoainc.com, fax: (510) 832-2856, by ***Thursday, November 10, 2011***. For additional information, contact Melissa at (510) 832-2852 ext. 101.

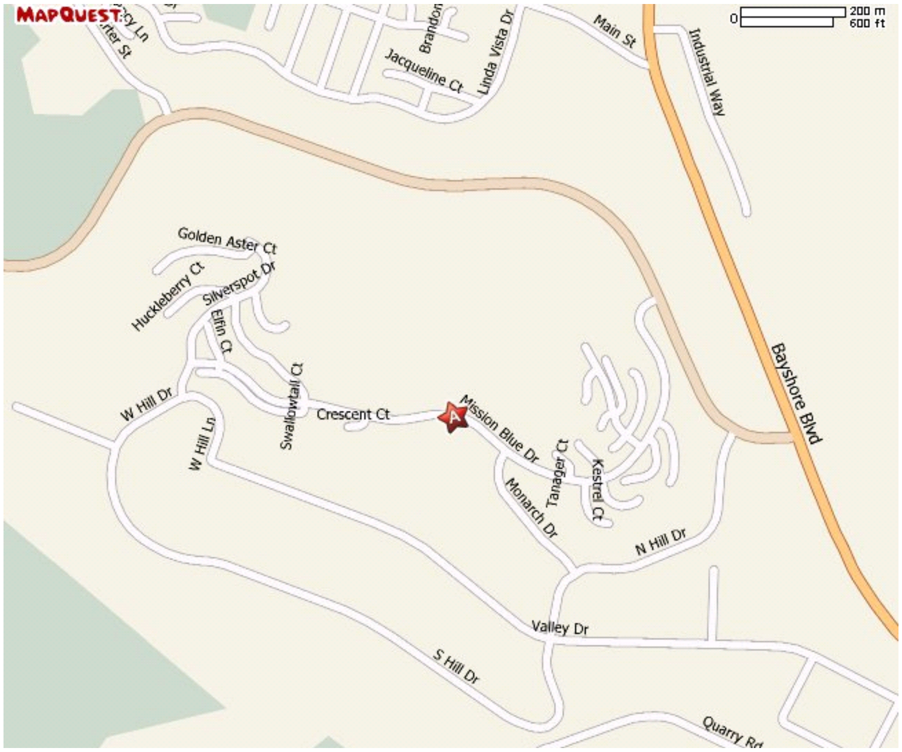
Municipality/Affiliation:______________________________

Name(s) of Registrant(s):______________________________

Phone:____________________ **Email:**______________________________

Please pass this flyer along to appropriate staff within your organization.
You will be sent a confirmation, including an agenda and directions, one week prior to the workshop.

Directions to Mission Blue Center:



475 Mission Blue Drive
Brisbane

Directions from 101 Northbound

- Exit Bayshore Blvd. / Cow Palace.
- Merge onto Bayshore Blvd.
- Turn LEFT onto Guadalupe Canyon Pkwy.
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Directions from 101 Southbound

- Exit Third Street toward Cow Palace.
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SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

How to Complete the New Low Impact Development (LID) Feasibility Worksheets:

A step-by-step practice session to evaluate LID Feasibility

Mission Blue Conference Center
475 Mission Blue Drive, Brisbane
Thursday, November 17, 2011
8:45 a.m. – 12:00 noon

Agenda

Registration 8:45 – 9:05

Introductory Remarks 9:05 - 9:10
Matt Fabry – *San Mateo Countywide Water Pollution Prevention Program*

Overview: Why and How Do We Evaluate Feasibility of Infiltrating and Harvesting/Using Stormwater? 9:10 – 9:45
Laura Prickett – *EOA, Inc.*

Overview of the Final LID Feasibility Worksheets 9:45 – 10:15

- Screening Worksheet: Infiltration & Rainwater Harvesting/Use Feasibility
- Rainwater Harvesting and Use Feasibility Worksheet
- Infiltration Feasibility Worksheet

Laura Prickett – *EOA, Inc.*

BREAK **10:15 – 10:25**

Exercise 1: Fill out the Screening Worksheet (Commercial Project) 10:25 – 11:10
Laura Prickett – *EOA, Inc.*

Exercise 2: Fill out the Screening Worksheet (Residential Project) 11:10 – 11:55
Laura Prickett – *EOA, Inc.*

Closing Remarks 11:55 – 12:00
Matt Fabry – *San Mateo Countywide Water Pollution Prevention Program*

2011 SMCWPPP LID Feasibility Workshop Registration
November 17th

Summary of Workshop Evaluations

Total Number of Evaluations: 18 (% Response) Total Number of Attendees: 22

1) Was the material presented relevant to your job?

NO **YES**

1	2	3	4	5
			3	15

2) Were the presentations clear and easy to follow?

NO **YES**

1	2	3	4	5
		1	5	12

3) Was the pace of the presentations appropriate?

NO **YES**

1	2	3	4	5
			5	13

4) Were the presenters knowledgeable about the material?

NO **YES**

1	2	3	4	5
			3	15

5) Were the presenters well-prepared?

NO **YES**

1	2	3	4	5
			3	15

6) Did the presenters invite questions and participation?

NO **YES**

1	2	3	4	5
			3	15

7) Were the handouts informative and useful?

NO **YES**

1	2	3	4	5
			3	14

8) Overall, how useful was this workshop?

Not Useful **Very Useful**

1	2	3	4	5
		1	4	12

9) What was most valuable about today's training?

Worksheets were good.
Case studies
Case study exercise
Case studies
The exercises
Worksheets
Feasibility Evaluation
Worksheep example
Good overview from a planning perspective
The case studies and worksheets were very helpful
Much more focused than last training
Follow along exercise were helpful
Exercises and discussions

10) What was the least valuable about today's training?

N/A.
N/A
None
None

11) Please offer suggestions for what could be improved.

Do a case study that qualifies.
Good as it is
Microphone

12) Please offer suggestions for future training topics.

½ day trainings are perfect!

13) General comments.

As a planner, I did not stay for the exercises
Filled out from a Planner's perspective. In our city, the engineers do the plan check on the worksheets, so I'm here only for the overview. Very good for that.
As a Planning Director, I do not directly get involved in these calculations or specific methods. However, good presentation of material and very understandable.
Sounds like it makes more sense to come up with regional solutions rather than site specific solutions.
If reduction of pollutants into the Bay is the goal...this strategy for rainwater harvesting and infiltration can only happen if it is mandated.
Good job Laura!
Great job Laura!
Great workshop, thank you!
Great workshop

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Prevention Program
Clean Water. Healthy Community.
www.flowstobay.org

Infiltration/Harvesting and Use Feasibility Screening Worksheet

Apply these screening criteria for C.3 Regulated Projects required to implement Provision C.3 stormwater treatment requirements. See the Glossary (Attachment 1) for definitions of terms marked with an asterisk (*).Contact municipal staff to determine whether the project meets Special Project* criteria. If the project meets Special Project criteria, it will receive LID treatment reduction credits.*

1. Applicant Info

Site Address: ______________________________, CA APN: ______________

Applicant Name: ______________________________ Phone No.: ______________

Mailing Address: ______________________________

2. Feasibility Screening for Infiltration

Do site soils either (a) have a saturated hydraulic conductivity* (Ksat) that will NOT allow infiltration of 80% of the annual runoff (that is, the Ksat is LESS than 1.6 inches/hour), or, if the Ksat rate is not available, (b) consist of Type C or D soils?[1]

☐ Yes (continue)

☐ No – complete the Infiltration Feasibility Worksheet. If infiltration of the C.3.d amount of runoff is found to be feasible, there is no need to complete the rest of this screening worksheet.

3. Recycled Water Use

Check the box if the project is installing and using a recycled water plumbing system for non-potable water use.

☐ The project is installing a recycled water plumbing system, and the installation of a second non-potable water system for harvested rainwater is impractical, and considered infeasible due to cost considerations. Skip to Section 6.

4. Calculate the Potential Rainwater Capture Area* for Screening of Harvesting and Use

Complete this section for the entire project area. If completing this form shows that rainwater harvesting and use is infeasible for the entire project, and the project includes one or more buildings that each have an individual roof area of 10,000 sq. ft. or more, then complete Sections 4 and 5 of this form for each of these buildings. For special projects that receive < 100% LID treatment reduction, skip Sections 4 through 6 of this form and use the Rainwater Harvesting and Use Feasibility Worksheet to determine feasibility of harvest and use.

4.1 Table 1 for (check one): ☐ The whole project ☐ Area of 1 building roof (10,000 sq.ft. min.)

Table 1: Calculation of the Potential Rainwater Capture Area*

The Potential Rainwater Capture Area may consist of either the entire project area or one building with a roof area of 10,000 sq. ft. or more.

	1	2	3	4
	Pre-Project Impervious surface[2] (sq.ft.), if applicable	Proposed Impervious Surface[2] (IS), in sq. ft.		Post-project landscaping (sq.ft.), if applicable
		Replaced[3] IS	Created[4] IS	
a. Enter the totals for the area to be evaluated:				
b. Sum of replaced and created impervious surface:	N/A			N/A
c. Area of existing impervious surface that will NOT be replaced by the project.		N/A		N/A

[1] Base this response on the site-specific soil report, if available. If this is not available, consult soil hydraulic conductivity maps in Attachment 3.
[2], Enter the total of all impervious surfaces, including the building footprint, driveway(s), patio(s), impervious deck(s), unroofed porch(es), uncovered parking lot (including top deck of parking structure), impervious trails, miscellaneous paving or structures, and off-lot impervious surface (new, contiguous impervious surface created from road projects, including sidewalks and/or bike lanes built as part of new street). Impervious surfaces do NOT include vegetated roofs or pervious pavement that stores and infiltrates rainfall at a rate equal to immediately surrounding, unpaved landscaped areas, or that stores and infiltrates the C.3.d amount of runoff*.
[3] "Replaced" means that the project will install impervious surface where existing impervious surface is removed.
[4] "Created" means the project will install new impervious surface where there is currently no impervious surface.
* For definitions, see Glossary (Attachment 1).

4.2 Answer this question ONLY if you are completing this section for the entire project area. If existing impervious surface will be replaced by the project, does the area to be replaced equal at least 50%, but less than 100%, of the existing area of impervious surface? *(Refer to Table 1, Row "a". Is the area in Column 2 $\geq$ 50%, but < 100%, of Column 1?)*

☐ Yes, C.3. stormwater treatment requirements apply to areas of impervious surface that will remain in place as well as the area created and/or replaced. This is known as the 50% rule.

☐ No, C.3. requirements apply only to the impervious area created and/or replaced.

4.3 Enter the square footage of the Potential Rainwater Capture Area*. If you are evaluating only the roof area of a building, or you answered "no" to Question 4.2, this amount is from Row "b" in Table 1. If you answered "yes" to Question 4.2, this amount is the sum of Rows "b" and "c" in Table 1.:

______________________________________ square feet.

4.4 Convert the measurement of the Potential Rainwater Capture Area* from square feet to acres (divide the amount in Item 4.3 by 43,560):

______________________________________ acres.

5. Feasibility Screening for Rainwater Harvesting and Use

5.1 Use of harvested rainwater for landscape irrigation:

Is the onsite landscaping LESS than 3.2 times the size of the Potential Rainwater Capture Area* (Item 4.3)? (Note that the landscape area(s) would have to be contiguous and within the same Drainage Management Area to use harvested rainwater for irrigation via gravity flow.)

☐ Yes (continue) ☐ No – direct runoff from impervious areas to self-retaining areas* OR refer to Table 11 and the curves in Appendix F of the LID Feasibility Report to evaluate feasibility of harvesting and using the C.3.d amount of runoff for irrigation.

5.2 Use of harvested rainwater for toilet flushing or non-potable industrial use:

a. Residential Projects: Proposed number of dwelling units:________________________________
Calculate the dwelling units per impervious acre by dividing the number of dwelling units by the acres of the Potential Rainwater Capture Area* in Item 4.4. Enter the result here:

________________)

Is the number of dwelling units per impervious acre LESS than 124 (assuming 2.7 occupants/unit)?

☐ Yes (continue) ☐ No – complete the Harvest/Use Feasibility Worksheet.

b. Commercial/Industrial Projects: Proposed interior floor area:___________________________ (sq. ft.)

Calculate the proposed interior floor area (sq.ft.) per acre of impervious surface by *dividing the interior floor area (sq.ft.) by the acres of the Potential Rainwater Capture Area* in Item 4.4. Enter the result here:*

____

Does square footage of the interior floor space per impervious acre equal LESS than 84,000?)

☐ Yes (continue) ☐ No – complete the Harvest/Use Feasibility Worksheet

c. School Projects: Proposed interior floor area:____ (sq. ft.)

Calculate the proposed interior floor area per acre of impervious surface by *dividing the interior floor area (sq.ft.) by the acres of the Potential Rainwater Capture Area* in Item 4.4 . Enter the result here:*

________________.

Does square footage of the interior floor space per impervious acre equal LESS than 27,000?)

* For definitions, see Glossary (Attachment 1).

☐ Yes (continue) ☐ No – complete the Harvest/Use Feasibility Worksheet

d. Mixed Commercial and Residential Use Projects

- Evaluate the residential toilet flushing demand based on the dwelling units per impervious acre for the residential portion of the project, following the instructions in Item 5.2.a, except you will use a prorated acreage of impervious surface, based on the percentage of the project dedicated to residential use.
- Evaluate the commercial toilet flushing demand per impervious acre for the commercial portion of the project, following the instructions in Item 5.2.b, except you will use a prorated acreage of impervious surface, based on the percentage of the project dedicated to commercial use.

e. Industrial Projects: Estimated non-potable water demand (gal/day): ____________________________

Is the non-potable demand LESS than 2,900 gal/day per acre of the Potential Rainwater Capture Area?

☐ Yes (continue) ☐ No – refer to the curves in Appendix F of the LID Feasibility Report to evaluate feasibility of harvesting and using the C.3.d amount of runoff for industrial use.

6. Use of Biotreatment

If only the "Yes" boxes were checked for all questions in Sections 2 and 5, or the project will have a recycled water system for non-potable use (Section 3), then the applicant may use appropriately designed bioretention facilities for compliance with C.3 treatment requirements. The applicant is encouraged to maximize infiltration of stormwater if site conditions allow.

7. Results of Screening Analysis

Based on this screening analysis, the following steps will be taken for the project (If biotreatment is allowed, check the biotreatment option only. If further analysis is needed, check all that apply):

☐ Implement biotreatment measures (such as an appropriately designed bioretention area).

☐ Conduct further analysis of infiltration feasibility by completing the Infiltration Feasibility Worksheet.

☐ Conduct further analysis of rainwater harvesting and use by (check one):

☐ Completing the Rainwater Harvesting and Use Feasibility Worksheet for:

☐ The entire project

☐ Individual building(s), if applicable, describe:__________________________________

☐ Evaluating the feasibility of harvesting and using the C.3.d amount of runoff for irrigation, based on Table 11 and the curves in Appendix F of the LID Feasibility Report

☐ Evaluating the feasibility of harvesting and using the C.3.d amount of runoff for non-potable industrial use, based on the curves in Appendix F of the LID Feasibility Report.

* For definitions, see Glossary (Attachment 1).

Infiltration Feasibility Worksheet

Municipal Regional Stormwater Permit (MRP)
Stormwater Controls for Development Projects

INSERT CITY SPECIFIC INFO HERE
ADDRESS
PHONE
FAX

Complete this worksheet for C.3 Regulated Projects* *for which the soil hydraulic conductivity (Ksat) exceeds 1.6. Use this checklist to determine the feasibility of treating the* C.3.d *amount of runoff** *with infiltration. Where it is infeasible to treat the C.3.d amount of runoff* with infiltration or rainwater harvesting and use, stormwater may be treated with* biotreatment* *measures. See Glossary (Attachment 1) for definitions of terms marked with an asterisk (*).*

1. Enter Project Data.

1.1 Project Name: ______________________

1.2 Project Address: ______________________

1.3 Applicant/Agent Name: ______________________

1.4 Applicant/Agent Address: ______________________

1.5 Applicant/Agent Email: ______________________ Applicant / Agent Phone: ______________________

2. Evaluate infiltration feasibility.

Check "Yes" or "No" to indicate whether the following conditions apply to the project. If "Yes" is checked for any question, then infiltration is infeasible, and you can continue to Item 3.1 without answering any further questions in Section 2. If all of the answers in Section 2 are "No," then infiltration is feasible, and you may design *infiltration facilities** *for the area from which runoff must be treated. Items 2.1 through 2.3 address the feasibility of using* *infiltration facilities**, *as well as the potential need to line bioretention areas.*

		Yes	No
2.1	Would infiltration facilities at this site conflict with the location of existing or proposed underground utilities or easements, or would the siting of infiltration facilities at this site result in their placement on top of underground utilities, or otherwise oriented to underground utilities, such that they would discharge to the utility trench, restrict access, or cause stability concerns? (If yes, attach evidence documenting this condition.)	☐	☐
2.2	Is there a documented concern that there is a potential on the site for soil or groundwater pollutants to be mobilized? (If yes, attach documentation of mobilization concerns.)	☐	☐
2.3	Are geotechnical hazards present, such as steep slopes, areas with landslide potential, soils subject to liquefaction, or would an infiltration facility need to be built less than 10 feet from a building foundation or other improvements subject to undermining by saturated soils? (If yes, attach documentation of geotechnical hazard.)	☐	☐

Respond to Questions 2.4 through 2.8 only if the project proposes to use an infiltration device*.

		Yes	No
2.4	Do local water district or other agency's policies or guidelines regarding the locations where infiltration may occur, the separation from seasonal high groundwater, or setbacks from potential sources of pollution prevent infiltration devices from being implemented at this site? (If yes, attach evidence documenting this condition.)	☐	☐
2.5	Would construction of an infiltration device require that it be located less than 100 feet away from a septic tank, underground storage tank with hazardous materials, or other potential underground source of pollution? (If yes, attach evidence documenting this claim.)	☐	☐

* See Glossary (Attachment 1) for definitions.

Infiltration Feasibility Worksheet

		Yes	No
2.6	Is there a seasonal high groundwater table or mounded groundwater that would be within 10 feet of the base of an infiltration device* constructed on the site? (If yes, attach documentation of high groundwater.)	☐	☐
2.7	Are there land uses that pose a high threat to water quality – including but not limited to industrial and light industrial activities, high vehicular traffic (i.e., 25,000 or greater average daily traffic on a main roadway or 15,000 or more average daily traffic on any intersecting roadway), automotive repair shops, car washes, fleet storage areas, or nurseries? (If yes, attach evidence documenting this claim.)	☐	☐
2.8	Is there a groundwater production well within 100 feet of the location where an infiltration device would be constructed? (If yes, attach map showing the well.)	☐	☐

3. Results of Feasibility Determination

		Infeasible	Feasible
3.1	Based on the results of the Section 2 feasibility analysis, infiltration is (check one):	☐	☐

→ *If "FEASIBLE" is indicated for Item 3.1, then the amount of stormwater requiring treatment must be treated with infiltration (or rainwater harvest and use, if feasible).* ***Infiltration facilities**** *may be designed for the area from which runoff must be treated.*

→ *If "INFEASIBLE" is checked for item 3.1, then the applicant may use appropriately designed biotreatment facilities for compliance with C.3 treatment requirements. The applicant is encouraged to maximize infiltration of stormwater if site conditions allow.*

Name of Applicant (Print)

Name of Applicant (Sign)

Date

* See Glossary (Attachment 1) for definitions.

Rainwater Harvesting and Use Feasibility Worksheet

Municipal Regional Stormwater Permit (MRP)

Stormwater Controls for Development Projects

INSERT AGENCY INFO
ADDRESS
PHONE, FAX
WEBSITE

Complete this worksheet for all C.3 Regulated Projects* for which the project density exceeds the screening density* in the Infiltration/Harvesting and Use Feasibility Screening Worksheet. Use this worksheet to determine the feasibility of treating the C.3.d amount of runoff* with rainwater harvesting and use for indoor, non-potable water uses. Where it is infeasible to treat the C.3d amount of runoff with either harvesting and use or infiltration, stormwater may be treated with biotreatment* measures. See Glossary (Attachment 1) for definitions of terms marked with an asterisk (*).

Complete this worksheet for the entire project area. If completing this form shows that rainwater harvesting and use is infeasible for the entire project, and the project includes one or more buildings that each have an individual roof area of 10,000 sq. ft. or more, then complete Sections 4 and 5 of this form for each of these buildings (in this case, complete only the sections of the form that make sense for the roof area evaluation).

1. Enter Project Data.

1.1 Project Name: ____________

1.2 Project Address: ____________

1.3 Applicant/Agent Name: ____________

1.4 Applicant/Agent Address: ____________

(For projects with a potential non-potable water use other than toilet flushing, skip to Question 5.1)

1.5 Project Type: ________ If residential or mixed use, enter # of dwelling units: ________

1.6 Enter square footage of non-residential interior floor area.: ________

1.7 Total area being evaluated (entire project or individual roof with an area ≥ 10,000 sq.ft.) ________ sq.ft.

1.8 If it is a Special Project*, indicate the percentage of LID treatment* reduction: ________ percent
(Item 1.8 applies only to entire project evaluations, not individual roof area evaluations.)

1.9 Total area being evaluated adjusted for Special Project LID treatment reduction credit: 0 sq.ft.
(This is the total area being evaluated that requires LID treatment.)

2. Calculate Area of Self-Treating Areas, Self-Retaining Areas, and Areas Contributing to Self-Retaining Areas.

2.1 Enter square footage of any self-treating areas* in the area that is being evaluated: ________ sq.ft.

2.2 Enter square footage of any self-retaining areas* in the area that is being evaluated: ________ sq.ft.

2.3 Enter the square footage of areas contributing runoff to self-retaining area*: ________ sq.ft.

2.4 TOTAL of Items 2.1, 2.2, and 2.3: - sq.ft.

3. Subtract credit for self-treating/self-retaining areas from area requiring treatment.

3.1 Subtract the TOTAL in Item 2.4 from the adjusted area being evaluated (Item 1.9). This is the potential rainwater capture area*. - sq.ft.

3.2 Convert the potential rainwater capture area (Item 3.1) from square feet to acres. 0.00 acres

4. Determine feasibility of use for toilet flushing based on demand

4.1 Project's dwelling units per acre of potential rainwater capture area (Divide the number in 1.5 by the number in 3.3). ________ dwelling units/acre

4.2 Non-residential interior floor area per acre of potential rain capture area (Divide the number in 1.6 by the number in 3.3). ________ Int. non-res. floor area/acre

Note: formulas in Items 4.1 and 4.2 are set up, respectively, for a residential or a non-residential project. Do not use these pre-set formulas for mixed use projects. ***For mixed use projects****, evaluate the residential toilet flushing demand based on the dwelling units per acre for the residential portion of the project (use a prorated acreage, based on the percentage of the project dedicated to residential use). Then evaluate the commercial toilet flushing demand per acre for the commercial portion of the project (use a prorated acreage, based on the percentage of the project dedicated to commercial use).*

* See definitions in Glossary (Attachment 1)

4.3	Refer to the applicable countywide table in Attachment 2. Identify the number of dwelling units per impervious acre needed in your Rain Gauge Area to provide the toilet flushing demand required for rainwater harvest feasibility.		dwelling units/acre
4.4	Refer to the applicable countywide table in Attachment 2. Identify the square feet of non-residential interior floor area per impervious acre needed in your Rain Gauge Area to provide the toilet flushing demand required for rainwater harvest feasibility.		int. non-res. floor area/acre

Check "Yes" or "No" to indicate whether the following conditions apply. If "Yes" is checked for any question, then rainwater harvesting and use is infeasible. As soon as you answer "Yes", you can skip to Item 6.1. If "No" is checked for all items, then rainwater harvesting and use is feasible and you must harvest and use the C.3.d amount of stormwater, unless you infiltrate the C.3.d amount of stormwater.*

4.5 Is the project's number of dwelling units per acre of potential rainwater capture area (listed in Item 4.1) LESS than the number identified in Item 4.3? ☐ Yes ☐ No

4.6 Is the project's square footage of non-residential interior floor area per acre of potential rainwater capture area (listed in Item 4.2) LESS than the number identified in Item 4.4? ☐ Yes ☐ No

5. Determine feasibility of rainwater harvesting and use based on factors other than demand.

5.1 Does the requirement for rainwater harvesting and use at the project conflict with local, state, or federal ordinances or building codes? ☐ Yes ☐ No

5.2 Would the technical requirements cause the harvesting system to exceed 2% of the Total Project Cost, or has the applicant documented economic hardship in relation to maintenance costs? (If so, attach an explanation.) ☐ Yes ☐ No

5.3 Do constraints, such as a slope above 10% or lack of available space at the site, make it infeasible to locate on the site a cistern of adequate size to harvest and use the C.3.d amount of water? (If so, attach an explanation.) ☐ Yes ☐ No

5.4 Are there geotechnical/stability concerns related to the surface (roof or ground) where a cistern would be located that make the use of rainwater harvesting infeasible? (If so, attach an explanation.) ☐ Yes ☐ No

5.5 Does the location of utilities, a septic system and/or **heritage trees*** limit the placement of a cistern on the site to the extent that rainwater harvesting is infeasible? (If so, attach an explanation.) ☐ Yes ☐ No

Note 1: It is assumed that projects with significant amounts of landscaping will either treat runoff with landscape dispersal (self-treating and self-retaining areas) or will evaluate the feasibility of havesting and using rainwater for irrigation using the curves in Appendix F of the LID Feasibility Report.

6. Results of Feasibility Determination

6.1 Based on the results of the feasibility analysis in Item 4.4 and Section 5, rainwater harvesting/use is (check one): ☐ Infeasible ☐ Feasible

→ If "FEASIBLE" is indicated for Item 6.1 the amount of stormwater requiring treatment must be treated with harvesting/use, unless it is infiltrated into the soil.

→ If "INFEASIBLE" is checked for Item 6.1, then the applicant may use appropriately designed bioretention,[1] facilities for compliance with C.3 treatment requirements. If Ksat > 1.6 in./hr., and infiltration is unimpeded by subsurface conditions, then the bioretention facilities are predicted to infiltrate 80% or more average annual runoff. If Ksat < 1.6, maximize infiltration of stormwater by using bioretention if site conditions allow, and remaining runoff will be discharged to storm drains via facility underdrains. If site conditions preclude infiltration, a lined bioretention area or flow-through planter may be used.*

Applicant (Print)

Applicant (Sign)

Date

[1] Bioretention facilities designed to maximize infiltration with a raised underdrain may also be called bioinfiltration facilities*.

* See definitions in Glossary (Attachment 1)

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program
Clean Water. Healthy Community.

STAFF ONLY
Date of Building Permit: __________
Permit #:________

NPDES PERMIT IMPERVIOUS SURFACE DATA COLLECTION WORKSHEET

COMPLETE THIS WORKSHEET FOR EACH NEW OR REDEVELOPMENT PROJECT WHERE 5,000 SQUARE FEET OR MORE OF IMPERVIOUS SURFACE WILL HAVE BEEN CREATED, ADDED AND/OR REPLACED.

What Projects Are Applicable?

All project applicants proposing to create and/or replace 5,000 sq. ft. or more of impervious surface on the project site must fill out this form and submit it to the Planning Division. Interior remodeling projects and routine maintenance or repair projects, such as re-roofing and re-paving, are NOT required to complete this form.

What is an Impervious Surface?

An impervious surface is a surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall/stormwater. Impervious surfaces include rooftops, walkways, patios, driveways, parking lots, storage areas, impervious concrete and asphalt.[1]

For More Information

For more information regarding selection of best management practices for stormwater pollution prevention, stormwater treatment, or hydromodification management contact:

Project Name: ____________________________________ **APN #**__ __ __ - __ __ - __ __ __

Project Description: ____

Applicant's Name: ____________________________________ **Phone:** ________________________________

Project Location: ____
(address)

1. Project Type (Check all that apply**):**

☐ Residential ☐ Commercial ☐ Industrial ☐ Public ☐ Mixed Use
☐ Restaurant ☐ Uncovered Parking ☐ Auto-service Facility ☐ Retail Gasoline Outlet

2. Project size:

a. Total area of project site (parcel) ____sq. ft.

b. Area of land disturbance during construction _______________sq. ft. (include clearing, grading, excavating).

	Pre-Project Impervious Surface (IS), in sq.ft.	Proposed Impervious surface (IS), in sq. ft[1]	
		Replaced IS[2]	Created IS[3]
c. Non-parking impervious surface area (includes land covered by buildings, sheds, patios/ covers, streets, sidewalks, paved walkway)			
d. Areas of uncovered parking			
e. Off-lot impervious surface (streets, sidewalks, and/or bike lanes built as part of new street)	N/A		
TOTAL: 2c through 2e			

[1] Pervious pavement underlain with pervious soil or pervious storage material, such as a gravel layer sufficient to hold at least the volume of rainfall runoff specified in Provision C.3.d of the MRP, is not an impervious surface. See MRP at www.flowstobay.org/ms_municipalities.php.
[2] "Replaced" means that the project will install impervious surface where existing impervious surface is removed.
[3] "Created" means the project will install new impervious surface where there is currently no impervious surface.

f. Area of pre-project landscaping:___________ sq.ft.   Area of post-project landscaping:____________ sq.ft.

3. Determine Requirements for Stormwater Treatment and Hydromodification Management (HM)

a. Check box if total proposed impervious surface is equal to or greater than:

☐ 10,000 sq. ft.: Stormwater treatment required (sizing requirements in Provision C.3.d of the MRP)

☐ 43,560 sq. ft.: If the following two statements apply to the project, then hydromodification management (HM) is required:

- ☐ Check box if the project replaces existing impervious surface (such as a building, parking lot, roadway, etc.), the total impervious area is increased from the pre-project condition.
- ☐ Check box if project is located in an area subject to the HM standard (see HM Control Area map at www.flowstobay.org/bs_new_development.php), OR, if further analysis is required, an engineer or qualified environmental professional has determined that runoff from the project flows only through a hardened channel or enclosed pipe along its entire length before emptying into a waterway in the exempt area. *(Attach signed statement by qualified professional.)*

b. Check box if combined area of uncovered parking lot, plus any impervious surface for auto-service facility, retail gasoline outlet, and/or restaurant, is equal to or greater than:

☐ 5,000 sq. ft.: If project is approved on or after 12/1/11, stormwater treatment is required.

c. Check box if the project will REPLACE more than 50% of the existing impervious surface.

☐ Project will replace > 50% of the existing impervious surface. The project is required to treat stormwater runoff from the on-site existing impervious surface that is NOT modified, in addition to the impervious surface that created and/or replaced by the project.

This section to be completed by Agency Staff

Reviewed:

Community Development Department	**Public Works Department**
Planning Division: ________	**Engineering:**________
Building Division: ________	
Return form to: ________	
Data entry performed by: ________	

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

INSERT CITY SPECIFIC INFO HERE
ADDRESS
PHONE
FAX
WEB (for those who allow download etc)

Summary of Stormwater Requirements

Municipal Regional Stormwater Permit (MRP)
Order No. R2-2009-0074; Order No. R2-2011-0083
NPDES No. CAS612008

Notice to Project Applicant: Municipal staff will use this summary sheet to identify the stormwater-related forms that are required for your project. The attached flow chart indicates how the forms are used.

A. Project Information

A.1 Project Name: ______________________

A.2 Project Address: ______________________

A.3 Project APN(s): ______________________

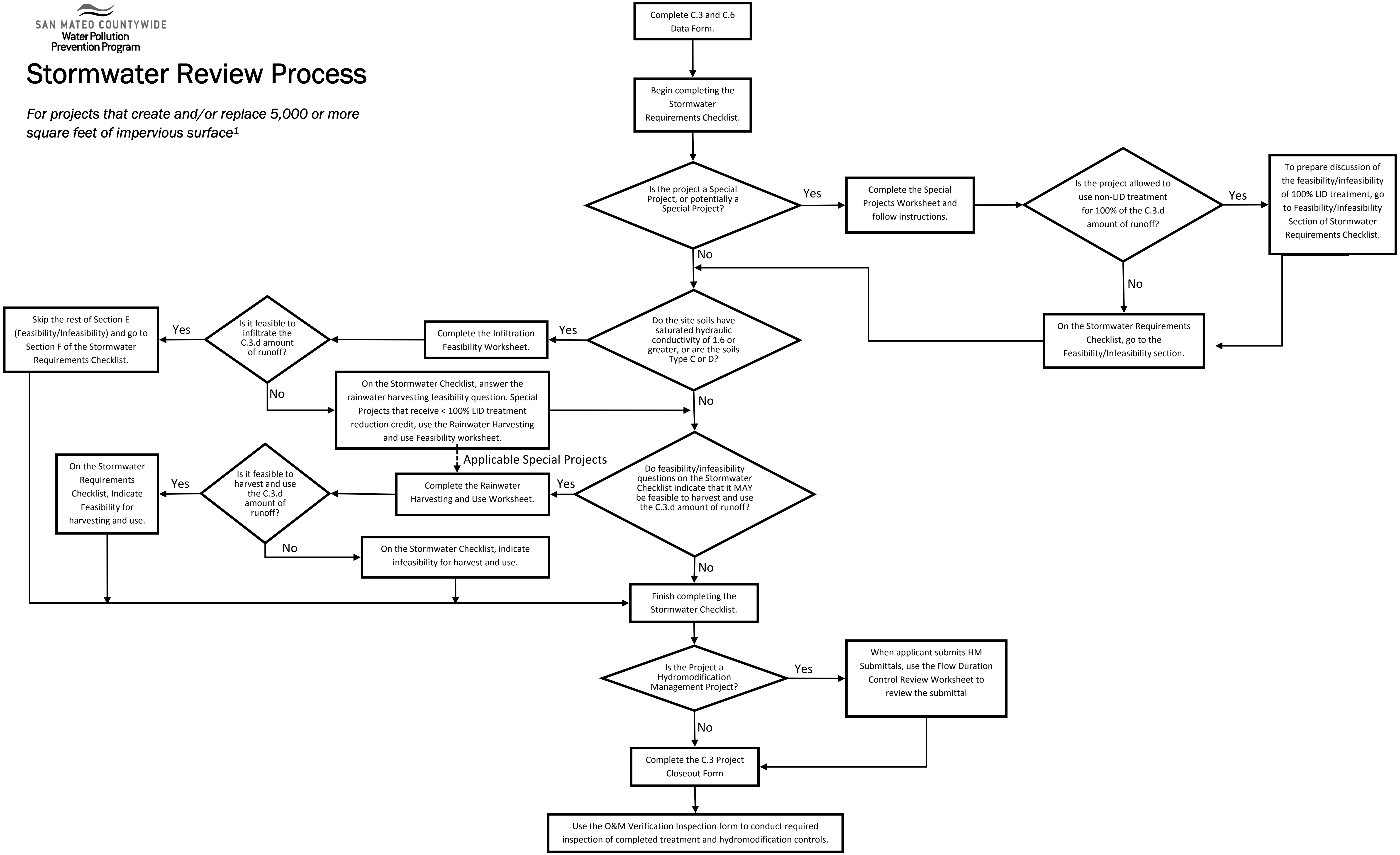
B. Applicable Forms

Required for the project	Form	Applicability
☐	Stormwater Requirements Checklist	• For all projects regardless of size (Non-C.3 Regulated Projects complete only sections A-D). • Includes a section with screening questions to determine infeasibility of infiltration or rainwater harvesting and use (this section applies only to C.3 Regulated Projects).
☐	C.3 and C.6 Data Collection Form	• For projects that create and/or replace 5,000 square feet or more of impervious surface.
☐	Infiltration Feasibility Worksheet	• For C.3 Regulated Projects with onsite soils suitable for infiltration. • Fill out this form only if indicated by the results of feasibility screening questions in the Stormwater Requirements Checklist.
☐	Rainwater Harvesting and Use Feasibility Worksheet	• For C.3 Regulated Projects with non-potable water demand greater than screening thresholds in the Stormwater Requirements Checklist. • Fill out this form only if indicated by the results of feasibility screening questions in the Stormwater Requirements Checklist.
☐	Special Projects Worksheet	• For transit oriented, high density, and/or infill projects that may meet the MRP criteria for Special Projects
☐	Flow Duration Control Review Worksheet	• To be completed by municipal staff for projects subject to Hydromodification Management (HM) requirements.
☐	Project Close-Out Form	• To be completed by municipal staff for projects regulated by Provision C.3 of the MRP (C.3 Regulated Projects)

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Stormwater Review Process

For projects that create and/or replace 5,000 or more square feet of impervious surface[1]



[1] Projects that create/replace less than 5,000 sq. ft. of impervious surface fill out only the Stormwater Requirements Checklist, and will skip the questions on the checklist regarding Special Projects, feasibility/infeasibility, stormwater treatment, and hydromodification management.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

C.3 and C.6 Data Collection Form

Municipal Regional Stormwater Permit (MRP)
Order No. R2-2009-0074; Order No. R2-2011-0083
NPDES No. CAS612008

INSERT CITY SPECIFIC INFO HERE
ADDRESS
PHONE
FAX
WEB (for those who allow download, etc.)

Complete this form for all projects that propose to create and/or replace 5,000 sq. ft. or more of impervious surface. (For "C.3 Regulated Projects," data will be reported in the municipality's stormwater Annual Report).

A. Project Data

A.1 Project Name: ______________________________

A.2 Project Address (include cross streets): ______________________________

A.3 Project APN: ____________________ A.4 Project Watershed: ____________________

A.5 Applicant Name: ______________________________

A.6 Applicant Address: ______________________________

A.7 Applicant Phone: ____________________. Applicant Email Address: ____________________.

A.8 Development type: (check all that apply)

☐ Residential ☐ Commercial ☐ Industrial ☐ Mixed-Use ☐ Streets, Roads, etc.

☐ 'Redevelopment' as defined by MRP: creating, adding and/or replacing exterior existing impervious surface on a site where past development has occurred.[1]

☐ 'Special land use categories' as defined by MRP: (1) auto service facilities[2], (2) retail gasoline outlets, (3) restaurants[2], and (4) uncovered parking area (stand-alone or part of a larger project).

A.9 Project Description[3] (Also note any past or future phases of the project): ______________________________

A.10 Total Area of Site: ______________ acres

Total Area of land disturbed during construction (include clearing, grading, excavating and stockpile area): ______________ acres

B. Is the project a "C.3 Regulated Project" per MRP Provision C.3.b?

B.1 Enter the amount of impervious surface[4] created and/or replaced by the project (if the total amount is 5,000 sq.ft. or more):

Table of Impervious and Pervious Surfaces

	a	b	c	d
Type of Impervious Surface	Pre-Project Impervious Surface (sq.ft.)	Existing Impervious Surface to be Replaced[6] (sq.ft.)	New Impervious Surface to be Created[6] (sq.ft.)	Post-project landscaping (sq.ft.), if applicable
Roof area(s) – excluding any portion of the roof that is vegetated ("green roof")				
Impervious[4] sidewalks, patios, paths, driveways				
Impervious[4] uncovered parking[5]				N/A
Streets (public)				
Streets (private)				
Totals:				
Area of Existing Impervious Surface NOT replaced		N/A		
Total New Impervious Surface *(sum of totals for columns b and c):*				

1 Roadway projects that replace existing impervious surfaces are subject to C.3 requirements only if one or more lanes of travel are added.
2 See Standard Industrial Classification (SIC) codes here.
3 Project description examples: 5-story office building, industrial warehouse, residential with five 4-story buildings for 200 condominiums, etc.
4 Per the MRP, pavement that meets the following definition of pervious pavement is NOT an impervious surface. Pervious pavement is defined as pavement that stores and infiltrates rainfall at a rate equal to immediately surrounding unpaved, landscaped areas, or that stores and infiltrates the rainfall runoff volume described in Provision C.3.d.
5 Uncovered parking includes the top level of a parking structure.
6 "Replace" means to install new impervious surface where existing impervious surface is removed. "Create" means to install new impervious surface where there is currently no impervious surface.

B. Is the project a "C.3 Regulated Project" per MRP Provision C.3.b? (continued)

		Yes	No	N/A
B.2	In Item B.1, does the Total New Impervious Surface equal 10,000 sq.ft. or more? *If YES, skip to Item B.5 and check "Yes." If NO, continue to Item B.3.*	☐	☐	☐
B.3	Does the Item B.1 Total New Impervious Surface equal 5,000 sq.ft. or more, but less than 10,000 sq.ft? *If YES, continue to Item B.4. If NO, skip to Item B.5 and check "No."*	☐	☐	☐
B.4	Is the project a "Special Land Use Category" per Item A.8? For uncovered parking, check YES only if there is 5,000 sq.ft or more of uncovered parking. *If NO, go to Item B.5 and check "No." If YES, go to Item B.5 and check "Yes."*	☐	☐	☐
B.5	Is the project a C.3 Regulated Project? *If YES, continue to Item B.6. If NO, skip to Item C.*	☐	☐	☐
B.6	Does the total amount of Replaced impervious surface equal 50 percent or more of the Pre-Project Impervious Surface? *If YES, site design, source control and treatment requirements apply to the whole site; if NO, these requirements apply only to the impervious surface created and/or replaced.*	☐	☐	☐

C. Projects that are NOT C.3 Regulated Projects

If you answered NO to Item B.5, or the project creates/replaces less than 5,000 sq. ft. of impervious surface, then the project is NOT a C.3 Regulated Project, and stormwater treatment is not required, BUT the municipality may determine that source controls and site design measures are required. Refer to the Stormwater Requirements Checklist.

D. Projects that ARE C.3 Regulated Projects

If you answered YES to Item B.5, then the project is a C.3 Regulated Project. The project must include appropriate site design measures and source controls AND hydraulically-sized stormwater treatment measures. Hydromodification management may also be required; refer to the Stormwater Requirements Checklist to make this determination. If final discretionary approval is granted on or after **DECEMBER 1, 2011**, Low Impact Development (LID) requirements apply, except for "Special Projects." See the Stormwater Requirements Checklist.

E. Identify C.6 Construction-Phase Stormwater Requirements

		Yes	No
E.1	Does the project disturb 1.0 acre (43,560 sq.ft.) or more of land? (See Item A.10) ▪ *If Yes, obtain coverage under the state's Construction General Permit at https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.jsp. Submit to the municipality a copy of your Notice of Intent and Storm Water Pollution Prevention Plan (SWPPP) before a grading or building permit is issued.*	☐	☐
E.2	Is the site as a "High Priority Site" that disturbs less than 1.0 acre (43,560 sq.ft.) of land? (Municipal staff will make this determination.) ▪ "High Priority Sites" are sites that require a grading permit, are adjacent to a creek, or are otherwise high priority for stormwater protection during construction (see MRP Provision C.6.e.ii(2)).	☐	☐

NOTE TO APPLICANT: All projects require appropriate stormwater best management practices (BMPs) during construction. Refer to the Stormwater Requirements Checklist to identify appropriate construction BMPs.

NOTE TO MUNICIPAL STAFF: If the answer is "Yes" to either question in Section E, refer this project to construction site inspection staff to be added to their list of projects that require stormwater inspections at least monthly during the wet season (October 1 through April 30).

F. NOTES (for municipal staff use only):

Section A Notes:____

Section B Notes:____

Section C Notes:____

Section D Notes:____

Section E Notes:____

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Stormwater Requirements Checklist

Municipal Regional Stormwater Permit (MRP)
Order No. R2-2009-0074 ; Order No. R2-2011-0083
NPDES No. CAS612008

INSERT CITY SPECIFIC INFO HERE
ADDRESS
PHONE
FAX
WEB (for those who allow download etc)

Complete this form for all projects regardless of size. The purpose of this form is to identify requirements for stormwater controls.

A. Project Information

A.1 Project Name: ____________________

A.2 Project Address: ____________________

A.3 Project APN: ____________________

A.4 Is the project a C.3 Regulated Project? *(Refer to the C.3 and C.6 Data Collection Form for projects that create and/or replace 5,000 square feet or more of impervious surface. Smaller projects check No.)* ☐ Yes ☐ No

- *For non-Regulated Projects, Sections B, C, and D apply. For Regulated Projects, all sections of this checklist apply.*

B. Select Appropriate Site Design Measures *(Required for C.3 Regulated Projects; all other projects are encouraged to implement site design measures, which may be required at municipality discretion. Starting December 1, 2012, projects that create and/or replace 2,500 – 10,000 sq.ft. of impervious surface, and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface, must include one of Site Design Measures a through f.[1] Consult with municipal staff about requirements for your project.)*

B.1 Is the site design measure included in the project plans?

Yes	No	Plan Sheet No.	
☐	☐		a. Direct roof runoff into cisterns or rain barrels and use rainwater for irrigation or other non-potable use.
☐	☐		b. Direct roof runoff onto vegetated areas.
☐	☐		c. Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
☐	☐		d. Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
☐	☐		e. Construct sidewalks, walkways, and/or patios with permeable surfaces.
☐	☐		f. Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.
☐	☐		g. Minimize land disturbance and impervious surface (especially parking lots).
☐	☐		h. Maximize permeability by clustering development and preserving open space.
☐	☐		i. Use micro-detention, including distributed landscape-based detention.
☐	☐		j. Protect sensitive areas, including wetland and riparian areas, and minimize changes to the natural topography.
☐	☐		k. Self-treating area (see Section 4.2 of the C.3 Technical Guidance)
☐	☐		l. Self-retaining area (see Section 4.3 of the C.3 Technical Guidance)
☐	☐		m. Plant or preserve interceptor trees (Section 4.1, C.3 Technical Guidance)

[1] See MRP Provision C.3.a.i(6) for non-C.3 Regulated Projects, C.3.c.i(2)(a) for Regulated Projects, C.3.i for projects that create/replace 2,500 to 10,000 sq.ft. of impervious surface and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface.

C. Select appropriate source controls *(Applies to C.3 Regulated Projects; encouraged for other projects. Consult municipal staff.[2])*

Are these features in project? Yes	No	Features that require source control measures	**Source control measures** (Refer to Local Source Control List for detailed requirements)	Is source control measure included in project plans? Yes	No	Plan Sheet No.
☐	☐	Storm Drain	Mark on-site inlets with the words “No Dumping! Flows to Bay” or equivalent.	☐	☐	
☐	☐	Floor Drains	Plumb interior floor drains to sanitary sewer[3] [or prohibit].	☐	☐	
☐	☐	Parking garage	Plumb interior parking garage floor drains to sanitary sewer.[3]	☐	☐	
☐	☐	Landscaping	▪ Retain existing vegetation as practicable. ▪ Select diverse species appropriate to the site. Include plants that are pest- and/or disease-resistant, drought-tolerant, and/or attract beneficial insects. ▪ Minimize use of pesticides and quick-release fertilizers. ▪ Use efficient irrigation system; design to minimize runoff.	☐	☐	
☐	☐	Pool/Spa/Fountain	Provide connection to the sanitary sewer to facilitate draining.[3]	☐	☐	
☐	☐	Food Service Equipment (non-residential)	Provide sink or other area for equipment cleaning, which is: ▪ Connected to a grease interceptor prior to sanitary sewer discharge.[3] ▪ Large enough for the largest mat or piece of equipment to be cleaned. ▪ Indoors or in an outdoor roofed area designed to prevent stormwater run-on and run-off, and signed to require equipment washing in this area.	☐	☐	
☐	☐	Refuse Areas	▪ Provide a roofed and enclosed area for dumpsters, recycling containers, etc., designed to prevent stormwater run-on and runoff. ▪ Connect any drains in or beneath dumpsters, compactors, and tallow bin areas serving food service facilities to the sanitary sewer.[3]	☐	☐	
☐	☐	Outdoor Process Activities [4]	Perform process activities either indoors or in roofed outdoor area, designed to prevent stormwater run-on and runoff, and to drain to the sanitary sewer.[3]	☐	☐	
☐	☐	Outdoor Equipment/ Materials Storage	▪ Cover the area or design to avoid pollutant contact with stormwater runoff. ▪ Locate area only on paved and contained areas. ▪ Roof storage areas that will contain non-hazardous liquids, drain to sanitary sewer[8], and contain by berms or similar.	☐	☐	
☐	☐	Vehicle/ Equipment Cleaning	▪ Roofed, pave and berm wash area to prevent stormwater run-on and runoff, plumb to the sanitary sewer[3], and sign as a designated wash area. ▪ Commercial car wash facilities shall discharge to the sanitary sewer.[3]	☐	☐	
☐	☐	Vehicle/ Equipment Repair and Maintenance	▪ Designate repair/maintenance area indoors, or an outdoors area designed to prevent stormwater run-on and runoff and provide secondary containment. Do not install drains in the secondary containment areas. ▪ No floor drains unless pretreated prior to discharge to the sanitary sewer.[3] ▪ Connect containers or sinks used for parts cleaning to the sanitary sewer.[3]	☐	☐	
☐	☐	Fuel Dispensing Areas	▪ Fueling areas shall have impermeable surface that is a) minimally graded to prevent ponding and b) separated from the rest of the site by a grade break. ▪ Canopy shall extend at least 10 ft in each direction from each pump and drain away from fueling area.	☐	☐	
☐	☐	Loading Docks	▪ Cover and/or grade to minimize run-on to and runoff from the loading area. ▪ Position downspouts to direct stormwater away from the loading area. ▪ Drain water from loading dock areas to the sanitary sewer.[3] ▪ Install door skirts between the trailers and the building.	☐	☐	
☐	☐	Fire Sprinklers	Design for discharge of fire sprinkler test water to landscape or sanitary sewer.[3]	☐	☐	
☐	☐	Miscellaneous Drain or Wash Water	▪ Drain condensate of air conditioning units to landscaping. Large air conditioning units may connect to the sanitary sewer.[3] ▪ Roof drains shall drain to unpaved area where practicable. ▪ Drain boiler drain lines, roof top equipment, all washwater to sanitary sewer[3].	☐	☐	
☐	☐	Architectural Copper	▪ Drain rinse water to landscaping, discharge to sanitary sewer[3], or collect and dispose properly offsite. See flyer “Requirements for Architectural Copper.”	☐	☐	

[2] See MRP Provision C.3.a.i(7) for non-C.3 Regulated Projects and Provision C.3.c.i(1) for C.3 Regulated Projects.
[3] Any connection to the sanitary sewer system is subject to sanitary district approval.
[4] Businesses that may have outdoor process activities/equipment include machine shops, auto repair, industries with pretreatment facilities.

D. Implement construction Best Management Practices (BMPs) *(Applies to all projects).*

Yes	No	Best Management Practice (BMP)
☐	☐	Attach the San Mateo Countywide Water Pollution Prevention Program's construction BMP plan sheet to project plans and require contractor to implement the applicable BMPs on the plan sheet.
☐	☐	Temporary erosion controls to stabilize all denuded areas until permanent erosion controls are established.
☐	☐	Delineate with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.
☐	☐	Provide notes, specifications, or attachments describing the following: ▪ Construction, operation and maintenance of erosion and sediment controls, include inspection frequency; ▪ Methods and schedule for grading, excavation, filling, clearing of vegetation, and storage and disposal of excavated or cleared material; ▪ Specifications for vegetative cover & mulch, include methods and schedules for planting and fertilization; ▪ Provisions for temporary and/or permanent irrigation.
☐	☐	Perform clearing and earth moving activities only during dry weather.
☐	☐	Use sediment controls or filtration to remove sediment when dewatering and obtain all necessary permits.
☐	☐	Protect all storm drain inlets in vicinity of site using sediment controls such as berms, fiber rolls, or filters.
☐	☐	Trap sediment on-site, using BMPs such as sediment basins or traps, earthen dikes or berms, silt fences, check dams, soil blankets or mats, covers for soil stock piles, etc.
☐	☐	Divert on-site runoff around exposed areas; divert off-site runoff around the site (e.g., swales and dikes).
☐	☐	Protect adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.
☐	☐	Limit construction access routes and stabilize designated access points.
☐	☐	No cleaning, fueling, or maintaining vehicles on-site, except in a designated area where washwater is contained and treated.
☐	☐	Store, handle, and dispose of construction materials/wastes properly to prevent contact with stormwater.
☐	☐	Contractor shall train and provide instruction to all employees/subcontractors re: construction BMPs.
☐	☐	Control and prevent the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, washwater or sediments, rinse water from architectural copper, and non-stormwater discharges to storm drains and watercourses.

PROJECTS THAT ARE <u>NOT</u> C.3 REGULATED PROJECTS STOP HERE!

E. Feasibility/Infeasibility of Infiltration and Rainwater Harvesting/Use (Applies to C.3 Regulated Projects ONLY)

Except for some Special Projects, C.3 Regulated Projects must include low impact development (LID) treatment measures. LID treatment measures are rainwater harvesting, infiltration, evapotranspiration, and biotreatment (i.e., landscape-based treatment with special soils). Biotreatment is allowed ONLY if it is infeasible to treat the amount of runoff specified in Provision C.3.d with rainwater harvesting, infiltration, and evapotranspiration.

		Yes	No	N/A
E.1	**Is this project a "Special Project"?** (See Appendix J of the C.3 Technical Guidance for criteria.) ➢ *If No, continue to Item E.2.* ➢ *If Yes, or if there is potential that the project MAY be a Special Project, complete the Special Projects Worksheet.*	☐	☐	☐
E.2	**Infiltration Potential.** Based on site-specific soil report[5], do site soils either: a. Have a saturated hydraulic conductivity (Ksat) <u>less</u> than 1.6 inches/hour), or, if the Ksat rate is not available, b. Consist of Type C or D soils? ➢ *If Yes, continue to E.3.* ➢ *If No, complete the Infiltration Feasibility Worksheet. If infiltration of the C.3.d amount of runoff is found to be feasible, skip to E.8; if infiltration is found to be infeasible, continue to E.3.*	☐	☐	☐

[5] If no site-specific soil report is available, refer to soil hydraulic conductivity maps in C.3 Technical Guidance Appendix I.

E.3 Recycled Water. Check the box if the project is installing and using a recycled water plumbing system for non-potable water use.

☐ The project is installing a recycled water plumbing system, and the installation of a second non-potable water system for harvested rainwater is impractical, and considered infeasible due to cost considerations.

- ➢ *If you checked this box, there is no need for further evaluation of rainwater harvesting. Skip to E.9.*

E.4 Potential Rainwater Capture Area

a. Refer to the Table of Impervious and Pervious Surfaces in the C.3 and C.6 Data Collection Form, and enter the total square footage of impervious surface that will be replaced and/or created by the project. ____________ Sq. ft.

b. If Section B of the C.3 and C.6 Data Collection Form indicates that 50% or more of the existing impervious surface will be replaced with new impervious surface, then add any existing impervious surface that will remain in place to the amount in E.4.a. ____________ Sq. ft.

c. Convert the amount in Item E.4.b from square feet to acres (divide by 43,560). If E.4.b is not applicable, convert the amount in E.4.a from square feet to acres. This is the project's Potential Rainwater Capture Area, in acres. ____________ Acres

E.5 Landscape Irrigation: Feasibility of Rainwater Harvesting and Use

a. Enter area of onsite landscaping. ____________ Acres

b. Multiply the Potential Rainwater Capture Area (the amount in E.4.c) times 3.2. ____________ Acres

c. Is the amount of onsite landscaping (E.5.a) LESS than 3.2 times the size of the Potential Rainwater Capture Area (E.5.b)[6]? ☐ **Yes** ☐ **No**

- ➢ *If Yes, continue.*
- ➢ *If No, it may be possible to meet the treatment requirements by directing runoff from impervious areas to self-retaining areas (see Section 4.3 of the C.3 Technical Guidance). If not, refer to Table 11 and the curves in Appendix F of the LID Feasibility Report to evaluate feasibility of harvesting and using the C.3.d amount of runoff for irrigation. Skip to E.7.*

E.6 Indoor Non-Potable Uses: Feasibility of Rainwater Harvesting and Use *(check the box for the applicable project type, then fill in the requested information and answer the question):*[7]

☐ a. Residential Project

i. Number of dwelling units (total post-project): ____________ Units

ii. Divide the amount in (i) by Potential Rainwater Capture Area (E.4.c): ____________ Du/ac

iii. Is the amount in (ii) LESS than 124? ☐ **Yes** ☐ **No**

☐ b. Commercial Project

i. Floor area (total interior post-project square footage): ____________ Sq.ft.

ii. Divide the amount in (i) by Potential Rainwater Capture Area (E.4.c): ____________ Sq.ft./ac

iii. Is the amount in (ii) LESS than 84,000? ☐ **Yes** ☐ **No**

☐ c. School Project

i. Floor area (total interior post-project square footage): ____________ Sq.ft.

ii. Divide the amount in (i) by Potential Rainwater Capture Area (E.4.c): ____________ Sq.ft./ac

iii. Is the amount in (ii) LESS than 27,000? ☐ **Yes** ☐ **No**

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[6] Landscape areas must be contiguous and within the same Drainage Management Area to irrigate with harvested rainwater via gravity flow.
[7] Rainwater harvested for indoor use is typically used for toilet/urinal flushing, industrial processes, or other non-potable uses.

E.6 Indoor Non-Potable Uses: Feasibility of Rainwater Harvesting and Use (continued)

☐ d. Industrial Project

i. Estimated demand for non-potable water (gallons/day): ____________ Gal.

ii. Divide the amount in (i) by Potential Rainwater Capture Area (E.4.c): ____________ Gal./ac

iii. Is the amount in (ii) LESS than 2,900? ☐ **Yes** ☐ **No**

☐ e. Mixed-Use Residential/Commercial Project[8]

	Residential	*Commercial*
i. Number of residential dwelling units and commercial floor area:	________ Units	________ Sq.ft.
ii. Percentage of total interior post-project floor area serving each activity:	________ %	________ %
iii. Prorated Potential Rainwater Capture Area per activity (multiply amount in E.4.c by the percentages in [ii]):	________ Acres	________ Acres
iv. Prorated project demand per impervious area (divide the amounts in [i] by the amounts in [iii]):	________ Du/ac	________ Sq.ft/ac

v. Is the amount in (iv) in the residential column less than 124, AND is the amount in the commercial column less than 84,000? ☐ **Yes** ☐ **No**

- *If you checked "Yes" for the above question for the applicable project type, rainwater harvesting for indoor use is considered infeasible, unless the project includes one or more buildings that each have an individual roof area of 10,000 sq. ft. or more, in which case further analysis is needed. Complete Sections E.5 and E.6 of this form for each such building, then continue to E.7.*
- *If you checked "No" for the question applicable to the type of project, rainwater harvesting for indoor use may be feasible. Complete the Rainwater Harvesting Feasibility Worksheet, and then continue to E.7.*

E.7 Identify and Attach Additional Feasibility Analyses

If further analysis is conducted based on results in E.1, E.2, E.5, or E.6, indicate the analysis that is conducted and attach the applicable form or other documentation (check all that apply):

☐ Special Projects Worksheet (if required in E.1)

☐ Infiltration Feasibility Worksheet (if required in E.2)

☐ Rainwater Harvesting and Use Feasibility Worksheet (if required in E.5 or E.6), completed for:

- ☐ The entire project
- ☐ Individual building(s), if applicable, describe:________________________

☐ Evaluation of the feasibility of harvesting and using the C.3.d amount of runoff for irrigation, based on Table 11 and the curves in Appendix F of the LID Feasibility Report (if required in E.5).

☐ Evaluation of the feasibility of harvesting and using the C.3.d amount of runoff for non-potable industrial use, based on the curves in Appendix F of the LID Feasibility Report (if required in E.6.d).

E.8 Finding of Infiltration Feasibility/Infeasibility

Infiltration of the C.3.d amount of runoff is infeasible if any of the following conditions apply (check all that apply):

☐ The "Yes" box was checked for Item E.2.

☐ Completion of the Infiltration Feasibility Worksheet resulted in a finding that infiltration of the C.3.d amount of runoff is infeasible.

- *Based on the above evaluation, infiltration of the C.3.d amount of runoff is (check one):*

  ☐ Infeasible ☐ Feasible

[8] For a mixed-use project involving activities other than residential and commercial activities, follow the steps for residential/commercial mixed-use projects. Prorate the Potential Rainwater Capture Area for each activity based on the percentage of the project serving each activity.

E.9 Finding of Rainwater Harvesting and Use Feasibility/Infeasibility

Harvesting and use of the C.3.d amount of runoff is infeasible if any of the following apply (check all that apply):

☐ The project will have a recycled water system for non-potable use (E.3).

☐ Only the "Yes" boxes were checked for Items E.5 and E.6.

☐ Completion of the Rainwater Harvesting and Use Feasibility Worksheet resulted in a finding that harvesting and use of the C.3.d amount of runoff is infeasible.

☐ Evaluation of the feasibility of harvesting and using the C.3.d amount of runoff for irrigation, based on Table 11 and the curves in Appendix F of the LID Feasibility Report, resulted in a finding of infeasibility.

☐ Evaluation of the feasibility of harvesting and using the C.3.d amount of runoff for non-potable industrial use, based on the curves in Appendix F of the LID Feasibility Report, resulted in a finding of infeasibility.

- *Based on the above evaluation, harvesting and using the C.3.d amount of runoff is (check one):*

  ☐ Infeasible ☐ Feasible

E.10. Use of Biotreatment

If findings of infeasibility are made in both E.8 (Infiltration) and E.9 (Rainwater Harvesting and Use), then the applicant may use appropriately designed bioretention facilities for compliance with C.3 treatment requirements.

- *Applicants using biotreatment are encouraged to maximize infiltration of stormwater if site conditions allow.*

F. Stormwater Treatment Measures (Applies to C.3 Regulated Projects)

F.1 Check the applicable box and indicate the treatment measures to be included in the project.

Yes	No	
☐	☐	Is the project a **Special Project**? If yes, consult with municipal staff about the need to prepare a discussion of the feasibility and infeasibility of 100% LID treatment. Indicate the type of non-LID treatment to be used, the hydraulic sizing method[9], and percentage of the amount of runoff specified in Provision C.3.d that is treated: Non-LID Treatment — Hydraulic sizing method[15] — % of C.3.d amount of runoff treated ☐ Media filter ☐ Tree well filter
☐	☐	Is it **infeasible** to treat the C.3.d amount of runoff using either infiltration or rainwater harvesting/use (see E.8 and E.9)? If yes, indicate the biotreatment measures to be used, and the hydraulic sizing method: Biotreatment Measures — Hydraulic sizing method[15] ☐ Bioretention area ☐ Flow-through planter ☐ Other (specify):
☐	☐	Is it **feasible** to treat the C.3.d amount of runoff using either infiltration or rainwater harvesting/use (see E.8 and E.9)? If yes, indicate the non-biotreatment LID measures to be used, and hydraulic sizing method: LID Treatment Measure (non-biotreatment) — Hydraulic sizing method[15] ☐ Rainwater harvesting and use ☐ Bioinfiltration[10] ☐ Infiltration trench ☐ Other (specify):____________________

F.2 Alternative Certification: Was the treatment system sizing and design reviewed by a qualified third-party professional that is not a member of the project team or agency staff?

☐ Yes ☐ No Name of Reviewer ____

[9] Indicate which of the following Provision C.3.d.i hydraulic sizing methods were used. Volume based approaches: 1(a) Urban Runoff Quality Management approach, or 1(b) 80% capture approach (recommended volume-based approach). Flow-based approaches: 2(a) 10% of 50-year peak flow approach, 2(b) Percentile rainfall intensity approach, or 2(c) 0.2-Inch-per-hour intensity approach (recommended flow-based approach). If a combination flow and volume design basis was used, indicate which flow-based and volume-based criteria were used.

[10] See Section 6.1 of the C.3 Technical Guidance for conditions in which bioretention areas provide bioinfiltration.

G. Is the project a Hydromodification Management[11] (HM) Project? (Complete this section for C.3 Regulated Projects)

G.1 Does the project create and/or replace 1 acre (43,560 sq. ft.) or more of impervious surface? (Refer to Item B.1.)

- ☐ Yes. *Continue to Item G.2.*
- ☐ No. *Skip to Item G.5 and check "No."*

G.2 Is the total impervious area increased over the pre-project condition? (Refer to Item B.1.)

- ☐ Yes. *Continue to Item G.3.*
- ☐ No. *The project is NOT required to incorporate HM measures. Skip to Item G.5 and check "No."*

G.3 Is the site located in an HM Control Area per the HM Control Areas map (Appendix H of the C.3 Technical Guidance)?

- ☐ Yes. *Skip to Item G.5 and check "Yes."*
- ☐ No. *Attach map, indicating project location. Skip to Item G.5 and check "No."*
- ☐ Further analysis required. *Continue to Item G.4.*

G.4 Has an engineer or qualified environmental professional determined that runoff from the project flows only through a hardened channel or enclosed pipe along its entire length before emptying into a waterway in the exempt area?

- ☐ Yes. *Attach signed statement by qualified professional. Go to Item G.5 and check "No."*
- ☐ No. *Go to Item G.5 and check "Yes."*

G.5 Is the project a Hydromodification Management Project?

- ☐ Yes. *The project is subject to HM requirements in Provision C.3.g of the Municipal Regional Stormwater Permit.*
- ☐ No. *The project is EXEMPT from HM requirements.*

➢ *If the project is subject to the HM requirements, incorporate in the project flow duration stormwater control measures designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations. The Bay Area Hydrology Model (BAHM) has been developed to size flow duration controls. See www.bayareahydrologymodel.org. Guidance is provided in Chapter 7 of the C.3 Technical Guidance.*

Name of applicant completing the form:____

Signature:____________________________ Date:__________________

H. Confirm Operations and Maintenance (O&M) Submittals (for municipal staff use only):

The following questions apply to C.3 Regulated Projects and Hydromodification Management Projects.

		Yes	No	N/A
H.1	Was maintenance plan submitted?	☐	☐	☐
H.2	Was maintenance plan approved?	☐	☐	☐
H.3	Was maintenance agreement submitted? (Date executed:____________)	☐	☐	☐

➢ *Attach the executed maintenance agreement as an appendix to this checklist.*

I. Comments (for municipal staff use only):

____

____

____

____

____

[11] Hydromodification is the modification of a stream's hydrograph, caused in general by increases in flows and durations that result when land is developed (made more impervious). The effects of hydromodification include, but are not limited to, increased bed and bank erosion, loss of habitat, increased sediment transport and deposition, and increased flooding. Hydromodification management control measures are designed to reduce these effects.

J. NOTES (for municipal staff use only):

Section A Notes:____________________________

Section B Notes:____________________________

Section C Notes:____________________________

Section D Notes:____________________________

Section E Notes:____________________________

Section F Notes:____________________________

Section G Notes:____________________________

Section H Notes:____________________________

Appendix: O&M Agreement

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

INSERT CITY SPECIFIC INFO HERE
ADDRESS
PHONE
FAX
WEB (for those who allow download, etc.)

C.3 and C.6 Project Closeout Form (for municipal staff use only)

Municipal Regional Stormwater Permit (MRP)
Stormwater Controls for Development Projects

This form is for completion by municipal staff for all C.3 Regulated Projects prior to issuing a certificate of occupancy.

1. Project Name: ______________________________
2. Project Address (include cross streets, if applicable): ______________________________
3. Project APN: ______________________________

		Yes	No	N/A
4.	Were the final Conditions of Approval met?	☐	☐	
5.	Was the initial inspection of the completed treatment/HM measure(s) conducted? (Date of inspection: ____________________)	☐	☐	☐
6.	Was the maintenance plan submitted? (Date executed:________________)	☐	☐	☐
7.	Was project information provided to staff responsible for O&M verification inspections? (Date provided to inspection staff:________________________)	☐	☐	☐

Name of staff confirming project closeout: ______________________________

Signature:______________________________ Date: ____________________

Name of O&M staff receiving information: ______________________________

Signature:______________________________ Date: ____________________

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Special Projects Worksheet

Complete this worksheet for projects that appear to meet the definition of "Special Project", per Provision C.3.e.ii of the Municipal Regional Stormwater Permit (MRP). The form assists in determining whether a project meets Special Project criteria, and the percentage of low impact development (LID) treatment reduction credit. Special Projects that implement less than 100% LID treatment must provide a narrative discussion of the feasibility or infeasibility of 100% LID treatment.

Project Name:____

Project Address:____

Applicant/Developer Name:____

1. "Special Project" Determination:

Special Project Category "A"

Does the project have ALL of the following characteristics?

- ☐ Located in a municipality's designated central business district, downtown core area or downtown core zoning district, neighborhood business district or comparable pedestrian-oriented commercial district, or historic preservation site and/or district[1];
- ☐ Creates and/or replaces 0.5 acres or less of impervious surface;
- ☐ Includes no surface parking, except for incidental parking for emergency vehicle access, ADA access, and passenger or freight loading zones;
- ☐ Has at least 85% coverage of the entire site by permanent structures. The remaining 15% portion of the site may be used for safety access, parking structure entrances, trash and recycling service, utility access, pedestrian connections, public uses, landscaping and stormwater treatment.

☐ No (continue) ☐ Yes – complete Section 2 of the Special Project Worksheet

Special Project Category "B"

Does the project have ALL of the following characteristics?

- ☐ Located in a municipality's designated central business district, downtown core area or downtown core zoning district, neighborhood business district or comparable pedestrian-oriented commercial district, or historic preservation site and/or district[1];
- ☐ Creates and/or replaces an area of impervious surface that is greater than 0.5 acres, and no more than 2.0 acres;
- ☐ Includes no surface parking, except for incidental parking for emergency access, ADA access, and passenger or freight loading zones;
- ☐ Has at least 85% coverage of the entire site by permanent structures. The remaining 15% portion of the site may be used for safety access, parking structure entrances, trash and recycling service, utility access, pedestrian connections, public uses, landscaping and stormwater treatment;
- ☐ Minimum density of either 50 dwelling units per acre (for residential projects) or a Floor Area Ratio (FAR) of 2:1 (for commercial or mixed use projects)

☐ No (continue) ☐ Yes – complete Section 2 of the Special Project Worksheet

Special Project Category "C"

Does the project have ALL of the following characteristics?

- ☐ At least 50% of the project area is within 1/2 mile of an existing or planned transit hub[2] or 100% within a planned Priority Development Area[3];
- ☐ The project is characterized as a non-auto-related use[4]; and
- ☐ Minimum density of either 25 dwelling units per acre (for residential projects) or a Floor Area Ratio (FAR) of 2:1 (for commercial or mixed use projects)

☐ No ☐ Yes – complete Section 2 of the Special Project Worksheet

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[1] And built as part of a municipality's stated objective to preserve/enhance a pedestrian-oriented type of urban design.

[2] "Transit hub" is defined as a rail, light rail, or commuter rail station, ferry terminal, or bus transfer station served by three or more bus routes. (A bus stop with no supporting services does not qualify.)

[3] A "planned Priority Development Area" is an infill development area formally designated by the Association of Bay Area Government's / Metropolitan Transportation Commission's FOCUS regional planning program.

[4] Category C specifically excludes stand-alone surface parking lots; car dealerships; auto and truck rental facilities with onsite surface storage; fast-food restaurants, banks or pharmacies with drive-through lanes; gas stations; car washes; auto repair and service facilities; or other auto-related project unrelated to the concept of transit oriented development.

Special Projects Worksheet (continued)

2. LID Treatment Reduction Credit Calculation:

Category	Impervious Area Created/Replaced (acres)	Site Coverage (%)	Project Density or FAR	Density/Criteria	Allowable Credit (%)	Applied Credit (%)
A			N.A.	N.A.	100%	
B				Res ≥ 50 DU/ac or FAR ≥ 2:1	50%	
				Res ≥ 75 DU/ac or FAR ≥ 3:1	75%	
				Res ≥ 100 DU/ac or FAR ≥ 4:1	100%	
C				**Location credit (select one)[5]:**		
				Within ¼ mile of transit hub	50%	
				Within ½ mile of transit hub	25%	
				Within a planned PDA	25%	
				Density credit (select one):		
				Res ≥ 30 DU/ac or FAR ≥ 2:1	10%	
				Res ≥ 60 DU/ac or FAR ≥ 4:1	20%	
				Res ≥ 100 DU/ac or FAR ≥ 6:1	30%	
				Parking credit (select one):		
				≥ 10% at-grade surface parking[6]	10%	
				No surface parking	20%	
				TOTAL TOD CREDIT =		

3. Narrative Discussion of the Feasibility/Infeasibility of 100% LID Treatment:

If project will implement less than 100% LID, refer to the Potential Special Projects Reporting Form to prepare a discussion of the feasibility or infeasibility of 100% LID treatment, as required by MRP Provision C.3.e.vi(2).

Special Projects Worksheet Completed by:

______________________________ ______________
Signature Date

____
Print or Type Name

[5] To qualify for the location credit, at least 50% of the project's site must be located within the ¼ mile or ½ mile radius of an existing or planned transit hub, as defined on page 1, footnote 2. A planned transit hub is a station on the MTC's Regional Transit Expansion Program list, per MTC's Resolution 3434 (revised April 2006), which is a regional priority funding plan for future transit stations in the San Francisco Bay Area. To qualify for the PDA location credit, 100% of the project site must be located within a PDA, as defined on page 1, footnote 3.

[6] The at-grade surface parking must be treated with LID treatment measures.

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

INSERT AGENCY NAME HERE

Potential Special Projects Reporting Form

Municipal Regional Stormwater Permit (MRP)
Provision C.3.e.vi Compliance

All agencies must complete at least Section 1 of this form for submittal to the Regional Water Quality Control Board (Water Board) by the permit due date of March 15. Agencies that have no projects to report in Sections 2 and 3 are only required to submit Section 1 (Page 1) of this form. Agencies that enter project information in Sections 2 and 3 must submit the entire form.

1. Statement Regarding Potential Special Projects

All agencies must complete this section of the form; subsequent sections are to be completed only by agencies that have received, and not yet approved[1], development permit applications for projects that are identified as potential "Special Projects" based on criteria provided in MRP Provision C.3.e.ii(2).

1.1 **Contact Information.**
Enter the name and contact information of the person to whom questions about this form should be directed.

Name:_______________________________ Phone No. :_______________________________

Email Address : ____

Mailing Address:____

1.2 **Statement Regarding Potential Special Projects**
Has the agency received , but not yet granted final discretionary approval of, a development permit application for a project that has been identified as a potential Special Project based on criteria listed in MRP Provision C.3.e.ii(2) for any of the three categories of Special Projects (Categories A, B or C)? Or has the agency granted final discretionary approval on or after December 1, 2011, but before March 1, 2012, of a project identified as a Special Project?

☐ YES. *Enter information on all of these projects in Sections 2 and 3 of this form.*

☐ NO. *After the authorized person signs below, submit to the Water Board only Page 1 of this form.*

1.3 **Certification Statement**
The following statement must be signed by the duly authorized representative.

I certify under penalty of law that this document and all attachments are prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete*. I am aware that there are significant penalties for submitting false information, including the possibiilty of fine and imprisonment for knowing violations.

*Note that projects still in review are likely to change as a result of the review process, and that the information provided is based on the version of the project plans on file with the agency on the date this report was submitted.

Signature :_______________________________________ Date :____________________

Print or Type Name:____________________________ Title :_____________________________

[1] If a project identified as a Special Project was approved on or after December 1, 2011, but before March 15, 2012, it should also be documented in Sections 2 and 3.

2. Tracking of Potential Special Projects

Provide all information indicated in the table. Do not leave blank cells in the table. If any of the indicated information is not available, please explain (for example, "Information is not yet available due to the preliminary phase of design.")

Project Name & No.	Permittee	Address	Application Submittal Date	Status	Description	Site Total Acreage	Density DU/Acre	Density FAR	Special Project Category	LID Treatment Reduction Credit Available	List of LID Stormwater Treatment Systems	List of Non-LID Stormwater Treatment Systems
									Category A: Category B: Category C: Location: Density: Parking:	Category A: Category B: Category C: Location: Density: Parking:	Indicate each type of LID treatment system and the percentage of total runoff treated	Indicate each type of non-LID treatment system and the percentage of total runoff treated. Indicate whether minimum design criteria met or certification received (see footnotes).

Project Name and No: Name of the Special Project and Project No. (if applicable)

Permittee: Name of the Permittee in whose jurisdiction the Special Project will be built.

Address: Address of the Special Project; if no street address, state the cross streets.

Submittal Date: Date that a planning application for the Special Project was submitted; if a planning application has not been submitted, include a projected application submittal date.

Status: Indicate whether final discretionary approval is still pending or has been granted, and provide the date or version of the project plans upon which reporting is based.

Description: Type of project (commercial, mixed-use, residential), number of floors, number of units, type of parking, and other relevant information.

Site Acreage: Total site area in acres.

Density in DU/Ac: Number of dwelling units per acre.

Density in FAR: Floor Area Ratio

Special Project Category: For each applicable Special Project Category, list the specific criteria applied to determine applicability. For each non-applicable Special Project Category, indicate n/a.

LID Treatment Reduction Credit Available: For each applicable Special Project Category, state the maximum total LID Treatment Reduction Credit available. For Category C Special Projects also list the individual Location, Density, and Minimized Surface Parking Credits available.

List of LID Stormwater Treatment Systems: List all LID stormwater treatment systems proposed. For each type, indicate the percentage of the total amount of runoff identified in Provision C.3.d. for the Special Project's drainage area.

List of Non-LID Stormwater Treatment Systems: List all non-LID stormwater treatment systems proposed. For each type of non-LID treatment system, indicate: (1) the percentage of the total amount of runoff identified in Provision C.3.d. for the Special Project's drainage area, and (2) whether the treatment system either meets minimum design criteria published by a government agency or received certification issued by a government agency, and reference the applicable criteria or certification.

3. Narrative Discussion of LID Feasibility or Infeasibility

For each potential Special Project listed in Section 2, provide a narrative discussion of the feasibility or infeasibility of 100% LID treatment, onsite and offsite, using the template provided below. Insert information specific to the project where indicated with brackets and yellow shading [[== insert information here ==]].

[[== Insert Project Name ==]]

1. Feasibility/Infeasibility of Onsite Infiltration, Evapotranspiration, and Harvesting/Use

The Countywide Program's [[== infiltration/harvesting and use feasibility screening worksheet and/or infiltration worksheet and/or rainwater harvesting and use worksheet was/were ==]] completed for the project. The results of this analysis showed that it was [[== feasible/infeasible ==]] to treat the C.3.d amount of runoff with [[==infiltration and/or harvesting and use==]].

2. Feasibility/Infeasibility of Onsite LID Treatment

The project site was reviewed with regard to the feasibility and infeasibility of onsite LID treatment. The results of this review showed that it was [[== feasible/infeasible ==]] to treat [[==___ percent [fill in percentage] ==]] of the C.3.d amount of runoff with LID treatment. The findings of this review are presented below.

a. **On-site Drainage Conditions.** [[== Describe the site drainage, including the site slope, direction of flow, and how the site was divided into drainage management areas that will each drain to a separate stormwater treatment measure.==]]

b. **Self-treating and Self-Retaining Areas and LID Treatment Measures.** [[== Describe any drainage management areas for which self-treating or self-retaining areas (such as pervious pavement, green roofs or landscaped areas) or LID treatment measures are provided. If there are none, delete this paragraph. ==]].

c. **Maximizing Flow to LID Features and Facilities.** [[== Explain how the routing of drainage has been optimized to route as much drainage as possible to LID features and facilities (if any). If there are no LID features or facilities, delete this paragraph. ==]]

d. **Constraints to Providing On-site LID.** The drainage management areas that are proposed to drain to tree-box type high flow rate biofilters and/or vault-based high flow rate media filters include some areas that are not covered by buildings. [[== Briefly describe all areas within these portions of the site that are not covered by buildings.==]] In these areas, conditions and technical constraints are present that preclude the use of LID features and facilities, as described below.

   i. Impervious paved areas: [[== Describe the uses of all impervious paved areas in these areas, and why the uses preclude the use of LID treatment.==]]

   ii. Landscaped areas: [[== For any of the following bullet points that are applicable, briefly describe how the conditions apply to the applicable landscaped areas. Delete any of the bullet points that are not applicable.==]]

   - Inadequate size to accommodate biotreatment facilities that meet sizing requirements for the tributary area.
   - Slopes too steep to terrace;
   - Proximity to an unstable bank or slope;
   - Environmental constraints (for example, landscaped area is within riparian corridor);
   - High groundwater or shallow bedrock;
   - Conflict with subsurface utilities;
   - Cap over polluted soil or groundwater;
   - Lack of head or routing path to move collected runoff to the landscaped area or from the landscaped area to a disposal point;

- Other conflicts, including required uses that preclude use for stormwater treatment (describe in more detail).

3. **Feasibility/Infeasibility of Off-Site LID Treatment.** The possibility of providing off-site LID treatment was found to be [[== feasible/infeasible ==]] for the following reasons.

    i. [[**==** Describe whether the project proponent owns or otherwise controls land within the same watershed of the project that can accommodate in perpetuity off-site bioretention facilities adequately sized to treat the runoff volume of the primary project. ==]]

    ii. [[**==** Indicate whether there is a regional LID stormwater mitigation program available to the project for in-lieu C.3 compliance. ==]]

C.3 Stormwater Technical Guidance

For use by developers, builders and project applicants to design and build low impact development projects

December 5, 2011

Version 3.0

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.
www.flowstobay.org

A Program of the City/County Association of Governments

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New Stormwater Control Requirements Effective 12/1/12

For Projects that Create and/or Replace 2,500 to 10,000 sq.ft. of Impervious Surface

New stormwater requirements go into effect on December 1, 2012 for development projects that will create and/or replace at least 2,500 square feet of impervious, but less than 10,000 square feet of impervious surface, and stand-alone single family homes that create and/or replace 2,500 square feet or more of impervious surface. These requirements are in the San Francisco Bay Region Municipal Regional Stormwater Permit (MRP)[1] and are described below.

Runoff is directed to landscaping.

What Is an Impervious Surface?

An impervious surface is a surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall. Impervious surfaces include, but are not limited to: rooftops, walkways, patios, driveways, parking lots, storage areas, impervious concrete and asphalt, and any other continuous watertight pavement or covering.

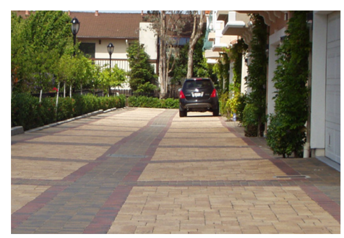
Does Pervious Paving Count as Impervious Surface?

Pervious paving, including pavers with permeable openings and seams, is not considered impervious if it is underlain with pervious soil or pervious storage material, such as a gravel layer that is sized to hold the volume of stormwater runoff specified in Provision C.3.d of the MRP (80 percent of the average annual runoff). Guidance for calculating this amount of runoff is provided in Section 5.1 of the San Mateo Countywide Water Pollution Prevention Program's (Countywide Program) C.3 Technical Guidance. A link to this guidance is provided under "For More Information."

What Are the New Requirements?

Beginning December 1, 2012, projects will need to incorporate one of the following site design measures if the project creates and/or replace at least 2,500 square feet of impervious, but less than 10,000 square feet of impervious surface, or it is a stand-alone single family home that creates and/or replaces 2,500 square feet or more of impervious surface.

- Direct roof runoff into cisterns or rain barrels for use.
- Direct roof runoff onto vegetated areas.
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- Direct runoff from driveways/uncovered parking lots onto vegetated areas.
- Construct sidewalks, walkways, and/or patios with permeable surfaces.[2]
- Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.[2]



Permeable joint pavers are one option for permeable surfaces.

Where Can I Find Site Design Guidance?

Chapter 4 of the Countywide Program's C.3 Technical Guidance provides guidance regarding rainwater harvesting and use, and directing runoff to vegetated areas ("self-retaining areas"). Sections 6.7 and 6.8 of the C.3 Technical Guidance provide guidance on using permeable paving. Fact sheets with standard specifications for these site designs are scheduled to be completed in the summer of 2012.

For More Information

To download the C.3 Technical Guidance, or find a stormwater compliance contact for your municipality, go to www.flowstobay.org (click on "Business", then "C.3 Stormwater Technical Guidance". For a list of municipal contacts who can provide information on stormwater compliance for development projects, click on the "local permitting agency" link.

[1] The MRP may be downloaded at www.flowstobay.org (click on "Municipalities"). These requirements are in Provision C.3.i of the MRP.
[2] Permeable surfaces include pervious concrete, porous asphalt, permeable joint unit pavers, and granular materials.

Template for Preparing Narrative Discussion of LID Feasibility or Infeasibility

A template is provided below, which may be used to prepare a narrative discussion of the feasibility or infeasibility of 100% LID treatment for each potential Special Project that an agency identifies in its half-yearly Special Projects Reporting submittal. This submittal is due to the Regional Water Quality Control Board by March 15 and September 15 each year. Follow the tips listed below to complete your template:

- *If you have more than one identified potential Special Project, copy the template and enter appropriate information for each project.*
- *Prompts for entering information are highlighted in yellow and provided within double brackets. After you have entered the project-specific information, delete the brackets and remove the highlighting.*
- *If the phase of design is too preliminary to provide the LID treatment feasibility discussion, so state in the Special Projects Reporting Table in the Annual Report (for the September 15 submittal) or in the Special Projects Reporting Form (for the March 15 submittal).*

[[== Insert Project Name ==]]

1. Feasibility/Infeasibility of Onsite Infiltration, Evapotranspiration, and Harvesting/Use

The Countywide Program's [[== infiltration/harvesting and use feasibility screening worksheet and/or infiltration worksheet and/or rainwater harvesting and use worksheet was/were ==]] completed for the project. The results of this analysis showed that it was [[== feasible/infeasible ==]] to treat the C.3.d amount of runoff with [[==infiltration and/or harvesting and use==]].

2. Feasibility/Infeasibility of Onsite LID Treatment

The project site was reviewed with regard to the feasibility and infeasibility of onsite LID treatment. The results of this review showed that it was [[== feasible/infeasible ==]] to treat [[==___ percent [fill in percentage] ==]] of the C.3.d amount of runoff with LID treatment. The findings of this review are presented below.

a. **On-site Drainage Conditions.** [[== Describe the site drainage, including the site slope, direction of flow, and how the site was divided into drainage management areas that will each drain to a separate stormwater treatment measure.==]]

b. **Self-treating and Self-Retaining Areas and LID Treatment Measures.** [[== Describe any drainage management areas for which self-treating or self-retaining areas (such as pervious pavement, green roofs or landscaped areas) or LID treatment measures are provided. If there are none, delete this paragraph. ==]].

c. **Maximizing Flow to LID Features and Facilities.** [[== Explain how the routing of drainage has been optimized to route as much drainage as possible to LID features and facilities (if any). If there are no LID features or facilities, delete this paragraph. ==]]

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   i. Impervious paved areas: [[== Describe the uses of all impervious paved areas in these areas, and why the uses preclude the use of LID treatment.==]]

   ii. Landscaped areas: [[== For any of the following bullet points that are applicable, briefly describe how the conditions apply to the applicable landscaped areas. Delete any of the bullet points that are not applicable.==]]

   - Inadequate size to accommodate biotreatment facilities that meet sizing requirements for the tributary area.
   - Slopes too steep to terrace;
   - Proximity to an unstable bank or slope;
   - Environmental constraints (for example, landscaped area is within riparian corridor);

- High groundwater or shallow bedrock;
- Conflict with subsurface utilities;
- Cap over polluted soil or groundwater;
- Lack of head or routing path to move collected runoff to the landscaped area or from the landscaped area to a disposal point;
- Other conflicts, including required uses that preclude use for stormwater treatment (describe in more detail).

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   ii. [[**==** Indicate whether there is a regional LID stormwater mitigation program available to the project for in-lieu C.3 compliance. ==]]

Table prepared by CONTECH Vendor for BASMAA, with info from the TAPE program and 2 other governmental certification programs; BASMAA recommends using systems approved by TAPE for GULD Basic Treatment

High Rate Biofilter and Media Filter Approvals and Design Constraints					
Technology	Vendor	Technology Type	TAPE GULD for Basic Treatment[1]	TARP Tier II Approval[2]	Sacramento Stormwater Quality Partnership[3]
			Design Operating Rate	Design Operating Rate	Design Operating Rate
Filterra	Americast	High Rate BioFilter	Hydraulic condictivity of 35.46"/hr	n/a	50"/hr percolation rate
Stormwater Management StormFilter	CONTECH Construction Products, Inc.	Media Filter	1 gpm/ft^2 of filter surface area	2 gpm/ft^2 filter surface area	2 gpm/sf filter surface area
Media Filtration System (MFS)	CONTECH Construction Products, Inc.	Media Filter	1 gpm/ft^2 of filter surface area	2 gpm/ft^2 filter surface area	n/a
FloGard Perk Filter	Kristar Enterprises, Inc.	Media Filter	1.5 gpm/ft^2 of filter surface area	n/a	n/a
BayFilter Cartridge	Baysaver Technologies, Inc.	Media Filter	0.5 gpm/ft^2 of filter surface area	n/a	n/a
Enhanced Media Cartridge	Baysaver Technologies, Inc.	Media Filter	0.7 gpm/ft^2 of filter surface area	n/a	n/a

1 - General Use Level Designation for Basic Treatment granted by the Washington State Department of Ecology. For program information and use level designation statements see: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/basic.html

2 - Certification of performance granted by the New Jersey Department of Environmental Protection based on field testing following the Technology Assessment Reciprocity Partnership Protocol for Stormwater Best Management Practice Demonstrations. For certification statements see: http://www.state.nj.us/dep/stormwater/treatment.html

3 - Approval by the Sacramento Stormwater Quality Partnership for stand alone treatment of stormwater. For program information and approved products list see: http://www.beriverfriendly.net/newdevelopment/propstormwatertreatdevice/

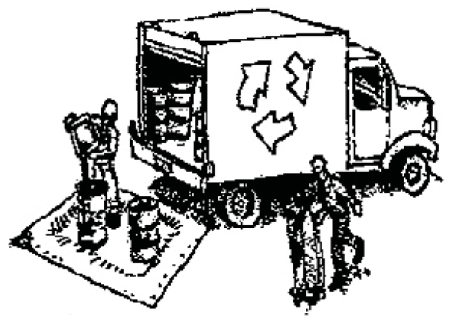
TAPE = Technical Assessment Protocol - Ecology, a certification program operated by Washington State Dept. of Ecology
GULD = General Use Level Designation

Construction Best Management Practices (BMPs)

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Construction projects are required to implement the stormwater best management practices (BMP) on this page, as they apply to your project, all year long.

Materials & Waste Management



Non-Hazardous Materials

- ❑ Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.
- ❑ Use (but don't overuse) reclaimed water for dust control.

Hazardous Materials

- ❑ Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state and federal regulations.
- ❑ Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast.
- ❑ Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.
- ❑ Arrange for appropriate disposal of all hazardous wastes.

Waste Management

- ❑ Cover waste disposal containers securely with tarps at the end of every work day and during wet weather.
- ❑ Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site.
- ❑ Clean or replace portable toilets, and inspect them frequently for leaks and spills.
- ❑ Dispose of all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.)
- ❑ Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste.

Construction Entrances and Perimeter

- ❑ Establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from site and tracking off site.
- ❑ Sweep or vacuum any street tracking immediately and secure sediment source to prevent further tracking. Never hose down streets to clean up tracking.

Equipment Management & Spill Control

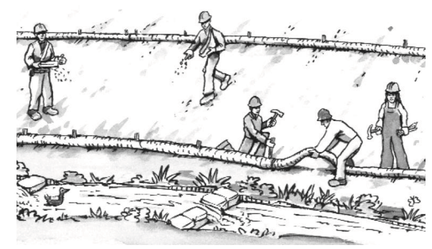
Maintenance and Parking

- ❑ Designate an area, fitted with appropriate BMPs, for vehicle and equipment parking and storage.
- ❑ Perform major maintenance, repair jobs, and vehicle and equipment washing off site.
- ❑ If refueling or vehicle maintenance must be done onsite, work in a bermed area away from storm drains and over a drip pan big enough to collect fluids. Recycle or dispose of fluids as hazardous waste.
- ❑ If vehicle or equipment cleaning must be done onsite, clean with water only in a bermed area that will not allow rinse water to run into gutters, streets, storm drains, or surface waters.
- ❑ Do not clean vehicle or equipment onsite using soaps, solvents, degreasers, steam cleaning equipment, etc.

Spill Prevention and Control

- ❑ Keep spill cleanup materials (rags, absorbents, etc.) available at the construction site at all times.
- ❑ Inspect vehicles and equipment frequently for and repair leaks promptly. Use drip pans to catch leaks until repairs are made.
- ❑ Clean up spills or leaks immediately and dispose of cleanup materials properly.
- ❑ Do not hose down surfaces where fluids have spilled. Use dry cleanup methods (absorbent materials, cat litter, and/or rags).
- ❑ Sweep up spilled dry materials immediately. Do not try to wash them away with water, or bury them.
- ❑ Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
- ❑ Report significant spills immediately. You are required by law to report all significant releases of hazardous materials, including oil. To report a spill: 1) Dial 911 or your local emergency response number, 2) Call the Governor's Office of Emergency Services Warning Center, (800) 852-7550 (24 hours).

Earthwork & Contaminated Soils



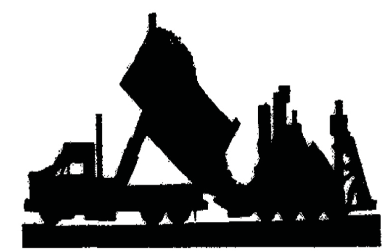
Erosion Control

- ❑ Schedule grading and excavation work for dry weather only.
- ❑ Stabilize all denuded areas, install and maintain temporary erosion controls (such as erosion control fabric or bonded fiber matrix) until vegetation is established.
- ❑ Seed or plant vegetation for erosion control on slopes or where construction is not immediately planned.

Sediment Control

- ❑ Protect storm drain inlets, gutters, ditches, and drainage courses with appropriate BMPs, such as gravel bags, fiber rolls, berms, etc.
- ❑ Prevent sediment from migrating offsite by installing and maintaining sediment controls, such as fiber rolls, silt fences, or sediment basins.
- ❑ Keep excavated soil on the site where it will not collect into the street.
- ❑ Transfer excavated materials to dump trucks on the site, not in the street.
- ❑ Contaminated Soils
- ❑ If any of the following conditions are observed, test for contamination and contact the Regional Water Quality Control Board:
  - ■ Unusual soil conditions, discoloration, or odor.
  - ■ Abandoned underground tanks.
  - ■ Abandoned wells
  - ■ Buried barrels, debris, or trash.

Paving/Asphalt Work



- ❑ Avoid paving and seal coating in wet weather, or when rain is forecast before fresh pavement will have time to cure.
- ❑ Cover storm drain inlets and manholes when applying seal coat, tack coat, slurry seal, fog seal, etc.
- ❑ Collect and recycle or appropriately dispose of excess abrasive gravel or sand. Do NOT sweep or wash it into gutters.
- ❑ Do not use water to wash down fresh asphalt concrete pavement.

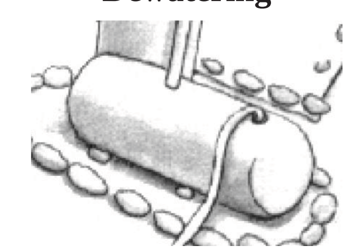
Sawcutting & Asphalt/Concrete Removal

- ❑ Completely cover or barricade storm drain inlets when saw cutting. Use filter fabric, catch basin inlet filters, or gravel bags to keep slurry out of the storm drain system.
- ❑ Shovel, abosorb, or vacuum saw-cut slurry and dispose of all waste as soon as you are finished in one location or at the end of each work day (whichever is sooner!).
- ❑ If sawcut slurry enters a catch basin, clean it up immediately.

Concrete, Grout & Mortar Application

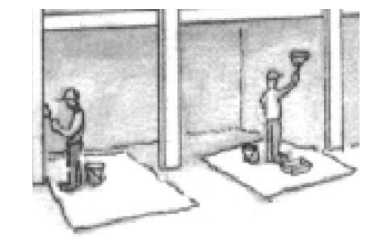
- ❑ Store concrete, grout and mortar under cover, on pallets and away from drainage areas. These materials must never reach a storm drain.
- ❑ Wash out concrete equipment/trucks offsite or in a contained area, so there is no discharge into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage.
- ❑ Collect the wash water from washing exposed aggregate concrete and remove it for appropriate disposal offsite.

Dewatering



- ❑ Effectively manage all run-on, all runoff within the site, and all runoff that discharges from the site. Divert run-on water from offsite away from all disturbed areas or otherwise ensure compliance.
- ❑ When dewatering, notify and obtain approval from the local municipality before discharging water to a street gutter or storm drain. Filtration or diversion through a basin, tank, or sediment trap may be required.
- ❑ In areas of known contamination, testing is required prior to reuse or discharge of groundwater. Consult with the Engineer to determine whether testing is required and how to interpret results. Contaminated groundwater must be treated or hauled off-site for proper disposal.

Painting & Paint Removal



Painting cleanup

- ❑ Never clean brushes or rinse paint containers into a street, gutter, storm drain, or surface waters.
- ❑ For water-based paints, paint out brushes to the extent possible. Rinse to the sanitary sewer once you have gained permission from the local wastewater treatment authority. Never pour paint down a drain.
- ❑ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of residue and unusable thinner/solvents as hazardous waste.

Paint removal

- ❑ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead or tributyltin must be disposed of as hazardous waste.
- ❑ Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up or collected in plastic drop cloths and disposed of as trash.

Landscape Materials

- ❑ Contain stockpiled landscaping materials by storing them under tarps when they are not actively being used.
- ❑ Stack erodible landscape material on pallets. Cover or store these materials when they are not actively being used or applied.
- ❑ Discontinue application of any erodible landscape material within 2 days before a forecast rain event or during wet weather.

Storm drain polluters may be liable for fines of up to $10,000 per day!

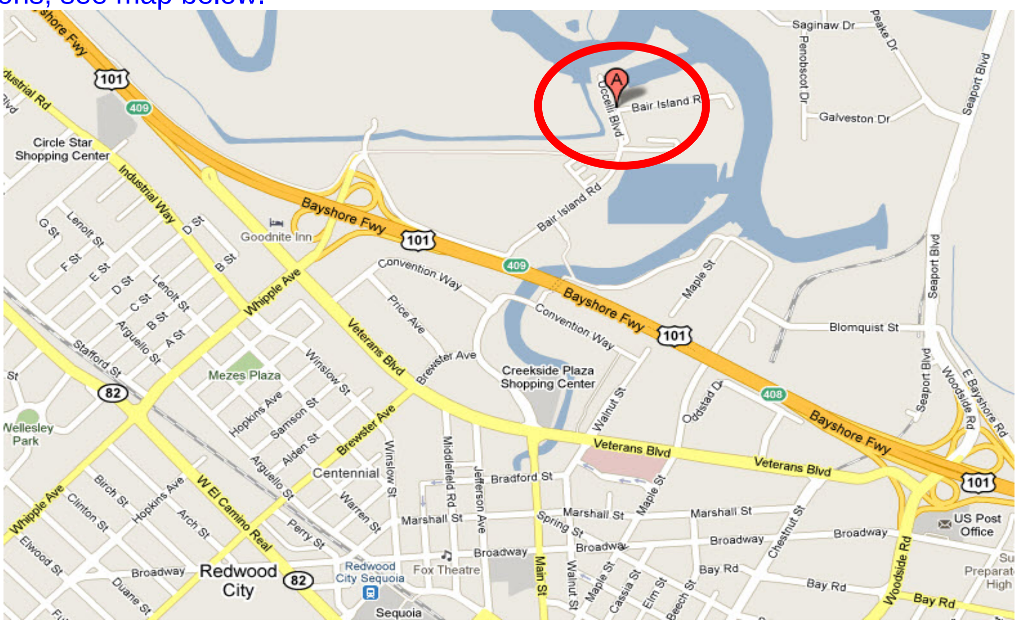
CALBIG MEETING ANNOUCEMENT

- Stormwater Management and Inspections -

(See Below)

This month's CALBIG meeting will be on Wednesday, August 10th from 11:30 to 1pm at The Waterfront Café located in Redwood City at Pete's Harbor. The location is at 1 Uccelli Blvd Redwood City. Phone # is 650-298-9896.

For directions, see map below.



Directions: Take US 101 to Whipple Ave Exit. Go east and follow the frontage road on the east side of Us101 to Bair Island Rd. Turn left and follow it to the end.

Fee: A charge of $20 per attendee will be taken at the door. We accept cash or check. All checks are to be made out to CALBIG.

Choice of meals: orders will be taken at the restaurant.

Fresh filet of sole
Fresh sole sautéed with white wine, butter, garlic and lemon juice

Pasta rustica
Penne pasta-rigati with Italian sausages, onions and bell peppers

Shrimp Louie salad

Super cheeseburger
1/2 lb of choice ground beef, cheese and French fries

Inspecting Stormwater Best Management Practices (BMPs) at Construction Sites

The Waterfront Restaurant, Pete's Harbor
1 Uccelli Blvd, Redwood City

Wednesday, August 10, 2011

Agenda

Registration/Seating 11:30 – 11:45
Welcome **11:45**

Michael Gorman, President, CalBIG

Introduction 11:45 – 11:50

- Follow-up on March 17 review of stormwater permit requirements
- Today's focus: BMPs
- Regional Water Board's recent enforcement actions
- Opportunities for countywide information sharing and problem-solving

Matt Fabry, *San Mateo Countywide Water Pollution Prevention Program*

Construction Sites Stormwater BMP Expectations 11:50 –12:50

- *Keys to proper BMP implementation and installation*
  - *Plan and manage the site*
  - *Avoid rainfall contact with site inventory*
  - *Prevent unauthorized non-stormwater runoff*
  - *Keep trash and fugitive dust on site*
  - *Provide erosion control*
  - *Provide sediment control*

Ed Boscacci, *BKF Engineers*

Identify Needs for Further Training and Information 12:50 – 1:00

Matt Fabry, *San Mateo Countywide Water Pollution Prevention Program*

Closing 1:00

Michael Gorman, President, CalBIG

Please RSVP to Jeff Frishof at jfrishof@yahoo.com no later than Monday, August 7th. Because of the importance of this months meeting, we need an accurate head count.

Thank you !

COMING ATTRACTIONS @ "THE WATERFRONT RESTAURANT"
PETE'S HARBOR, REDWOOD CITY, 11:30 AM - 1:00 PM
SAVE THESE DATES!!!

Wednesday; September 14, 2011

Keynote speaker: David Goodin, Hardy Frames, Inc.
Topic: Moment Frames that Utilize the (N) Generation Side Plate Moment Connection Technology

Wednesday; October 12, 2011

Keynote speaker: Dee Dee Graham, Louisiana-Pacific Corporation
Topic: “Flame Block” OSB and “Tech Shield” Radiant Barrier

Wednesday; November 9, 2011

Keynote speaker: Branch Mgr. San Francisco Region, Powers Fasteners
Topic: Anchors vs the California Building Codes for “Alternative Materials” i.e. acceptance criteria for post-installed adhesive anchors in concrete elements (ACI 308)

Wednesday; December 14, 2011

Keynote speaker: Mandy Snow, S.R. Smith Company
Topic: Private and Public Pool Alarms, Barriers and Accessibility Requirements vs S.R. Smith Company’s Product Line Solutions.

December we will take nominations for and online voting for our 2012 Officers and Board of Directors. Michael Gorman has termed out so consider doing your part in support of our chapter by running for one of three positions.

Santa Clara Valley
Urban Runoff
Pollution Prevention Program

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Register Now!

Construction Site Stormwater Compliance:

One-Day Training for Municipal Inspectors

Attention:

- **Do you inspect construction sites for stormwater compliance?**
- **Do you need training on:**
  - **Construction BMPs?**
  - **Inspecting construction of permanent stormwater controls?**

Tuesday, February 7, 2012
Quinlan Community Center
10185 North Stelling Road, Cupertino
8:00 a.m. to 3:30 p.m.

OR

Wednesday, February 8, 2012
Belmont Sports Complex
550 Island Parkway, Belmont
8:00 a.m. to 3:30 p.m.

This one-day training workshop is for municipal staff who inspect construction sites for compliance with stormwater requirements. The workshop will address:

- ✓ Municipal Regional Stormwater Permit requirements for construction site inspections,
- ✓ Key requirements in the statewide Construction General Permit,
- ✓ Construction BMPs: proper installation and maintenance, and examples (good and bad),
- ✓ Inspecting construction of permanent stormwater control measures.

Which Day to Attend?

→ The February 7 workshop (in Cupertino) is primarily for staff from agencies in Santa Clara County.
→ The February 8 workshop (in Belmont) is primarily for staff from agencies in San Mateo County.
→ Staff from agencies in one county may attend the other county's workshop on a space-available basis.

Registrations Due January 31, 2012!

Email or fax this RSVP to Lori Baumgartner, lorib@eoainc.com, fax: (408) 720-8812, by ***Tuesday, January 31, 2012***.
For additional information, contact Lori at (408) 720-8811 ext. 2.

Name: ________________________________

Agency: ________________________________

Phone: ________________________________

Email: ________________________________

Check one:

☐ **Tuesday, Feb 7** (Cupertino)

☐ **Wednesday, Feb 8** (Belmont)

*There will be **no charge** to agency staff for the workshop. Refreshments & box lunch will be served.*
Please pass this flyer along to appropriate staff within your organization.
You will be sent a confirmation, including an agenda and directions, one week prior to the workshop.

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.
www.flowstobay.org

Stormwater Workshop for Construction Site Inspectors

Inspecting Construction BMPs and Construction of Permanent Stormwater Controls

February 8
Belmont Sports Complex
Agenda

8:00 a.m.	Registration and Breakfast
8:30 a.m.	Introductory Remarks *Jeanne Naughton, New Development Subcommittee Chair*

Construction Module

8:40 a.m.	Municipal Regional Stormwater Permit (MRP) Requirements for Inspection of Construction Sites *Laura Prickett, EOA, Inc.*
9:00 a.m.	Key Requirements of the Construction General Permit *Tanya Bilezikjian, RBF Consulting*
9:30 a.m.	Overview of Construction BMPs *Scott Taylor, RBF Consulting*
10:30 a.m.	Break
10:40 a.m.	Examples of Enforcement Experiences *Rob Lecel, South San Francisco*
11:00 a.m.	Construction Site Compliance Exercise *Scott Taylor, RBF Consulting*
11:45 a.m.	How MRP Requirements Differ from State Permit Requirements *Laura Prickett, EOA, Inc.*
12:15 p.m.	Lunch

Post-Construction Module

1:00 p.m.	Inspecting Construction of Stormwater Treatment and HM Measures *Scott Taylor, RBF Consulting*
2:00 p.m.	Break
2:10 p.m.	Treatment Measure Inspection Exercise *Tanya Bilezikjian, RBF Consulting*
3:00 p.m.	Closing Remarks/Adjourn *Jeanne Naughton, New Development Subcommittee Chair*

A - G

Stormwater Workshop for Construction Site Inspectors
February 7, 2012 (Cupertino)

	Last Name	First Name	Municipality	Initial
~~1~~	~~Aguilar~~	~~Mirabel~~	~~City of San Jose~~	
2	Amador	Gerardo	City of Milpitas	
3	Anderson	Eric	City of Mountain View	
4	Arnold	Scott	City of San Jose	
5	Aslin	Akrista	West Valley Clean Water Program	
6	Avalos	Jaime	City of San Jose	
7	Avalos	Jose	City of San Jose	
8	Baggese	David	City of San Jose	
9	Barragan	Manuel	City of Cupertino	
10	Bermillo	David	City of San Jose	
11	Bjurman	Brad	City of San Jose	
12	Blancher	Gordon	City of Sunnyvale	
13	Bocalan	Michelle	City of Los Altos	
14	Bozorginia	Mazier	Town of Los Gatos	
15	Brown	Alan	City of Sunnyvale	
16	Bullock	Nigel	SCVWD	
17	Caldera	Sergio	City of Milpitas	
18	Campbell	Ben	County of San Mateo	
19	Carroll	Kelly	West Valley Clean Water Program	
20	Castro	Ray G.	City of San Jose	
21	Chan	Allan	County of San Mateo	
22	Chang	Andy	City of Mountain View	
23	Chen	Jen	Town of Hillsborough	
24	Cheung	Ron	City of San Jose - Public Works	
25	Chitwood	Ron	County of Santa Clara	
26	Chung	Johnson	Town of Los Altos Hills	
27	Ciprian	Jordan	City of San Jose	
28	Cruz	Pete	County of Santa Clara Roads & Airports	
29	Damey	Mark	City of San Jose - Public Works	
30	Donaldson	Chris	City of San Jose - Env. Services	
31	Donnelly	Cheri	City of Cupertino	
32	Erkel	Brent Andrew	City of San Jose	
33	Eydam	Albert	County of Santa Clara Roads & Airports	
34	Fairman	Aida	City of Los Altos	
35	Frederick	Mark	Santa Clara County Parks	
36	Fung	Wing	City of Mountain View	
37	Greef	Jeff	City of Cupertino	
38	Guevara	Jerry	County of Santa Clara	

39-45

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H-S

Stormwater Workshop for Construction Site Inspectors
February 7, 2012 (Cupertino)

	Last Name	First Name	Municipality	Initial
46	~~Horn~~ HOM	Alan	City of Campbell	
47	Huynh	David	Town of Atherton	
48	Ingebrigtsen	Tracy	Stanford University - Utilities Division	
49	Jones	Arion T.	City of San Jose - Public Works	
50	Khadiv	Bardia	City of Milpitas	
51	Krukar	Paul	City of San Jose - Public Works	PK
52	Lennon	Erin	West Valley Clean Water Program	
53	Lizotte	Damond D.	City of Los Altos	
54	Mekala	Sindhi	City of Monte Sereno	
55	Melvin	David	County of Santa Clara Roads & Airports	
56	Mendoza	Cathy	City of San Jose	
57	Moreno	Frank	City of San Jose	
58	Mostafavi	Saeid	Town of Colma	
59	Mu	Huimin	City of San Jose	
60	Murdock	Terry	City of Los Altos	
61	Naraval	Herbert	County of Santa Clara Roads & Airports	
62	Newton	Matthew	City of San Jose	
63	Nguyen	Ted	County of Santa Clara Roads & Airports	Ted
64	Nichols	Allen	City of San Jose - Public Works	
65	Ottenberg	Kathy	West Valley Clean Water Program	
66	Pagan	Steven	City of San Jose	
~~67~~	~~Palajac~~	~~Jan~~	~~City of San Jose~~	
68	Parks	David	County of Santa Clara Roads & Airports	
69	Parsons	Fletcher	Town of Los Gatos	
70	Perez	Ubaldo	County of Santa Clara	
71	Props	Jason	County of Santa Clara Roads & Airports	
74	Prudhel	Cassie	City of South San Francisco	CP
75	Rivera	Martin	SCVWD	
76	Rodriguez	Ralph	City of San Jose	
77	Rose	Patrick	City of Santa Clara	PR
78	Rowdy	Pipkin	County of Santa Clara Roads & Airports	
79	Sabich	Bobby	City of Cupertino	
80	Sangha	Gary	City of San Jose - Public Works	
81	Schaut	Michael	County of Santa Clara Roads & Airports	MTS
82	Schramm	Jim	County of Santa Clara Roads & Airports	
83	Seanez	David	SCVWD	
84	Sedaghatpour	Shara	City of San Jose	SS
85	Smith	Karla	Stanford University	
86	Souza	Steve	Town of Los Gatos	S.
87	Squarcia	Larry	City of Cupertino	
88	Strea[illegible]	Gary	City of Cupertino	
	88			
	46			

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T - Z

Stormwater Workshop for Construction Site Inspectors
February 7, 2012 (Cupertino)

	Last Name	First Name	Municpality	Initial
89	Tacke	Lauren	City of Cupertino	LMT
90	Thompson	Mitch	County of Santa Clara	
91	Tognetti	Shawn	City of Cupertino	[illegible]
92	Tucker	Charles	County of Santa Clara Roads & Airports	CWT
93	TuNguyen	Trang	Town of Los Gatos	TNT
94	Van Osdol	John	San Jose Municipal Water	[illegible]
95	Viray	Jun	City of San Jose	JV
96	Wier	Elliot	City of Santa Clara	[illegible]
97	Williams	Yvonne	City of San Jose - Public Works	WO
98	Wilson	Steve	County of Santa Clara Roads & Airports	SW
99	Winter	Richard	City of Cupertino	RW
100	Wolff	Shoshana	City of South San Francisco	SW
101	Yamaichi	George	County of Santa Clara Roads & Airports	GY
101	Yamauchi	Tawni	West Valley Clean Water Program	TY
102	Yniguez	Ray	Town of Hillsborough	RY
103	Zacarias	Jose	City of San Jose	JZ
104	Zarghampour	Reza	City of Mountain View	RZ
~~105~~			City of Saratoga	
~~106~~			City of Saratoga	
~~107~~			SCVWD	
~~108~~			SCVWD	
~~109~~			SCVWD	
110	WORMUTH, ~~MARTIN~~	MARTIN	City of SAN JOSE	MPW
111	MACHADO	MICHAEL	TOWN OF LOS GATOS	BLDG.
112	~~[illegible]~~ HO	TRAN	COUNTY OF SC	TH
113	HART	JARED	CITY OF SAN JOSE	JH
114	Halleck	William	CSJ	WH
115	CRUZ	TONY	CSJ	TRC
116	HANSEN	PATRICK	CSJ	PH
117	Hernandez	Chris	CSJ	CH

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A - J

Stormwater Workshop for Construction Site Inspectors
February 8, 2012 (Belmont)

	Last Name	First Name	Municipality	Initials	Credits?
1	Alao	Scott	SCVWD	SA	
2	Anderson	Tim	Town of Hillsborough	TA	yes
3	Apilado	Emil	City of Los Altos	EA	
~~4~~	~~Azzari~~	~~Zack~~	~~San Mateo County - DPWs~~		
5	Ballard	Mike	City of Sunnyvale	MD	
6	Benedik	Tanya	City of Milbrae	[illegible]	
7	Bonner	Jesse	CSG Consultants		
8	Brown	Brian	City of Mountain View	[illegible]	YES
9	Campbell	Bruce	SCVWD	[illegible]	YES
10	Daher	Michelle	City of East Palo Alto	[illegible]	
11	Daldrup	Stephen	Veolia Water NA	[illegible]	Yes
12	Delgado	Peter	City of Redwood City		
13	Donguines	Raymund	City of Pacifica		
14	Evora	Joel	City of Redwood City		
15	Francesconi	Dino L.	City of Belmont	[illegible]	YES
16	Fujimoto	Chris	City of Palo Alto	[illegible]	yes
17	Fulford	Dan	City of South San Francisco	[illegible]	Yes
18	Gross	Terri	SCVWD	Terri Gross	Yes
19	Haniger	Patrick	City of East Palo Alto	[illegible]	yes
20	Hathaway	Mark	City of San Mateo	[illegible]	Yes
21	Heap	Gary	City of San Mateo		
22	Hill	Matt	San Mateo County - DPWs	Matt Hill	
23	Imamura	Scott	SCVWD	[illegible]	
24	Jackson	Emmett	San Mateo County - DPWs	[illegible]	
25	Justimbaste	Eva	Veolia Water NA	[illegible]	yes

K-Z

Stormwater Workshop for Construction Site Inspectors
February 8, 2012 (Belmont)

	Last Name	First Name	Municpality	Initials	Credits?
26	Kenyon	Michelle	City of San Mateo		Yes
27	Lam	Aaron	City of San Mateo		
28	Laporte	Marty	Stanford University		
29	Latu	John	City of East Palo Alto		
30	Lecel	Rob	City of South San Francisco		Yes
31	Lind	Larry	City of Los Altos		
32	Lowrie	Bill	City of Burlingame		yes
33	Lowrie	Mik	City of Burlingame		yes
34	Loy	Mr. Whitney	City of Menlo Park		yes
35	Maharaj	Umesh	City of San Bruno		
~~36~~	~~Mai~~	~~Lisha~~	~~City of Burlingame~~		
37	Mao	Shaun	City of Menlo Park		YES
38	McCarty	James	City of East Palo Alto		
39	Medina	Marty	City of San Bruno		
40	Miranda	Luca	City of San Bruno		
41	Morales	Rene L.	City of Menlo Park		YES
42	Murphy	John	City of San Bruno		
43	Pacini	Ken	City of San Mateo		
44	Padilla	Tino	City of San Bruno		
45	Raj	Jai	City of San Mateo Yes		yes
46	Riddell	Anthony	City of Milbrae		
47	Tallitsch	John	City of Belmont		Yes
48	Tam	Dickson	City of Mountain View		
49	Tripiano	Frank	City of Sunnyvale		
50	Ung	Mario	City of San Mateo		
51	Vann	James	City of San Mateo		yes
52	Vergara	Anthony	City of San Mateo		yes
53	Wahidi	Syed	City of Campbell		
54	FAIRMAN	AIDA	CITY OF LOS ALTOS	LA. J.	
55	Wemmer,	ANDREW	City of SSF	AW	yes
56	MANNIGAN,	JOE	SAN BRUNO		

San Mateo Countywide Water Pollution Prevention Program
2012 Construction Site Stormwater Compliance:
February 8, 2012

Summary of Workshop Evaluations

Total Number of Evaluations: 64 (% Response) Total Number of Attendees: 56

1) Was the material presented relevant to your job?

NO **YES**

1	2	3	4	5
0	1	2	11	22

2) Were the presentations clear and easy to follow?

NO **YES**

1	2	3	4	5
1	1	3	9	22

3) Was the pace of the presentations appropriate?

NO **YES**

1	2	3	4	5
0	1	2	10	23

4) Were the presenters knowledgeable about the material?

NO **YES**

1	2	3	4	5
0	0	1	4	31

5) Were the presenters well-prepared?

NO **YES**

1	2	3	4	5
0	0	1	6	29

6) Did the presenters invite questions and participation?

NO **YES**

1	2	3	4	5
0	1	1	7	27

7) Were the handouts informative and useful?

NO **YES**

1	2	3	4	5
0	1	3	7	25

8) Overall, how useful was this workshop?

Not Useful **Very Useful**

1	2	3	4	5
0	1	5	5	25

9) What was most valuable about today's training?

Update Requirements
All
MRP Requirements
Examples in the field. Knowledge of speakers.
BMP info
Helpful slides
Actual examples shown
Contrasting MRP vs. General Permit
Technical/Design info about BMP's
Documentation guidance
The exercises
BMP applications/sample exercises
Differentiation b/n MRP/GCP
Bioretention samples
Adjacent slope stabilization
Learning new rules codes
Overview of construction BMP's
Liked the 1070 SMA presentation
Filling out forms, modification or changes to requirements
Review
The reporting inspection forms
Discussing issues with other inspectors, to hear what's going on in other areas
Scott was good speaker. This is 3rd time to this training. I understand more now but you need to figure out a more clear way to communicate & educate so people know where they fit into all the training.
Introduction to WPP
Scott Taylor's presentation
Inspection exercise
Learning what to look for on a job site.
Mock inspection.
Practible knowledge and examples.
RFB – Scott – Excellent presentations
RFB Scott
Const. site inspection report form

10) What was the least valuable about today's training?

Sme of picture/exercise confusing
Pictures hard to figure out
Filling out forms
None
Everything was valuable
None
N/A
?
Talking to others
Key requirements of the construction general permits

Too much review
None
No overview framework the program from Fed & state level C-3 down to Muni C-6 – what they are & what their differences are
Lack of ethics...”not good for business”
Municipalities should contact regulatory agencies.
N/A
RFB – Tanya- seemed less knowledgable. Lots of scrutiny of her presentation.
RFB Tanya

11) Please offer suggestions for what could be improved.

Label and organize exercise photos in handout with “hand-out” exercise
Colored handout pics
Better lunch
Additional case studies/practical apps.
Brightening of room and sound could be improved
Comfortable chairs
Financial aspect of the soft cost & implementation costs & construction duration to the MRP for project sponsors.
More clear photos
None
See notes below
Clearer pictures
Better slides/pictures
The pictures were hard to see better projection ect.
Inspection related sheets to help with field work.
Clarify terms ie: linear 1,2,3..., turbitit, NTU? Who is responsible for what (ie; enforcement).
More real life examples
Larger screen for presentations
N/A
Tanya Out.
Tanya
The class was great.

12) Please offer suggestions for future training topics.

More actual site pics for BMP violations
Same as above
Maybe get reps from proprietary products to show their products.
None.
See Notes Below.
Explain how the city is going to be responsible for violations from construction Sites run by others.
Actually very good.
More Q&A after forms are filled out
You all are doing a find job. Keep up the good work. Thank you.
How to fill out all forms properly.

Explain up front what you are talking about instead of talking in terms of "you need to..." and then at end explain why you are referring only to QSD & QSP.
N/A

13) **General comments.**

Should show example of completed forms fined in properly
Note: Especially for first time viewers. Not enough handouts (pics) for use as exercise.
Cold in AM
More example for work/projects.
Thank you.
If this class if for only public employees then the presentation by Tanya B. on construction general permit should be geared towards oversight of QSP/QSD hired by contractor to protect the city. Not as if this is a training class to become a QSPID. Too much information & confusing between city inspection requirements & contractor requirements. I guess what I would like to have seen is a class directed more towards city inspectors both for building and public works/construction inspectors who are the first to be on a site finding BMP issues. These are the people who will also help the contractor/home owner in selecting & inspecting installation of BMP's.
Other speakers need to be more enthusiastic, avoid monotone, act interested & speak louder. Within first 20 minutes I was confused bored & disinterested. It wasn't until just before lunch that the program outline was addressed & it still failed to give an overview of the whole stormwater program.
Good training.

Requirements for Architectural Copper

Protect water quality during installation, cleaning, treating, and washing!

Copper from Buildings May Harm Aquatic Life

Copper can harm aquatic life in San Francisco Bay. Water that comes into contact with architectural copper may contribute to impacts, especially during installation, cleaning, treating, or washing. Patination solutions that are used to obtain the desired shade of green or brown typically contain acids. After treatment, when the copper is rinsed to remove these acids, the rinse water is a source of pollutants. Municipalities prohibit discharges to the storm drain of water used in the installation, cleaning, treating and washing of architectural copper.

Building with copper flashing, gutter and drainpipe.

Use Best Management Practices (BMPs)

The following Best Management Practices (BMPs) must be implemented to prevent prohibited discharges to storm drains.

During Installation

- If possible, purchase copper materials that have been pre-patinated at the factory.
- If patination is done on-site, implement one or more of the following BMPs:
  - Discharge the rinse water to landscaping. Ensure that the rinse water does not flow to the street or storm drain. Block off storm drain inlet if needed.
  - Collect rinse water in a tank and pump to the sanitary sewer. Contact your local sanitary sewer agency before discharging to the sanitary sewer.
  - Collect the rinse water in a tank and haul off-site for proper disposal.
- Consider coating the copper materials with an impervious coating that prevents further corrosion and runoff. This will also maintain the desired color for a longer time, requiring less maintenance.

Storm drain inlet is blocked to prevent prohibited discharge. The water must be pumped and disposed of properly.

During Maintenance

Implement the following BMPs during routine maintenance activities, such as power washing the roof, re-patination or re-application of impervious coating:

- Block storm drain inlets as needed to prevent runoff from entering storm drains.
- Discharge the wash water to landscaping or to the sanitary sewer (with permission from the local sanitary sewer agency). If this is not an option, haul the wash water off-site for proper disposal.

Protect the Bay/Ocean and yourself!

If you are responsible for a discharge to the storm drain of non-stormwater generated by installing, cleaning, treating or washing copper architectural features, you are in violation of the municipal stormwater ordinance and may be subject to a fine.

Photo credit: Don Edwards National Wildlife Sanctuary

Contact Information

The San Mateo Countywide Water Pollution Prevention Program lists municipal stormwater contacts at www.flowstobay.org (click on "Business", then "New Development", then "local permitting agency").

FINAL February 29, 2012

Appendix C

- CII Subcommittee – Attendance List– FY 2011-12
- CII Stormwater Inspector Training Workshop – April 25, 2012
  - Agenda
  - Attendance List
  - Summary of workshop evaluations
- Water Utility Training Work Group – Attendance List– FY 2011-12

CII Subcommittee Attendance – FY 2011/12

Name	Agency	PHONE	FAX	E-Mail	Sept.	Dec.	March	June
	City of Atherton							
Bozhena Palatnik	City of Belmont	659 595-7463		Bpalatnik@Belmont.gov	√	√	√	√
Gilbert Yau	City of Belmont							
Leticia Alvarez	City of Belmont							
Randy Breoult	City of Brisbane	415-508-2131		rbreault@ci.brisbane.ca.us				√
Kiley Kinnon	City of Burlingame	342-3727	342-3712	kiley.kinnon@veoliawaterna.com	√			
Eva Justimbaste	City of Burlingame			eva.justimbaste@veoliawaterna.com		√		√
Stephen Daldrup	City of Burlingame			Stephen.daldrup@veoliawaterna.com			√	√
Louis Gotelli	City of Colma	757-8888	757-8890	Louis.Gotelli@colma.ca.us	√	√	√	√
Ward Donnelly	City of Daly City	991-8208	991-8220	wdonnelly@dalycity.org	√	√	√	√
Michele Daher	City of East Palo Alto	853-3165		mdaher@cityofepa.org	√	√	√	√
Salani Wendt				swendt@cityofepa.org				
John Doughty	City of East Palo Alto			jdoughty@cityofepa.org				
Sharon Jones	City of East Palo Alto			sjones@cityofepa.org				
Salani Wendt	City of East Palo Alto			swendt@cityofepa.org				
Norm Dorais	City of Foster City	286-3279	349-7204	ndorais@fostercity.org				
Larry Carnahan	City of Half Moon Bay	650-726-7177		larryc@hmbcity.com		√	√	√
Jen Chen	Town of Hillsborough							
Virginia Parks	City of Menlo Park	330-6752 330-6743		vkfparks@menlopark.org	√	√	√	√
Roger Starz	City of Menlo Park							√
Catherine Allin	City of Millbrae	259-2470	259-2398	callin@ci.millbrae.ca.us	√		√	√
Kevin Cesar	City of Millbrae	222-0545		kcesar@ci.millbrae.ca.us				
Lizzy Claycomb	City of Pacifica			jlo@ci.pacifica.ca.us				
Jason Lo	City of Pacifica	738-7456 738-3768		loj@ci.pacifica.ca.us	√	√		
Raymund Donguines	City of Pacifica			donguinesr@ci.pacifica.ca.us	√	√	√	√
	Town of Portola Valley							
Marilyn Harang	City of Redwood City	780-7497	780-7445	mharang@redwoodcity.org				
Gary Lepori	City San Bruno	616-7020		glepori@SanBruno.ca.gov	√		√	
Mike Dillon	City San Carlos	802-4139		mdillon@cityofsancarlos.org	√	√		
Shelli St. Clair	City of San Mateo	522-7342	522-7351	sstclair@cityofsanmateo.org	√	√	√	√
Debra Bickel	City of San Mateo	522-7343		dbicket@cityofsanmateo.org		√	√	
Rob Lecel	City of South San Francisco	829-3882	829-3855	rob.lecel@ssf.net		√	√	√
Andy Wemmer	City of South San Francisco	829-3883		Andrew.wemmer@ssf.net	√			
Gratien Etchebehere	Town of Woodside	650-851-6790		getchebehere@woodsidetown.org				
Dermot Casey	County of San Mateo	363-4957	363-7337	djcasey@co.sanmateo.ca.us		√	√	√
Tim Swillinger	County of San Mateo	372-6245	627-8244	tswillinger@co.sanmateo.ca.us				
Mark Chow	County of San Mateo	599-1489		mchow@co.sanmateo.ca.us				
Matt Fabry	SMCWPPP Coordinator	415 508-2134	415 467-5547	mfabry@smcgov.org	√			

Name	**Agency**	**PHONE**	**FAX**	**E-Mail**	**Sept.**	**Dec.**	**March**	**June**
Susan Hiestand	SBSA	650 832-6279		shiestand@sbsa.com		√	√	√
Francis Rooney	SBSA	650-594-8411		frooney@sbsa.com	√			
Cecil Felix	Water Board	510 622-2343		CFelix@waterboards.ca.gov				
Kristin Kerr	EOA, Inc.	510-832-2852	510-832-2856	kakerr@eoainc.com		√	√	√
Fred Jarvis	EOA, Inc.	510-832-2852	510-832-2856	Fejarvis@eoainc.com	√	√		
No. Attending					16	17	14	17

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Agenda
SMCWPPP *CII Stormwater Inspector Training*
April 25, 2012
South San Francisco Corporation Yard

Sign-in and Refreshments	8:30 to 9:00
1. Welcome and Introduction *Ward Donnelly, City of Daly City, Commercial, Industrial, and Illicit Discharge Control Subcommittee Chair*	9:00 to 9:15
2. Regulatory Review *Kristin Kerr, EOA*	9:15 to 9:35
3. County Environmental Health Business Inspection Work Flow *Dermot Casey, San Mateo County Environmental Health (SMCEH)*	9:35 to 9:55
4. Retail Food Programs *Eva Justimbaste, City of Burlingame (Veolia Water)*	9:55 to 10:15
5. Commercial Programs • **Hazardous Waste Facilities** *Dermot Casey, SMCEH* • **Mobile Food Service Providers** *Joanne San Jose, SMCEH* • **Mobile Washers/Oil Change Vendors** *Estuardo Montufar, SMCEH*	10:15 to 10:35
Break	10:35 to 10:50
6. SMCWPPP Public Information and Participation Program (PIP) *Timothy Swillinger and Mary Bell, SMCEH*	10:50 to 11:00
7. U.S. EPA Staff Perspective on Polychlorinated Biphenyls (PCBs) *Jennifer Downey, U.S. EPA Region 9 Southern California Office*	11:00 to 11:20
8. Regional Water Board Staff Perspective on PCBs *Mark Johnson, Regional Water Quality Control Board*	11:20 to 11:40
9. Residential Illicit Discharge Panel Discussion • **Residential Illicit Discharge Inspections** *Catherine Allin, City of Millbrae* • **Illicit Discharge Enforcement** *Ward Donnelly, City of Daly City* • **Case Study -** *Shelli St. Clair, City of San Mateo*	11:40 to 12:00
Lunch (provided)	**12:00 to 1:00**
10. Corporation Yard Inspection Exercise	1:00 to 2:00
11. Closing Remarks *Ward Donnelly, CII Chair*	2:00 to 2:15

CII Subcommittee
Stormwater Inspector Training Workshop
April 25, 2012
Final Attendance List

	Last Name	*First Name*	*Municipality*	*Attended*
1	Allin	Catherine	City of Millbrae	x
2	Baldwin	Bev	San Mateo County Environmental Health	x
3	Bartolo	Ray	City of Redwood City	x
4	Bell	Mary	San Mateo County Environmental Health	x
5	Bickel	Debra	City of San Mateo	x
6	Block	Andy	City of Union City	x
7	Casey	Dermot	San Mateo County Environmental Health	x
8	Cerezo	Liberty	San Mateo County	x
9	Cullen	Darrell	County of San Mateo	x
10	Daher	Michelle	City of East Palo Alto	x
11	Daldrup	Steve	City of Burlingame	x
12	Dillon	Michael	City of San Carlos	x
13	Donnelly	Ward	City of Daly City	x
14	Downey	Jennifer	U.S. EPA Region 9 Southern California Office	x
15	Ernest	Frobie	San Mateo County Environmental Health	x
16	Fascenda	Ron	City of Pacifica	x
17	Flood	John	City of Union City	x
18	Fong	Peter	South Bayside System Authority	x
19	Fulford	Daniel	City of South San Francisco	x
20	Gardner	Marietta	County of San Mateo Environmental Health	x
21	Gotelli	Louis	Town of Colma	x
22	Hiestand	Susan	South Bayside System Authority	x
23	Hobbs	Johnny	City of Union City	x
24	Hum	Cristina	San Mateo County	x
25	Jarin	Joanne	San Mateo County Environmental Health	x
26	Johnson	Mark	Regional Water Quality Control Board	x
27	Justimbaste	Eva	City of Burlingame	x
28	Tony	Edmond	San Mateo County Environmental Health	x
29	Kwong	Harry	City of Redwood City	x
30	Lam	Gloria	San Mateo County	x
31	Lecel	Rob	City of South San Francisco	x
32	Ledesma	Patrick	San Mateo County	x
33	Lindquist	Laurent	City of Menlo Park	x
34	Lo	Jason	City of Pacifica	x
35	Lopez	Eddie	City of Redwood City	x
36	Lowe	Steve	San Mateo County Environmental Health	x
37	Nguyen	Lyna	San Mateo County Environmental Health	x
38	Martin	Chris	City of Pacifica	x
39	Mau	Bernie	City of Pacifica	x
40	Mih	Sabrina	San Mateo County	x
41	Montufar	Estuardo	San Mateo County Environmental Health	x
42	Otero	Jeraldine	City of Menlo Park	x
43	Parks	Virginia	City of Menlo Park	x
44	Reed	Robert	County of San Mateo	x
45	Riddell	Anthony	City of Millbrae	x
46	Rooney	Francis	South Bayside System Authority	x
47	San Jose	Joanne	San Mateo County Environmental Health	x

	Last Name	*First Name*	*Municipality*	*Attended*
48	Sekhon	AJ	San Mateo County Environmental Health	x
49	St. Clair	Shelli	City of San Mateo	x
50	Swilling	Timothy	San Mateo County Environmental Health	x
51	Tallitsch	John	City of Belmont	x
52	Terrell	Marjorie	San Mateo County Environmental Health	x
53	Villarreal	Elizabeth	County of San Mateo	x
54	Wemmer	Andy	City of South San Francisco	x
55	Wolff	Shoshana	City of South San Francisco	x
56	Guier	Brent	San Mateo County	x
57	Erdozaincy	Rose	San Mateo County Environmental Health	x
58	Marcadejas	Vanessa	City of Menlo Park	x
59	Bilodeau	Michelle	San Mateo County Environmental Health	x

SAN MATEO COUNTYWIDE Water Pollution Prevention Program
Clean Water. Healthy Community.

Evaluation Summary

SMCWPPP CII Inspector Training Workshop
Wednesday, April 25, 2012

68 Attendees
44 Evaluations submitted (65% Evaluation Participation)

What Did You Think of the Following Presentations and Activities?

1. **Regulatory Review** *–Kristin Kerr, EOA*

   35 very helpful **7** somewhat helpful **0** not helpful

Comments:

- Good refresher & useful information
- Clear and concise
- Can not hear
- Good overall review of MRP
- Very nice, efficient, useful introduction to the basics
- Good way to start the training
- Not dry!! Good overview of where program comes from and oversight responsibility.
- Good summary of MRP
- Informative!
- Late arrival
- Provide 2 items in the handout (1) list of facilities that should have NOI, (2) Info site for list of facilities that have filed an NOI.

2. **County Environmental Health (CEH) Business Inspection Work Flow** – *Dermot Casey, San Mateo County Environmental Health (SMCEH)*

   32 very helpful **9** somewhat helpful **2** not helpful

Comments:

- Can not hear
- Don’t use yellow print. Can not see.
- Good to know more about
- Good speaker @ ease in front of crowd
- Dermot is a very great speaker. Presentation is thorough yet humorous.
- Good speaker with good info.
- Since I work for the county (very helpful choice)
- Good recommendations
- Great job, Dermot – Maybe a little less about EH work flow (or make more generic).
- Always very helpful. Excellent.
- Couldn’t hear from the back.

- Map on slide 2 was too small, use 1 slide with

3. **Retail Food Programs** – *Eva Justimbaste, City of Burlingame (Veolia Water)*

17 very helpful **20** somewhat helpful **4** not helpful

Comments:

- Too long
- Needs a PA system
- I don't work with FOG, but did have some good things to look out for.
- Can't hear her that well.
- Couldn't hear the presentation (too soft spoken)
- Not my responsibility, but good info. Needed a microphone, machine in back was LOUD!
- Material very helpful, but needs to speak louder. Very knowledgeable.
- Speaker needed to speak up.
- Could not hear her in the back of the room.
- Went way over timeline far as 15 minutes. Presentation needs more time.
- Would be helpful if I could have heard Eva. Need a microphone for this large of a room.
- Clear and to the point.
- Not helpful only because I'm really familiar with this already.
- Couldn't hear from the back.

4. **Commercial Programs: Vehicle Facilities, Mobile Food Service Providers and Mobile Washers**– *SMCEH staff*

25 very helpful **17** somewhat helpful **2** not helpful

Comments:

- Learned something about food trucks.
- Needs a PA system
- Don't have these in our city, but will look for them.
- Could not hear him very well. Hard to understand. Needs to talk louder.
- Wasn't able to hear much.
- Review of inspection form helpful. Good basic info. Good re-awareness
- Recap of info.
- Count not hear/understand speaker much.
- Good presentation
- Again, difficult to hear.
- Powerpoint photos very applicable. It visually illustrated main points.
- Dermot's and Estuardo's, very helpful. Mobile Food somewhat helpful. Very short, 1 minute?
- I want more information.

5. **SMCWPPP Public Information and Participation Program (PIP)** – *Timothy Swillinger and Mary Bell, SMCEH*

23 very helpful **17** somewhat helpful **2** not helpful

Comments:

- Some give away items that could be useful.
- Would be nice to have pictures/examples of programs and stories because it is public education. That their specialty.
- Can not hear
- Always good to hear what is available for us to pass on to our residents.
- Understandable.
- Agenda states 10 minute allotment!
- Fairly familiar with this program.
- Very clear and informative presentation.
- I appreciate the outreach materials.
- Good, quick overview of program and website.
- Lots of useful resources provided.
- Not helpful only because I already am familiar with it.
- Should have promoted program site as resource

6. **U.S. EPA Staff Perspective on PCBs** – *Jennifer Downey, U.S. EPA Region 9 Southern California Office*

18 very helpful **21** somewhat helpful **3** not helpful

Comments:

- Don't use yellow print. Can not see it.
- Could not hear her very well. Needs to talk louder.
- Appreciated the slides, especially since I could not really hear the presentation
- Good refresher, well done, educational and concise.
- Presentation needs more media. Pictures.
- I didn't know anything about PCB regs before the talk. So this was valuable.
- Generally not what we deal with. Could not hear speaker in rear of room.
- Interesting presentation
- Interesting, again difficult to hear though.
- Hypothetical situations most helpful.
- Content great
- Very general maybe more focused to recent regulations and permittees.

7. **Regional Water Board Staff Perspective on PCBs** – *Mark Johnson, RWQCB*

25 very helpful **13** somewhat helpful **4** not helpful

Comments:

- Better idea of what to do for in spotting potential PCB sources.
- Very interesting information.

- Can not hear
- Do not have PCBs in town but will keep an eye out for small transformers.
- Could not hear him very well needs to talk louder.
- Could not hear.
- Very informative.
- Good stuff, good experience, good tips to identify PCB sources.
- Concise presentation.
- Interesting presentation and helpful info for what to look for
- Speaker needed to speak up.
- Could not hear this speaker either. Sounded like he was very informed on his line of work.
- I loved the photographs.
- Very interesting talk on PCBs
- Great Content
- Excellent practical info on what to look for.

8. **Residential Illicit Discharge Panel Discussion** – *panelists*

   N/A

9. **Corporation Yard Inspection Group Exercise** – *All*

26 very helpful **11** somewhat helpful **1** not helpful

Comments:

- Helpful but could be better organized. Groups were too big, should have groups of 6 to 8 people, give a map, # sites and tell people how long they have at each place.
- Good to walk a site with others to get a different perspective on issues.
- Corny!
- Need smaller groups
- This is very valuable – to get different opinions on rankings
- Great staging of violations
- Should include other type of industry like restaurants
- Groups way to large
- Love This!!

Did this workshop meet your expectations? **40** Yes **0** No

Which topics/activities were most beneficial?
PCBs (9)
USEPA (2)
Reg. review and insights by speakers.
Exercise/ Outdoor Corp Yard inspection (9)
Parts I could hear
Water Pollution Prevention
Session time management.
Reviewing SWPPP Inspection form
Case Studies

Handouts with MRP requirements
Inspection and review topics
Retail food programs/mobile trucks
Restaurants, CEH workflow
Food related
The workshop was good
mobile food & washers

Which topics/activities were least beneficial?
PIP information (3)
Food
Commercial Programs just don't have these in our town.
Commercial Programs
Food Trucks
Parts I could not hear.
All
PCB topics (5)
County health work flow

How many previous workshops have you attended? 17 - 0 **9** - 1 **8** - 2 **3** - 3 **3** - 4 **1** - 5+

Would you be interested in attending a workshop next year? **36** Yes **4** No

What is your position (i.e., primary function as it relates to stormwater)?:

I do not perform stormwater inspection, primarily FOG inspections.
So over control Inspector.
Water Quality Specialist (no Stormwater Inspectors).
Maintenance worker
HazMat inspector (4)
City Inspector overseeing all stormwater issues.
Public works inspector (2)
Maintenance Tech III
LPWMW
Environmental Health Inspector (2)
HMS III
Water Conservation Specialist
Inspector (County)
Food Inspector/ Retail Food Facilities Inspector (2)
Inspector and manager of Environmental Programs.
Public Works Superintendent. New at this position.
Health Department (2)
Inspector (4)
Environmental Compliance Inspector
Source control Inspector, checks for stormwater violations during business inspections & responds to Illicit Discharge complaints, public outreach.
Stormwater Coordinator
Environmental programs manager
NPDES Coordination/Inspector

Does your agency hold internal meetings for stormwater staff?: **21** Yes **12** No

Suggestions for future workshop topics:

- More technical presentation such as PCBs, Copper, Surface Cleaning, mobile businesses- presentations by industry & examples of how they do it.
- I always like to hear real life issues with photos.
- Please consider setting up a microphone. It was difficult to hear most speakers.
- Less speakers, but more time for them to speak. Microphone for speakers.
- More pictures would be helpful, some slides were too text heavy.
- More specific things to watch for like other materials that have PCBs
- Many, many slides of activity area, for discussion of rankings
- Mircrophones
- Expand topic and presentation on mobile service – it appears this type of service is evolving.
- Agreement on violation/PIL numbers

General Comments:

- Need to have a good sound system so we can hear & understand.
- It does kind of stink that the RWQCB doesn't review/visit sites with SWPPP.
- A microphone for the speakers would have bee nice.
- Food was good, could have used a mic to help those in the back to hear better. Thanks for the forms from D.C and SM County.
- Get a mic. Enforce respectful & sound sensitive settings.
- I liked how some of the presentations were short. 20 to 25 minutes per presentation is great.
- Could not hear most of the people.
- Great Training
- I like the slides that went through pictures of a site and filled the storm water form while looking at the form.
- I didn't know annual training is required – important.
- Could not hear most of the presentations in back of room. Very noisy due to vending machines. Should have P.A. system, or speaker system.
- I would like to see more information on restaurant sw inspections e.g. how to document certain violations to be standardized with other inspectors.
- Provide microphones for speakers. Hard to hear with equipment running at back of room.
- Good training. Could have managed time better. Good presenters. Microphone system would be helpful, for people in back. Field exercise beneficial. I would like to have a panel with ideas as to how to implement BMPs through planning agencies and city agencies such as bioswales in parking lots and also storm drain by erosion and silt filters.
- More solutions during presentations. Case study from a typical problem that was solved, So that we can learn from experienced inspectors.
- Microphone and speaker system would be beneficial as it was hard to hear some presentations in the back.
- Please use some kind of amplification next time. It was hard to hear many of the speakers.
- Need microphones & speaker system. Video tape so we can have for new EE.
- Tell presenters up front how much time they're allotted and ask them to time their presentations to make sure they don't go over time. Provide handouts for all talks. A/V issues! Can't hear speakers. Restroom ran out of TP!!!

Water Utility Training Work Group Attendance – FY2011/12

Agency	Name	Phone	Email	4/19/12	5/14/12	6/13/12
Brisbane	Jerry Flanagan	415-508-2137	jflanagan@ci.brisbane.ca.us	✓	✓	
Burlingame	Tim McAuliffe		tmcauliffe@burlingame.org			
Daly City						
East Palo Alto	Michelle Daher	650.853.3197	mdaher@cityofepa.org	✓	✓	✓
	Gopi Nathan (American Water)		GNathan@amwater.com		✓	
Foster City	Nick Leonoudakis		nleonoudakis@fostercity.org			
Hillsborough	Catherine Chan	650-579-3353	cchan@hillsborough.net	✓	✓	✓
	Carlos Castro	650-375-7504	ccastro@hillsborough.net	✓		
	Ed Cooney	415-606-6786/ 650-579-3355	ecooney@hillsborough.net	✓	✓	
Menlo Park						
Millbrae	Khee Lim		klim@ci.millbrae.ca.us			
	Craig Centis		ccentis@ci.millbrae.ca.us			
	Jim Harrington	650-259-2374	jharrington@ci.millbrae.ca.us		✓	✓
	Jack Diaz		jdiaz@ci.millbrae.ca.us			
Redwood City	Justin Ezell	650.780.7474	jezell@redwoodcity.org			
San Bruno						
San Mateo County	Mark Chow	650-599-1489	mchow@smcgov.org	✓	✓	✓
SMCWPPP Coordinator	Matt Fabry	415 508-2134	mfabry@smcgov.org	✓		
EOA	Kristin Kerr	510-832-2852	kakerr@eoainc.com	✓	✓	✓

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix D

- PIP Subcommittee – Attendance List– FY 2011-12
- Countywide Media Relations– Press Releases– FY 2011-12
    - Press release (August 29, 2011): "Public Invited to Participate in 2011 California Coastal Cleanup Day Events"
    - Press release (October 27, 2011): "Federal Grant Available for Projects that Enhance San Mateo County Waterways"
    - Press release (October 28, 2011): "San Mateo County Stormwater Guidebook Wins National ASLA Award"
- Regional Media Relations– Press Releases– FY 2011-12
    - Press release (January 11, 2012): "Winter Rains Wash Pollutants into Local Waters"
    - Press release (February 2, 2012): "Survey Calculates Bay Area Litter Problem Reaches up to 1.6 Million Gallons Annually"
    - Press release (June 1, 2012): "Wash Your Car the Smart Way This Summer"
    - Press release (June 14, 2012): "Proper Pool Maintenance Means You Can Dive Into a No Pollution Summer in San Mateo County"
- SMCWPPP website (www.flowstobay.org) pages
    - Spring Cleaning SMC webpage
    - Spanish-language community webpage outline stormwater pollution prevention
    - Spanish-language community webpage outline stormwater pollution prevention
- P3 Pollution Prevention Post Newsletter
    - Fall 2011
    - Spring 2012
- Tip Card "Keep Car Wash Pollution Out of the Storm Drain" and 2012 Car Wash Discount Card
- Community Action Grant announcement postcard– November 2011

Public Information and Participation Subcommittee				FY 2011-2012					
AGENCY	**NAME**	**ALTERNATE**	**PHONE**	**Jul-11**	**Sep-11**	**Nov-11**	**Jan-12**	**Mar-12**	**May-12**
Prog. Coordinator	Matthew Fabry		415-599-1419	1	1				1
Atherton	Andrea Mardesich		752-0544		1			1	
Belmont	Diane Lynn		595-7425	1	1	1	1	1	1
Brisbane	Shelley Romriell	(M. Fabry)	415-508-2128	{1}	1				1
Burlingame	Stephen Daldrup	Eva Justimbaste	342-3727	1	1	1	1	1	1
Colma	Muneer Ahmed	Jason Chen	757-8888	1	1	1	1	1	1
Daly City	Ward Donnelly		991-8200	1	1	1	1		1
East Palo Alto	Michelle Daher	John Latu	853-3197	1	2	1	1	1	
Foster City	Mike McElligot		286-3546	1	1	1		1	
Half Moon Bay	Muneer Ahmed	Mo Sharma		{1}	{1}	{1}	{1}	{1}	{1}
Hillsborough	Rachelle Ungaretti		375-7444			1	1	1	
Menlo Park	Rebecca Fotu	Regina Wheeler	330-6765	1	1				1
Millbrae	Shelly Reider	Krista Kuehnhackl	259-2444	1	2	1	1	1	1
Pacifica	Lizzy Claycomb		738-7361	1	1	1	1		1
Portola Valley	Howard Young		851-1700 x 14						
Redwood City	Marilyn Harang		780-7477						
San Bruno	Jim Shannon		616-7046				1		
San Carlos	Jill Lewis		802-4361	1		1	1	1	1
San Mateo City	Debra Bickel	Shelli St. Clair	522-7343	1	1	1	1	1	1
San Mateo County	Carole Foster		599-1448	1		1			1
S. San Francisco	Daniel Fulford	Shoshana Wolff	829-3840	1	1	1	1	1	1
Woodside	Gratien Etchbehere		851-6790	1		1		1	
			TOTAL IN ATTENDANCE	**14**	**16**	**14**	**12**	**12**	**13**
PIP Consultants:									
Environ. Health	Waymond Wong		372-6248	1	1				
Environ. Health	Timothy Swillinger		372-6245	1	1	1	1	1	1
Environ. Health	Mary Bell Austin		372-6259		1	1	1		
Environ. Health	Ana Clayton	Julia Au	372-6214	1				1	1
Environ. Health	Mae Gardner		372-6291						

1 - Attendance **{1} - Duel Coverage**

News Release

County of San Mateo

Health System • 225 37th Avenue, San Mateo, CA 94403

FOR IMMEDIATE RELEASE
August 29, 2011

Contact: Robyn Thaw, (650) 573-3935
San Mateo County Health System

Public Invited to Participate in 2011 California Coastal Cleanup Day Events

Residents to clear debris from 30 sites throughout San Mateo County on Saturday, September 17

SAN MATEO, Calif. – On Saturday, September 17th, people of all ages can help make San Mateo County cleaner and greener by scouring beaches and watersheds during California Coastal Cleanup Day, the largest volunteer event of its kind in the State.

Families, students, service groups and neighbors will have the opportunity to help out at more than 30 cleanup sites across San Mateo County. Residents are invited to show up at any of the locations at 9 a.m., and most cleanups will end by noon

Coastal Cleanup Day is coordinated by the San Mateo Countywide Water Pollution Prevention Program and California Coastal Commission. This is the 27th year thousands of Californians will work together along beaches, shorelines and inland waterways to pick up cigarette butts, cans, bottles, plastic bags, grocery carts, old tires and other debris. Volunteers are encouraged to bring their own bucket or reusable bag, gloves, and reusable water bottle.

Last year, more than 4,200 volunteers in San Mateo County removed 42,000 pounds of trash and recyclables that would otherwise soil the County and threaten the health of wildlife. The vast majority of the debris wasn’t dropped on beaches or tossed into a watershed. Most of the debris started out as garbage on urban streets and was carried by storm drains or blown by the wind. This makes it critical to clean up neighborhood streets before trash flows to the Bay and ocean.

“We are all connected to the shoreline and creek banks by storm drains,” said Ana Clayton, San Mateo County Cleanup Day Coordinator. “The storm drains whisk litter you see on the sidewalk to our waterways. Most storm drains don’t flow to a sewage treatment plant. They flow to our vulnerable waterways. It’s important to remember that we need to do our part and keep trash and pollutants out of storm drains before they reach the ocean and Bay.”

Coastal cleanup participants will have the opportunity to join a “Pollution Solution Team.” The team’s focus is to continue picking up litter throughout the year at each site in the course of everyday activities. A limited number of gloves printed with the team logo will be available for those who sign up on the day of the event.

For more information about the San Mateo Countywide Water Pollution Prevention Program or cleanup sites within San Mateo County, visit www.flowstobay.org/ccd or call (650) 372-6214. For information on statewide locations and this year’s corporate sponsors, visit the California Coastal Commission at www.coast4u.org.

-MORE-

Bayside and Inland Locations

Belmont

- **<u>Belmont Creek</u>:** One Twin Pines Lane, City Hall Area. Located mid block behind Safeway. Volunteers will be sent out to various locations within the City.

Brisbane

- **<u>Brisbane Lagoon:</u>** Meet at Fisherman's Park. From 101 N. exit Bayshore/Cow Palace. Turn Right on Tunnel Av.(2nd stop light). Right on Lagoon Rd. (next stop sign). Right on Serra Point Pkwy (next stop sign). Approx 500 meters down on right side. From 101 S. exit Sierra Point Pkwy, go through stop sign and park is on right hand side.

Burlingame

- **<u>Burlingame Bayfront:</u>** Meet at Fisherman's Wharf, behind Embassy Suites - 150 Anza Blvd. **<u>Burlingame Bayfront Trail:</u>** Meet behind El Torito. 1590 Bayshore Highway.

East Palo Alto

- **<u>San Francisquito Creek</u>:** Meet on the corner of Manhatten Ave. & Woodland Rd.

Menlo Park

- **<u>Bedwell Bayfront Park:</u>** Meet at the first parking lot. The park is located at the East side of Hwy 101 off Marsh Road and Bayfront Expressway.
- **<u>San Francisquito Creek</u>:** Meet on the corner of Alma St. and East Creek Drive. This site is not appropriate for participants under 16 years of age.

Millbrae

- **<u>Central Park:</u>** Meet at Central Park, at the intersection of Palm and Landsdale; between Richmond Dr. and Taylor Blvd. Volunteers will be sent out to various locations within the City.

Redwood City

- **<u>Various Redwood City Locations:</u>** 8:30am-noon. Meet at Public Works Services- 1400 Broadway (on the corner of Woodside Road and Broadway). BBQ at noon for all participants.
- **<u>Cordilleras Creek:</u>** Meet in front of Redwood High: 1968 Old County Road, Redwood City

San Mateo

- **<u>San Mateo Bayfront (Ryder Park)</u>:** 7:30 am to noon. Meet at Ryder Park- 1801 J Hart Clinton Drive. From Hwy 101, take 3rd Ave East, follow signs to parking. BBQ, Entertainment, Prizes!
- **<u>Coyote Point State Park</u>:** Meet at Coyote Point Park - 1700 Coyote Point Drive. Signs shall be posted directing volunteers to the registration area.

South San Francisco

- **<u>Colma Creek</u>:** Meet at 180 Utah Avenue in South San Francisco. Park along the street next to 180 Utah Ave on the SW corner of Utah Ave and Harbor Way in South San Francisco.
- **<u>South San Francisco Cleanup:</u>** Meet at Bayfront Trail at the end of Haskins Way, South San Francisco. Cross street is East Grand Ave.

Coastside Locations

Daly City

- **<u>Thornton State Beach</u>:** Hwy 280 exit John Daly Blvd. west, right on Skyline Blvd., left on Olympic Way to Stables parking lot.

El Granada:

- **<u>Mirada Surf West:</u>** Cleanup the bluff and Surfers Beach at Mirada West in El Granada. Meet at the west side of Highway 1 at the intersection of Coronado & Highway 1.

Half Moon Bay

- **<u>Pilarcitos Creek:</u>** Meet in the Odwalla parking lot: 120 Stone Pine.

<u>Poplar State Beach</u>: Located a half-mile west of Hwy 1 at the end of Poplar Ave. Off Hwy 1, just south of Half Moon Bay State Beach. Parking available at the bluff top parking lot.

-MORE-

- **Francis State Beach:** From Highway 1, turn west on Kelly Ave (south of Highway 92). Park in Francis State Beach parking lot.
- **Purisima Creek Redwoods Open Space Preserve:** Meet at Purisima Creek Redwoods OSP North Ridge Parking Lot. Gate PCO1. Volunteers will remove invasive, non-native Ivy along the scenic Whittemore Gulch Trail in the Purisima Creek Watershed. Age limit: 14+ Registration required (flowstobay.org/ccd), maximum number of volunteers needed 15.

Montara

- **Montara State Beach:** Meet in the Northern Parking lot of Montara State Beach (not the Outrigger). A cleanup crew will also be sent to Grey Whale Cove.

Pacifica*

- **San Pedro Creek Watershed:** Meet at the north end of Pedro Point shopping center just south of Taco Bell off Hwy 1.
- **Manor Bluff:** Take Manor Drive west to the ocean. Meet in front of the Pacifica Post Office.
- **Sharp Park:** Meet at the start of the levee near the picnic tables on Beach Blvd at Clarendon just south of the Pacifica Pier.
- **Linda Mar/Pacifica State Beach:** Meet at the south end of Linda Mar State Beach parking lot near Taco Bell.
- **Rockaway:** Hwy1 to Rockaway Blvd, turn west to go to the end of the street. Meet by Nicks Restaurant.

*Celebration at noon for all Pacifica volunteers.

Pescadero

- **Pescadero State Beach:** Off Hwy 1. Meet at the beach's northern parking lot.
- **Gazos Beach:** Hwy 1, about 20 miles south of the Highway 92 and Highway 1 intersection in HMB. Near the restaurant Gazos Grill.

San Gregorio

- **San Gregorio State Beach:** Hwy 1 at Hwy 84 intersection. Meet in large parking lot - free parking for volunteers.

###

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

2000 Alameda De Las Pulgas
Suite 100
San Mateo, CA 94403

P 650.372.6200
F 650.627-8244
flowstobay.org

For Immediate Release **Contact:** Elizabeth Claycomb (650) 738-7361
October 27, 2011 San Mateo Countywide Water Pollution Prevention Program

Federal Grant Available for Projects that Enhance San Mateo County Waterways

San Mateo County, Calif. – San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) has announced a $15,000 grant for projects that enhance and protect the health of local watersheds, creeks, the San Francisco Bay and the Pacific Ocean.

Community groups, educators, environmentalists, nonprofit groups, and other organizations with outreach projects promoting the prevention of storm water pollution are encouraged to apply by the November 18, 2011 deadline.

SMCWPPP is a federally mandated program to reduce the amount of pollution entering local storm drain systems. The program offers San Mateo County $15,000 in Community Action Grants each year, with up to $3,000 awarded for each project.

Last year, six organizations located in San Mateo County received grant funding for new and ongoing projects, including school curriculum development and implementation, community environmental education activities, habitat restoration, and cleanup events.

For information and application packets, visit www.flowstobay.org or call (650) 372-6245. Deadline to apply is Nov. 18th, 2011.

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community. www.flowstobay.org
555 County Center • Redwood City, CA 94063

FOR IMMEDIATE RELEASE
October 28, 2011

Contacts:

Kevin Robert Perry, ASLA	Matthew Fabry, P.E.
Nevue Ngan Associates	San Mateo Countywide Water Pollution Prevention Program
(503) 239-0600	(650) 599-1419
kevin@nevuengan.com	mfabry@co.sanmateo.ca.us

San Mateo County Stormwater Guidebook Wins National ASLA Award

The "San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook" received a national American Society of Landscape Architects (ASLA) Honor Award for being an innovative and comprehensive guide on green street design. ASLA awards honor the top public places, residential designs, campuses, parks, and urban planning projects from around the world.

The San Mateo Countywide Water Pollution Prevention Program (a program of the City/County Association of Governments) published the guidebook to illustrate how streets and parking lots can be designed to manage stormwater in a more sustainable and natural way. Since it was first published in 2009, the guidebook has influenced the completion of four demonstration projects in San Mateo County.

ASLA praised the guidebook as "An excellent tool for communicating with public officials and constituents…Beautifully illustrated and very approachable." The guidebook has also been praised by the Environmental Protection Agency as having national significance and previously garnered an "Innovation in Green Community Planning" award from the American Planning Association's California chapter.

Kevin Robert Perry of the Portland-based landscape architecture firm Nevue Ngan Associates and Matthew Fabry of the San Mateo Countywide Water Pollution Prevention Program will accept the award on Nov. 2nd at the ASLA Annual Meeting and Expo in San Diego.

More information about the San Mateo County Sustainable Green Streets and Parking Lots Guidebook and program can be found at http://www.flowstobay.org/greenstreets

###

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For Immediate Release
January 11, 2012

Contact: Matt Fabry, Program Coordinator, (650) 599-1419
San Mateo Countywide Water Pollution Prevention Program

Winter Rains Wash Pollutants into Local Waters

SAN MATEO – The rainy season brings more than gray skies to San Mateo County. It also brings an increase in water pollution. The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) is reminding residents to help reduce pollution during rainy season to protect our creeks, stormwater systems and local watershed.

"The first heavy rains of the season wash pollutants, like motor oil, litter and pesticides off our streets and roads and send them into local waters, " explains Matt Fabry, Program Coordinator for SMCWPPP. "The good news is that there are things residents can do to help reduce water pollution during the rainy season."

A few things you can do to prevent water pollution this season:

• Check your vehicles for leaks! Even a small leak can have a big impact. One gallon of oil can contaminate 1,000,000 gallons of water.

• If you see litter, pick it up! A bottle or food wrapper on the ground is unsightly; when rains wash litter down storm drains, these items pollute local waters.

• Don't spray pesticides around the perimeter of your home, especially when rain is in the forecast.

For more tips on how you can prevent water pollution, visit flowstobay.org and BayWise.org. SMCWPPP is a program of the City/County Association of Governments of San Mateo County (C/CAG).

###

PRESS RELEASE FEBRUARY 2, 2012

CONTACT: Julia Fishman 415-543-0124

SURVEY CALCULATES BAY AREA LITTER PROBLEM REACHES UP TO 1.6 MILLON GALLONS ANNUALLY

Plastics, newspapers and plastic bags are major culprits; stormwater agencies develop litter reduction measures

February 2, 2012—Disposable cups, food wrappers and plastic bags. It's trash that's building up on every street corner, in gutters, on trails, on highways and in parks. Litter is a problem that is, literally, everywhere. The Bay Area Stormwater Management Agencies Association (BASMAA) has just presented findings from a study of litter in the region to the Regional Water Quality Control Board (Water Board) in Oakland that shows the magnitude of the litter problem in the area.

Preliminary estimates suggest that 1 – 1.6 million gallons of trash is discharged each year into local creeks that flow to San Francisco Bay. That's roughly 100,000 kitchen-sized garbage bags or enough to cover a football field three-and-a-half feet deep in trash.

This data was submitted to the Water Board as part of Trash Load Reduction Plans for 73 of BASMAA's member municipalities.

"Litter is a problem we can all see and we see it frequently," says Geoff Brosseau, Executive Director of BASMAA. "But getting accurate data to quantify the problem is an important step in moving ahead with informed efforts to reduce litter and the water pollution it causes. Litter is an entirely preventable source of pollution."

Litter is a major cause of water pollution in the region. Trash travels down storm drains untreated, polluting creeks, the Bay and the ocean. It degrades water quality and adversely affects fish, wildlife and aquatic habitats. That's why the Clean Water Act Stormwater Permit issued to municipalities in five Bay Area counties (Alameda, Contra Costa, San Mateo, Santa Clara and Solano) in 2009, required them to take actions to virtually eliminate trash in stormwater runoff by 2022. By 2014, a 40 percent reduction in trash must be met. (San Francisco, Marin, Sonoma and Napa are covered by a different permit.)

Many municipalities have already begun efforts to reduce litter, such as: encouraging the use of "re-usable" bags, cups and compostable food containers; educating students about the harmful impact of litter; and hosting creek clean-up events. The Trash Load Reduction Plans submitted to the Water Board describe how each local agency will achieve the 40 percent goal.

The preliminary estimates of trash volume were developed through a comprehensive study currently underway by BASMAA. The study is attempting to quantify the problem and provide water pollution prevention programs with information for planning their litter reduction efforts. To date, trash has been collected and sorted from more than 140 storm drains in wet and dry weather conditions. Key preliminary findings included:

- 49 percent of the trash collected was plastic, including candy wrappers, chip bags, cup lids, straws and cellophane.

- Paper accounted for 21 percent of litter in the form of bags, newspapers and receipts.

- Plastic grocery bags alone accounted for eight percent of the trash found.

The final report of the study will be completed this summer.

Moving ahead, Geoff Brosseau of BASMAA says that local stormwater programs will embark upon efforts such as increased public education about the impacts of litter, enhanced street sweeping and enhanced public trash can maintenance. Some Bay Area municipalities have already banned use of plastic grocery bags; others are considering adopting similar measures in 2012.

This spring BASMAA will move forward with a campaign that will heavily utilize social media as a way to reach teens and young adults—in order to increase awareness and educate the next generation of consumers.

"Litter is a preventable source of pollution," Brosseau emphasizes. "We would like to see Bay Area residents do more to prevent litter. While most people don't litter intentionally, it's important to prevent accidental litter. Simple steps such as using trash bags in cars, properly closing lids on trash and recycling bins and picking up litter you see are great ways to help."

For more information about BASMAA and litter prevention measures, visit www.BayWise.org

###

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

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Redwood City, CA 94063

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flowstobay.com

For Immediate Release
June 1, 2012

Contact: Matt Fabry (650) 599-1419
San Mateo Countywide Water
Pollution Prevention Program

SAN MATEO COUNTY RESIDENTS:
Wash Your Car the Smart Way This Summer

San Mateo County, Calif. - Summer is almost here and SAN MATEO COUNTY RESIDENTS are quick to get out in the sun and wash their cars. But car washing on a paved driveway or road is more than just suds and elbow grease: it can cause water pollution.

<u>How does this happen?</u>
Soap, oily grit and chemical residue (like copper, from brake pad dust) wash off your car and into the corner storm drain, polluting the nearest water body. Most soap contains phosphates, which encourage algae growth and harm water quality and fragile ecosystems.

<u>What to do?</u>
The SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM (SMCWPPP) asks that instead of washing cars at home, you take your car to a commercial car wash, where all water is treated and recycled. County residents can even get a discount at participating local car washes (see www.flowstoby.org for more details).

<u>The next best option?</u>
Instead of washing cars on paved surfaces (such as driveways or roads), wash over grass or gravel and *without* soap. Even biodegradable soap is harmful to wildlife.

"Car washing can pollute, but this is an easy problem to solve. Washing your car either at a car wash or over grass can make a significant difference," says Matt Fabry of SMCWPPP. "The good news is this is an entirely preventable source of pollution."

For more tips and information, visit www.flowstobay.org

###

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For Immediate Release
June 14, 2012

Contact: Matt Fabry (650) 599-1419
San Mateo Countywide Water
Pollution Prevention Program

PROPER POOL MAINTENANCE MEANS YOU CAN DIVE INTO A NO POLLUTION SUMMER IN SAN MATEO COUNTY

SMCWPPP reminds residents to maintain and properly drain their pools, spas, and fountains this summer in order to reduce water pollution in our community

Jump in! The water feels great!

San Mateo County, Calif. - As summer approaches, the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) is reminding residents about the importance of proper pool, spa, and fountain maintenance to help reduce chemical usage, minimize pollution issues, and save water. With regular cleaning and by maintaining proper chlorine levels and adequate water filtration, pool, spa, and fountain owners can reduce their chemical usage and protect aquatic life by eliminating the need to drain and refill them.

"Well-maintained pools, spas, and fountains with a balanced pH factor do not require the use of chemical algaecides," explains Matt Fabry of SMCWPPP. "Many algaecides contain copper, which can be harmful to aquatic life. Our goal is to reduce the use of these chemicals and keep pool, spa, and fountain water out of local storm drains, thereby protecting local creeks, San Francisco Bay, and the Pacific Ocean."

How does a backyard pool, spa, or fountain pollute local waters? It's simple: when drained to streets, the water and any chemicals flow into storm drains and straight to local creeks, the Bay, or the ocean without any cleaning or filtering. Draining pools, spas, and fountains to storm drains can pollute water bodies with copper, chlorine, sediments, and other contaminants.

SMCWPPP asks residents to follow these simple tips to reduce pollution:

- Keep your pool, spa, or fountain maintained with a balanced pH to minimize chemical usage and the need to drain and refill.
- If you must use an algaecide, ask a pool supply store to recommend one that does not contain copper.
- In general, select products with reduced phosphates. Without phosphate, algae cannot thrive.

- more -

County Government Center
555 County Center
Redwood City, CA 94063

P 650.599.1406
F 650.361.8227
flowstobay.com

- If needed, slowly drain your pool, spa, or fountain to a sanitary sewer cleanout so the water will go to a treatment plant or to a vegetated area where it can safely soak into the ground.
- Avoid draining your pool or spa to a paved driveway, street, or storm drain.
- If you need to clean your pool filters, rinse them over landscaped areas. Fresh water will dilute the chlorine so it won't harm plants or grass.
- After refilling your pool, check chemical levels daily for at least a week to monitor proper doses.

By practicing proactive maintenance, selecting appropriate products, and safely draining our pools, spas, and fountains, San Mateo County residents will help keep our creeks, Bay, and ocean clean!

For more information on reducing water pollution around your home or yard, visit www.flowstobay.org or www.BayWise.org.

###

Spring Cleanup Promotional Program

http://www.flowstobay.org/cs_spring_cleaning_smc.php

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

Spring Cleaning SMC

Sign up to receive e-mail updates for this page

Litter Information | Litter Prevention | Coastal Cleanup Day | Spring Cleaning SMC

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Too Toxic To Trash
Yard, Garden, and Landscape
Pest Control
Litter Prevention
Automotive Care
Green Streets & Parking Lots
Used Oil Recycling

Taking it to the Streets!

Spring Cleaning SMC is a combined effort by every city and unincorporated **San Mateo County** to organize spring cleanups in neighborhoods and parks, in order to gather trash before it reaches the creeks and beaches. Often time winter rains will carry trash into areas where it can be captured before entering the stormdrain.

Each year, cities have different events taking place throughout the spring where you can participate and make a difference. Without volunteers, these efforts would not be successful. Select an event near you and be part of the pollution solution. Join our Pollution Solution Team and get email updates of cleanup events taking place around the county by contacting us at pollutionprevention@smcgov.org. Or, create a group of your own and organize a cleanup! Then send us an email and we will post your event on this page! Together we can make a difference.

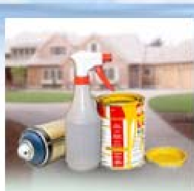
City	Event Information
Belmont	**Event:** EarthweekOn-Land Trash Cleanup **Organizer:** Belmont Public Works **Date:** Saturday, April 21st **Times:** 9:00am to Noon **Contact:** Diane Lynn (650) 595-7425, dlynn@belmont.gov **Website:** **www.**Belmont.gov **Details:** Volunteers will meet at One Twin Pines Lane, Belmont City Hall parking lot. This clean up is for various locations city-wide and will be assigned upon arrival and check-in.
Belmont	**Event:** Earthweek - Free Compost "Bring your own Bucket" **Organizer:** Belmont Public Works **Date:** Saturday and Sunday, April 21st & 22nd **Times:** 6:00am to 7:00pm **Contact:** Diane VanZant (650) 595-7425, dvanzant@belmont.gov **Website:** **www.**Belmont.gov **Details:** Compost will be available for pickup at the rear of Belmont City Hall Parking lot- One Twin Pines Lane. Signage will be posted
Belmont	**Event:** Earthweek – Document Shredding **Organizer:** Belmont Public Works **Date:** Saturday, April 21st **Times:** 8:30am to 2:00pm **Contact:** Diane VanZant (650) 595-7425, dvanzant@belmont.gov **Website:** www.Belmont.gov **Details:** Document shredding will be held in front of City Hall on 6th Avenue.
Belmont	**Event:** Earthweek – E-Waste Recycling **Organizer:** Belmont Public Works **Date:** Saturday, April 21st **Times:** 8:30am to 1:00pm **Contact:** Diane VanZant (650) 595-7425, dvanzant@belmont.gov **Website:** www.Belmont.gov **Details:** An E-Waste station will be set up in the parking lot on the corner of 6th and Emmett (across from Wells Fargo). For information on allowable items, please contact

Spanish-language community webpage outlining stormwater pollution prevention

http://www.flowstobay.org/cs_community_sp.php

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

NO DUMPING FLOWS TO BAY



- Community
- Residents
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- Stormwater 101
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- Too Toxic To Trash
- Yard, Garden, and Landscape
- Pest Control
- Litter Prevention
- Automotive Care
- Green Streets & Parking Lots
- Used Oil Recycling

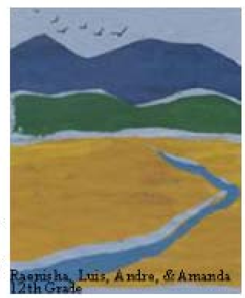
Comunidad

Programa del Condado de San Mateo para la Prevención de la Contaminación del Agua (SMCWPPP) educa a los residentes del Condado de San Mateo acerca de la prevención de la contaminación y calidad de las aguas pluviales. Eche un vistazo a los recursos para conocer más acerca de cómo puede ayudar a mantener nuestra agua limpia.

Residentes | Patio y Jardín | Muy Tóxico Para La Basura
Cuidado del Automóvil | Control de Plagas

Residentes

Usted vive en una cuenca



Una cuenca es una zona que drena el agua de lluvia y otras aguas en un arroyo, un río, un lago, una bahía o en el océano. La lluvia y del riego de prados y jardines arrastra los contaminantes desde superficies como calles, aceras, techos, entradas para vehículos y estacionamientos hacia desagües pluviales y arroyos y hacia la Bahía y el océano. Esta agua fluye hacia nuestras vías navegables *sin ningún tratamiento* y puede ser tóxica para los peces, la vida salvaje y las personas.

¿Qué puede hacer?

- Mantenga la basura y latas de reciclado cubiertas de forma segura. Si ve desperdicios, recójalos y colóquelos en el basurero. Participe en un evento de limpieza en su ciudad, o únase al día de limpieza de playas en septiembre.
- Use un lavadero de autos comercial o lave los autos sobre césped o superficie de tierra. Vacíe las cubetas de agua jabonosa en un fregadero.
- Limpie las herramientas de pintura en un fregadero, no en el exterior.
- Dele mantenimiento regular a su vehículo para evitar fugas. Recicle el aceite y filtros usados de motor. Use un material absorbente para limpiar cualquier derrame y descártelo apropiadamente.
- Use métodos "verdes" de jardinería como conservación del agua, siembra de plantas nativas y uso de métodos control de plagas no tóxicos.
- Vacíe su piscina o spa en una boca de limpieza de alcantarillado sanitario y drenaje de un área con vegetación, no en la calle o drenaje de aguas pluviales.
- Informe de tiraderos clandestinos en los desagües pluviales o arroyos. Para informar sobre los vertidos ilegales, ir a www.flowstobay.org/bs_illicit_discharge.php, pollutionprevention@smcgov.org correo electrónico, o llame al (650) 372-6200. Para reportar el vertido ilegale después de las horas, por favor comuníquese con el departamento de policía de su comunidad..

Patio y Jardín

Ponga en prácticamétodos seguros de limpieza en su jardín o patio.

- Para los patios, caminos, u otros servicios de disco duro, elegir los materiales permeables que permiten que el agua penetre en el lugar de salir corriendo.
- Cubra casi todo el suelo con sedimento o plantas.
- Evite el uso de fertilizantes sintéticos.
- Use una escoba para limpiar el exterior en lugar de una manguera.

Muy Tóxico Para La Basura

Muchos productos químicos no deseados del hogar son desechos domésticos peligrosos (HHW). Es peligroso e ilegal arrojar estos desechos en la basura, por el desagudero o en los desagües pluviales.

Las colectas semanales se llevan a cabo de jueves a sábado en el centro principal para HHW de San Mateo. Las recolecciones mensuales o anuales también se realizan en numerosas ciudades del condado.

En línea, se puede encontrar una lista completa de los materiales que aceptamos y de los que n o aceptamos. Si tiene alguna duda, llame al 372-6200 para hablar con el personal.

Para obtener más información acerca de como eliminar estos desechos gratuitamente, seguramente y legalmente:

Chinese-language community webpage outlining stormwater pollution prevention

http://www.flowstobay.org/cs_community_ch.php

SAN MATEO COUNTYWIDE

Water Pollution Prevention Program

- Business
- Best Management Practices
- New Development
- Construction
- Automotive
- Food Facilities
- Industry
- Mobile Cleaner & Powerwashing
- Landscape Professionals & Gardeners
- Stormwater Business Inspectors
- Illicit Discharge Coordinators
- Recycling Partners

商業

San Mateo 水　染防治計劃 (SMCWPPP) 旨在讓企業瞭望解雨水　染預防和控制的方法。 以下　將找到有關如何讓　的企業遵守雨水法規的資訊，這些法規旨在防止我們當地的溪流、海灣和太平洋出現水　染。

　的企業現在可使用的最佳管理實踐　施工　汽車　食品　景觀專業人員與園藝師

的企業現在可使用的最佳管理實踐

　染雨水是違法行為！ 如果　的企業允許除雨水外的任何其他物體排入雨水排水溝，　可能會收到傳訊、被處以罰款、失去許可證甚至入獄。　有義務承擔任何清理費用，以防止溢出物、垃圾及其他廢棄物　染雨水排水溝。

《實現更清潔海灣的技巧指南：　的企業如何防止雨水　染》為　提供了　力所能及的一些簡單事情，這些事情是雨水　染解決方案的一部分。

施工

防止建築　染。

- 請將建築材料安全存放，遠離街道、水溝和雨水渠。 使用塑膠薄膜覆蓋暴露的土壤、泥沙或碎石以及挖出物，以免受雨水、大風和徑流的侵襲。
- 潮濕天氣應避免挖掘。
- 在排放或傾倒液體時，使用盛液盤和漏斗清潔和防止溢出。 將溢出物打掃乾淨，而不是用水管沖洗。
- 在一個地點現場保養汽車和設備並加注燃料，遠離街道。 在場外完成主要設備的維修和清洗。
- 使訂購工作所需的材料數量，從而減少浪費。 盡可能使用再生或可回收材料，並正確處置用過或　生的所有物質。
- 切勿將水泥沖刷到車道、街道、水溝或排水溝中。 使在特定沖刷區域清洗混凝土攪拌機和設備，使水流入有　襯的廢料池中。 將水泥沖洗水泵回水泥攪拌機再利用，實現回收。

汽車

防止汽車設備　染。

- 將油性汽車零部件和液體容器存放于雨水和徑流無法到達的地方。
- 切勿將用過的油、防凍劑或汽油傾倒在雨水排水溝、溝渠中或地面上。 使用吸收性材料清理任何溢出物，並妥善處置。

更多詳情請參見以下手冊：

- 保護我們的海灣和海洋！

請勿在　外貯存漏油的車輛或器具。切勿將油，防　劑或其他物質留在滴盤或開口容器中。

請做！排出滲漏或破損車輛的液體。將液體或廢棄物存放在室　，或在有適當保護層的，密封的，貼有標籤的容器中存儲。

食品

餐廳、機構自助餐廳、雜貨店、麵包店和熟食店可能造成雨水　染，主要透過不正確的清理措施，即允許食品顆粒、油和油脂以及清潔用品流入街道、排水溝或雨水排水溝。

景觀專業人員與園藝師

Fall 2011

P3 POLLUTION PREVENTION POST

YOUR NEWS AND INFORMATION SOURCE ABOUT: RECYCLING, POLLUTION PREVENTION, LESS TOXIC PRODUCTS

Coming Soon: Community Action Grants

San Mateo Countywide Water Pollution Prevention Program offers Community Action Grants for volunteer groups, teachers, environmental organizations and other local, not-for-profit associations interested in developing and/or implementing projects that improve the quality of local creeks, the Bay or the Pacific Ocean within San Mateo County. Up to $3,000 is awarded to groups proposing projects to restore, protect,

enhance, or prevent pollution of local waterways - or that benefit the ecology of the San Mateo County watershed. Applications are available in October 2011, with a November 2011 deadline. Get more information at **www.flowstobay.org/grant** or call 650-372-6245.

Know Your Curbside and Door-to-Door Services

You want to do the right thing with your household hazardous waste – but what are your options? You can make an appointment and drive your stored-up "too toxic to trash" items to the County HHW facility. Or if you are dropping off a few fluorescent light bulbs, a baggie of used-up batteries, or a gallon of used motor oil you can visit one of our local business partners for proper recycling.

But what if the disposal service came right to your home? Depending on where you live within the County, that dream may already have come true. In many areas, household batteries can be placed on top of the recycling bin, and used motor oil and filters next to the bin. And in a few cities, households can call up a company providing door-to-door pick-up of any type of household hazardous waste and schedule a day to hand it all over at the doorstep.

(continued on page 2)

Water Pollution Education Gearing Up for Fall 2011

The San Mateo Countywide Water Pollution Prevention Program's school outreach program continues this Fall with environmental educators going into schools to teach children about ways to prevent water pollution. At the elementary level, the Banana Slug String Band's program "We All Live Downstream" will present concepts such as the water cycle, water quality, and urban

(continued on page 4)

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Funded by a grant from the Department of Resources Recycling and Recovery (CalRecycle).

Know Your Curbside and Door-to-Door Services (con't)

To find out what services are provided by your City's contracted hauling service, you can call the hauler directly, or visit their website. Or you can visit **www.Recycleworks.org** and use the interactive "Find Your Garbage Company" map to find the details of each company's service. There are seven companies, some of which operate in multiple cities.

Company	Phone	Website
Recology San Mateo County*	595-3900	www.recologysanmateocounty.com
Recology of the Coast	355-9000	www.recologyofthecoast.com
Allied Waste of Half Moon Bay	756-1130	www.alliedwastehalfmoonbay.com
Allied Waste of Daly City	756-1130	www.alliedwastedalycity.com
GreenWaste Recovery	568-9900	www.greenwaste.com
Recology San Bruno	583-8536	www.recologysanbruno.com
South SF Scavenger Company	589-4020	www.ssfscavenger.com

* Residents in Belmont, East Palo Alto, Foster City, Hillsborough, Menlo Park, San Carlos, City of San Mateo and the West Bay Sanitary District now have a Door to Door Household Hazardous Waste program offered at no additional charge. To make an appointment, call At Your Door at 1-800-449-7587.

Bye-Bye, Styrofoam Takeout Food Containers

Starting July 1, 2011, salads, sandwiches, milkshakes, burritos, hamburgers, and other food items that were commonly packaged in foam takeout containers must be packaged in other materials. Food vendors in unincorporated San Mateo County are banned from using products made with expanded polystyrene, also referred to as styrofoam. The San Mateo County Board of Supervisors expanded the ban (currently in effect for County facilities) to also include businesses located in unincorporated areas. Instead of using styrofoam, vendors may use containers made from recyclable, biodegradable or compostable materials like paper, cardboard, corn starch, potato starch or sugarcane.

Five cities have also banned food vendors from using polystyrene products: Millbrae, San Bruno, Pacifica, South San Francisco and, starting 2012, Burlingame. Slowly, styrofoam takeout containers are becoming extinct, replaced with environmentally friendly alternatives that are either recyclable or compostable.

Thank you, restaurants, for doing your part to keep San Mateo County green and clean.

Follow us on Twitter!

Get late-breaking pollution prevention news from our Twitter feed, **@flowstobay**

HIT THE STREETS, COMB THE BEACH

Be the Solution to Litter Pollution

Trash, garbage, illegal dumping, litter, debris, waste, junk – pick a name- if not properly disposed of, it ends up in our local creeks, waterways, the Bay, and eventually the ocean where it disrupts our delicate ecosystem. For the past 26 years, thousands of volunteers across California have joined forces during Coastal Cleanup Day to remove the debris that has

accumulated on California's beaches and inland shorelines. Join us this year for the 27th Annual California Coastal Cleanup Day, which will take place on Saturday, September 17th from 9 am to Noon. Together, volunteers spend the morning collecting plastic bags, cigarette butts, and other debris that makes its way to the bay or ocean via storm drains and waterways.

Without the help of dedicated volunteers, most of the debris collected would end up polluting our waterways, damaging marine ecosystems, and endangering marine life.

How Can YOU Help?

On Saturday, September 17th, 2011 join your fellow friends, family, students, service groups, and neighbors to take care of your own environment, show community support, learn about the impacts of litter, and have fun!

The San Mateo Countywide Water Pollution Prevention Program is helping to coordinate the California Coastal Cleanup in San Mateo County. All you have to do is pick a local cleanup location, show up, and cleanup! All materials will be handed out when you arrive at 9am and the cleanup goes until noon. For a list of Cleanup sites and more information visit **www.flowstobay.org/ccd** or contact Ana Clayton at 650.372.6214.

BRING YOUR OWN

Minimize our footprint and bring your own reusable gloves, a water bottle and a bucket or an old bag.

THE POLLUTION SOLUTION TEAM

This year, we challenge you to not only participate in Coastal Cleanup Day but to continue both educating others and cleaning up your local neighborhood all year round!

Join the *Pollution Solution Team*:

- Take a pledge to cleanup your neighborhood on a year round basis.
- Report your results.
- Actively make a difference in your community.
- Join the team on Coastal Cleanup Day.

STEP UP TO CLEANUP WORK OUT WHILE YOU HELP OUT

School Presentations (con't)

runoff. At the high school level, Rock Steady Science will present "Water Pollution Prevention and Your Car," a fifty-minute multi-media, interactive classroom presentation targeted to grades 10–12. The program focuses on automotive care and its relationship to storm water pollution prevention.

To learn more about the school presentations or to schedule a presentation at your school visit www.flowstobay.org/teachers. For more information about ways to educate your children about water pollution, go to www.flowstobay.org and select the Community tab. On the left side, click on "Kids" and you will find games, a glossary, and activity books that can be downloaded.

Recipe for a Cleaner Planet

Cleaning products are everywhere in our homes: dish soap, bathroom cleaners, kitchen cleansers, all purpose cleaners, detergents, oven cleaners, etc. Most of these cleaning products are petroleum-based and can present several health and environmental concerns. They may contain chemicals associated with eye, skin, or respiratory irritation, or other human or animal health issues. Some of them can become toxic if mixed together, such as ammonia and bleach. Unused quantities of these chemicals cannot be thrown into the trash because the toxins get into the landfill and find their way into soil and groundwater. Others evaporate and contribute to air pollution.

What can you do? The good news is there are alternatives to chemical cleaning products that are safe and affordable. There are many new products on the market that are natural and more environmentally sustainable. These can be found at hardware stores, supermarkets, pharmacies, and large box stores that sell cleaning products. Another option is to make your own! Everyday non-toxic household products, such as lemon juice, baking soda, white vinegar, and soapy water can be mixed in different quantities to clean ovens, countertops, floors, carpets, windows, toilet bowls and tile. Other mixtures can be used to polish wood, deodorize carpet and fabric, or open drains. Visit www.flowstobay.org/toxic for a Less Toxic Household Recipe List, or send your name and address to pollutionprevention@co.sanmateo.ca.us and we will send you some cleanser recipe cards to keep handy!

Let the Manual Guide Your Next Oil Change

Are you stuck in the habit of getting an oil change every 3,000 miles? Did you know many newer models have oil change intervals that range from 5,000 to 10,000 miles? Consult your service manual or Edmunds.com maintenance section to learn your car's actual oil change schedule. You might be surprised with what you find in your owners manual – go look today!

RECYCLE USED OIL

What changed the old rule?

Technology. In the past few years, engine advances and oil-chemistry breakthroughs have made newer cars capable of going at least 5,000 miles, or more, between changes. This means that up to half as much oil and oil filters have to be used. This equates to spending less money and wasting less oil.

Therefore, before you go in for your oil change, read your owner's manual and see what it says. And if you change your own oil and filter, know how and where to properly recycle used motor oil, filters, and other vehicle fluids. The next time you change your oil, take the last step and bring your oil and filter to a used oil collection center to recycle them free of charge. To find a collection center call 1-800- CLEANUP or go to **www.flowstobay.org/usedoil**.

Spring 2012

P3 POLLUTION PREVENTION POST

YOUR NEWS AND INFORMATION SOURCE ABOUT: RECYCLING, POLLUTION PREVENTION, LESS TOXIC PRODUCTS

Don't Forget Your Curbside Options!

Some local garbage companies are now providing curbside pickup of batteries, bulbs, motor oil, and even household hazardous waste.

To find out what services are provided by your city's contracted hauling service, you can call the hauler directly, or visit their website. Or you can visit **www.Recycleworks.org** and use their interactive "Find Your Garbage Company" map to find the details of each company's service.

And if you live in multi-family housing, look for good news later this year. Many apartment buildings and condominiums will offer recycling services for the first time.

Earth Day is April 22

Each year people come together to celebrate and work to sustain the planet we live on. You can make a difference with something big, like volunteering for a cleanup, or something small, like weather-stripping that leaky door.

This year Earth Day is Sunday, April 22. There are various activities taking place around the County. To find out more, go to the **www.flowstobay.org** calendar to find outdoor appreciation activities on Earth Day and every day!

Spring Cleaning SMC!

Due to the huge success of the California Coastal Cleanup Day that takes place every September, many cities in San Mateo County are now coordinating local cleanups that take place in the spring. Some events take place on or around Earth Day (April 22), National River Cleanup Day (May 19), and various other dates in the spring, depending on the city. The San Mateo County-wide Water Pollution Prevention Program has launched Spring Cleaning SMC, a season-long promotion of spring cleanup events throughout the county. Spring Cleaning SMC events include

(Continued on page 2)

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Funded by a grant from the Department of Resources Recycling and Recovery (CalRecycle).

Flex Your Consumer Power - Shop Green $

So you're ready to "vote with your dollars" and support businesses that practice good product stewardship, by using green design, avoiding toxics, and taking back used-up products if they need special disposal. Great!

Now how do you that?

To help local governments take action with their purchasing power, the County recently sponsored a Sustainable Purchasing Training Series. Although the series was tailored to the needs of government purchasers, there is plenty of information a small business owner or average County resident can use.

Online Training Videos

Each of the live training sessions was taped and has been edited into easy-to-watch video segments. They are available for viewing online at **www.flowstobay.org/sp_purchasing.php** .

Sessions include:

- Sustainable Purchasing 101
- Environmental Products and Practices that Save Money

- Green Cleaners
- Green Lighting (Indoors & Out)
- Reducing Battery Waste

Log on and learn about saving money while saving the environment, how to avoid green-washing, and how to use free tools to simplify your savvy shopping.

Spring Cleaning SMC! (continued from page 1)

trash pickup, habitat restoration, graffiti abatement, and general sprucing up! Many events emphasize neighborhood cleanups to capture trash before it goes into the stormdrain where it can end up in the creeks and beaches.

Log onto **www.flowstobay.org/litter** and select the Spring Cleaning SMC tab to see a list of cleanup activities taking place around the Peninsula.

Become a part of the Pollution Solution Team by sending an email to **pollutionprevention@smcgov.org** to receive email updates of pollution prevention events taking place around the County. Volunteers like you make all the difference!

Choosing Less Toxic Pest Control

Everyone has pests in their home and garden, but many products on the market to control them are harmful to the environment. Not only do the chemicals wash into the stormdrain and end up in the local waterways, but many are “broad spectrum” pesticides and herbicides, meaning they kill more than their intended target - including plants and insects that are actually beneficial!

To find less toxic or more targeted pest control, look for Our Water Our World at participating stores. You will see special labels in the garden products shelves that indicate a product is less toxic to people and pets.

In addition, each store has a rack of informative flyers that can help you deal with specific pests and garden issues. To find out which stores are participating in the Our Water Our World program, go to **www.flowstobay.org** and select Less Toxic Pest Control from the Community tab.

Car Wash Discount Program continues in 2012

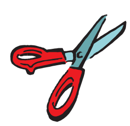
Did you know a well-maintained car prevents water pollution? Oil and fluid leaks get onto the roadways and then wash into the stormdrain which flows directly to the Bay or ocean. Did you also know that washing your car at home can also cause water pollution?

All the oil and fluids on the road can end up on your car, along with copper brake dust and other pollutants. Even biodegradable soap flowing in the gutter causes damage to aquatic life in creeks, lakes, bays and oceans before it breaks down! Preventing soaps and cleansers from getting into the street is difficult.

The best practice is to take your car to a commercial car wash. There, the water used is often recycled a few times before it is discharged to the sanitary sewer where it will be treated. Car washes also use less water than you would at home, and they are faster too!

Get a Discount

The San Mateo Countywide Water Pollution Prevention Program has partnered with 11 car washes for the second year in a row to offer discounts for car washes. Clip the coupon below and take it to one of the participating businesses before December 31, 2012, and save time, water, and the environment!



Clip

and

Save !

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community. www.flowstobay.org

2012 Car Wash Discount Card: Expires 12/31/12

Enjoy a ONE TIME USE Discount at listed car washes!

- **Westlake Touchless — $5 off a Super Wash**
  247 - 87th Street, Daly City, 650-992-5344
- **Bay Chevron — $2 off any wash**
  375 N. Cabrillo Hwy, Half Moon Bay 650-726-2963
- **Ducky's Car Wash — $5 off Supreme/Deluxe/Super Wash (120)**
  1436 El Camino Real, Menlo Park 650-838-9000
  1301 Old County Road, San Carlos 650-637-1301
  716 N. San Mateo Drive, San Mateo 650-375-8100
- **Millbrae Express Car Wash — $5 Plus Exterior Wash ($8 value)**
  310 Adrian Road, Millbrae 650-692-2345

MORE CAR WASH LOCATIONS LISTED ON THE OTHER SIDE

"Tired" of a Polluted Environment?

Hundreds of tires are illegally dumped every year in San Mateo County. Even more are stockpiled at residences. Millions of dollars are spent annually to clean up tires and illegal tire dumps statewide. Your tax dollars and other recycling-based fees pay for city and county personnel to collect dumped tires and place them into the recycling stream. There are a number of reasons why tires should be disposed of properly.

Neighborhood Tire Dumps Breed Disease

Rats and other disease carriers, including mosquitoes that may carry the West Nile virus, can breed in dumped tires. An inch of water can produce thousands of mosquitoes as they can complete their lifecycle in a week or less. If you store tires on your property, you are responsible for making sure they do not produce mosquitoes.

Steps you can take:

- Store tires inside a garage or under a tarp, making sure rain water does not accumulate in tires or on the tarp.
- Eliminate standing water in tires if the tires cannot be disposed of immediately.
- Drill holes in tires used for swings, barriers, running exercises, etc. so they won't hold water.

Dumped Tires Attract More Illegal Dumping

Dumping of medical waste, hazardous waste, garbage, and other debris frequently occurs where tires are dumped.

Old Tires can be Recycled

Old tires placed into the recycling stream can be safely ground and mixed into asphalt and a spongy material used to manufacture playground surfaces, rubber mats, landscaping bark, and many other consumer products.

For a small fee you can take your old tires to Costco, Big O Tires or Firestone locations. Call ahead to find out their specific policies.

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community. www.flowstobay.org

2012 Car Wash Discount Card: Expires 12/31/12

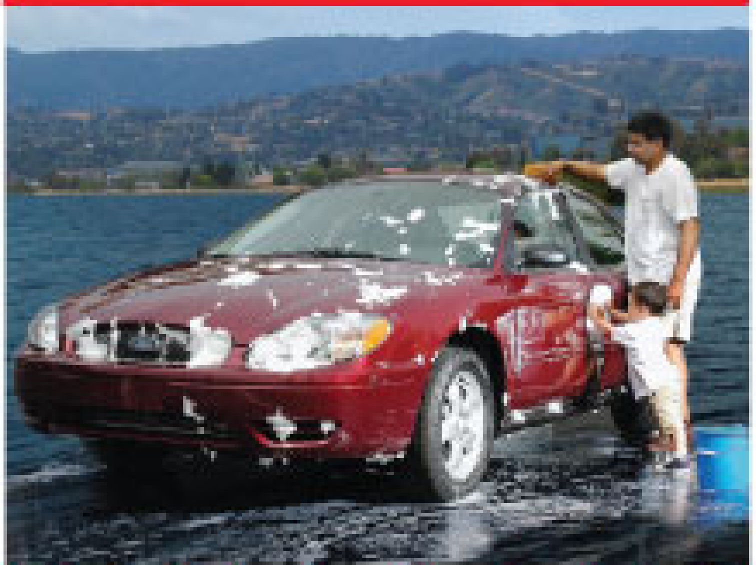
Enjoy a ONE TIME USE Discount at listed car washes!

- **San Mateo Car Wash — 50% off any Car Wash Service Package 20% off any Auto Detail Service** 221 E. Hillsdale Blvd, San Mateo 650-350-1122
- **Foster City Touchless — $5 off a Super Wash** 390 Foster City Blvd, Foster City 650-638-9274
- **South City Car Wash — $5 off any Car Wash Service** 988 El Camino Real, South San Francisco, 650-589-1214
- **5th Avenue Shell — $1 off any Car Wash** 3201 El Camino Real, Menlo Park, 650-367-6959
- **Eagle Car Wash — $2 off Regular Priced Car Wash Package — Best Deal Here!** 177 California Drive, Burlingame, 650-344-6284

MORE CAR WASH LOCATIONS LISTED ON THE OTHER SIDE

Printed on 100% recycled, 50% post-consumer waste, processed chlorine-free paper with soy based ink.

Keep Car Wash Pollution Out of the Storm Drain



The Car is Clean but what about the Bay?

Did you know there are approximately 700,000 registered vehicles in San Mateo County? Practicing good car care helps protect our creeks, the Pacific Ocean and the San Francisco Bay.

How? Storm drains located on our roadways lead directly into local waterways. When motor fluids or dirty water from washing our cars are washed or dumped into the storm drain, it pollutes our water.

What can you do? Follow the simple tips on the back of this card for a clean vehicle that also protects our creeks, ocean and bay.

Use the discount card below at a local car wash!

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community. www.flowstobay.org

2012 Car Wash Discount Card: Expires 12/31/12

Enjoy a ONE TIME USE Discount at listed car washes!

- **Westlake Touchless — $5 off a Super Wash**
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- **Millbrae Express Car Wash — $5 Plus Exterior Wash ($8 value)**
  310 Adrian Road, Millbrae 650-692-2345

MORE CAR WASH LOCATIONS LISTED ON THE OTHER SIDE


Community Action Grants
Now Available
from the San Mateo Countywide Water Pollution Prevention Program
Up to $3,000 will be awarded to volunteer groups, teachers, environmental organizations, and other local nonprofit associations for projects within San Mateo County that protect or improve the quality of local creeks, the San Francisco Bay, or the Pacific Ocean. The projects must contain a community public outreach element.
Applications Due:
November 18, 2011
To download the application, go to:
www.flowstobay.org/grant
For more information, call: (650) 372-6245 or email PollutionPrevention@co.sanmateo.ca.us

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

Appendix E

- Watershed and Assessment Monitoring Subcommittee – Attendance List– FY 2011-12

WAM Subcommittee Meeting Attendance FY 2011/12

Attending Staff	Municipality	9/1/2011	1/12/2012	5/12/2012
John Tallitsch	Belmont		√	
Jerry Flanagan	Brisbane	√	√	
Steve Daldrup	Burlingame		√	√
Cynthia Royer	Daly City	√	√	
Michelle Daher	East Palo Alto		√	√
Jon Konnan	EOA, Inc.	√	√	√
Lucy Buchan	EOA, Inc.	√	√	√
Raymond Donguines	Pacifica			√
Matt Fabry	Program Coordinator	√		
Debra Bickel	San Mateo		√	
Shelli St. Clair	San Mateo	√		√
Dermot Casey	San Mateo County	√	√	
Daniel Fulford	South San Francisco	√	√	√
Christina Horrisberger		√		

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

Appendix F

- FY 2011-2012 MRP Regional Supplement for New Development and Redevelopment
- FY 2011-2012 MRP Regional Supplement for Training and Outreach
- FY 2011-2012 MRP Regional Supplement for Pollutants of Concern and Monitoring

Annual Reporting for FY 2011-2012

Regional Supplement for New Development and Redevelopment

San Francisco Bay Area Municipal Regional Stormwater Permit

B A S M A A

Bay Area Stormwater Management Agencies Association

September 2012

Table of Contents Page

LIST OF ATTACHMENTS:

C.3.c.iii.(2) Status Report on Application of Feasibility/Infeasibility Criteria

Draft Outline - Status Report on Application of Feasibility/Infeasibility Criteria

INTRODUCTION

This Regional Supplement has been prepared to report on regionally implemented activities complying with portions of the Municipal Regional Stormwater Permit (MRP), issued to 76 municipalities and special districts (Permittees) by the San Francisco Bay Regional Water Quality Control Board (Water Board). The Regional Supplement covers new development and redevelopment activities related to the following MRP provisions:

- Provision C.3.c.iii.(1) LID Feasibility/Infeasibility Criteria Report,
- Provision C.3.c.iii.(2) Status Report on Application of Feasibility/Infeasibility Criteria, and
- Provision C.3.i.(iv) Site Design Measures for Small Projects and Detached Single-Family Home Projects.

These regionally implemented activities 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 2012 annual reporting requirements of the specific MRP Provisions covered in this Supplement are completely met by BASMAA Regional Project activities, except where otherwise noted herein or by Permittees in their reports. Scopes, budgets and contracting or in-kind project implementation mechanisms for BASMAA Regional Projects follow BASMAA's Operational Policies and Procedures as approved by the BASMAA Board of Directors. MRP Permittees, through their program representatives on the Board of Directors and its committees, collaboratively authorize and participate in BASMAA Regional Projects or Regional Tasks. Depending on the Regional Project or Task, either all BASMAA members or Phase I programs that are subject to the MRP share regional costs.

Low Impact Development

C.3.c.iii.(1) Feasibility/Infeasibility Criteria Report

This provision requires Permittees to submit to the Regional Water Board by May 1, 2011, a report on the feasibility/infeasibility of infiltration, harvesting and use, and evapotranspiration at development sites. BASMAA submitted such a report on May 1, 2011. Water Board staff provided comments in a July 12, 2011 letter. BASMAA provided a formal written response on April 30, 2012.

C.3.c.iii.(2) Status Report on Application of Feasibility/Infeasibility Criteria

MRP Provision C.3.c.iii.(2) requires MRP permittees to submit to the Regional Water Board, by December 1, 2013, a Status Report on the Application of Feasibility / Infeasibility Criteria. A BASMAA Development Committee Work Group drafted the attached draft outline of the Status Report with the intent that the outline be incorporated into the 2012 Annual Report, fulfilling a promise made in BASMAA's April 30, 2012 letter. The letter states:

> "As part of the FY 11-12 Annual Report, BASMAA representatives will provide: (1) an outline for the December 2013 report; and (2) clearer definition of the type of data that will be collected and the analyses that will be conducted over the next two years on Water Board staff issues that still need to be addressed. These include: analyzing identified barriers to LID; maximizing infiltration on-site where feasible; tracking and encouraging plumbing code changes related to rainwater harvesting use; and presenting options for ensuring pervious pavement is properly maintained…."

Standard Specifications

C.3.i.(iv) Site Design Measures for Small Projects and Detached Single-Family Home Projects

This provision requires Permittees to develop standard specifications for lot-scale site design and treatment measures (e.g., for roof runoff and paved areas) as a resource for single-family homes and small development projects. This task may be fulfilled by the Permittees cooperating on a countywide or regional basis. A report containing the standard specifications for lot-scale treatment measures is to be submitted by December 1, 2012. A related requirement, Provision C.3.i.i., states that permittees shall require small development projects that create and/or replace ≥ 2,500 ft^2 to < 10,000 ft^2 of impervious surface, and detached single family home projects that create and/or replace 2,500 ft^2 or more of impervious surface, to install one or more of the following measures:

- Direct roof runoff into cisterns or rain barrels for reuse.
- Direct roof runoff onto vegetated areas.
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
- Construct sidewalks, walkways, and/or patios with permeable surfaces.
- Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.

In FY 11-12, the BASMAA Development Committee initiated a regional project to develop fact sheets describing the lot-scale BMPs, using the fact sheets in the City of Los Angeles stormwater manual Appendix E as a model, but tailoring the Los Angeles approach to MRP requirements and preparing appropriate design details. The Development Committee reviewed the City of Los Angeles' fact sheets, agreed on desired changes to reflect MRP and Bay Area requirements, and contracted with a consultant to prepare user-friendly design details. The result is a set of four fact sheets on the following measures:

- Landscape Dispersion of Runoff
- Pervious Paving
- Rain Barrels
- Rain Gardens

The first three fact sheets fulfill the requirement to develop standard specifications for lot-scale site design and treatment measures as a resource for small development and single-family home projects. They collectively address the six options listed in Provision

C.3.i.(iv). The fourth fact sheet on rain gardens was developed to offer small project applicants another option for storing and infiltrating runoff, similar to the approach of landscape dispersion but in a smaller footprint.

The fact sheets have been provided to Permittees in MS Word version so that Permittees that use them to comply with Provision C.3.i may add customized logos, contact information, and any local requirements. Over the next several months, the Permittees will be modifying their development review procedures in order to achieve full implementation of Provision C.3.i by December 1, 2012. Permittees will submit reports including the standard specifications for lot-scale treatment measures by December 1, 2012. Permittees will report on the implementation of Provision C.3.i in their FY 12-13 Annual Reports.

Status Report on Application of Feasibility/Infeasibility Criteria
December 1, 2013

Draft Outline

I. Background

A. Regulatory requirements

B. BASMAA submittals to date

C. Discussions with Water Board staff and key issues raised

1. Maximize retention on-site before using biotreatment
2. Analyze increased footprint and depth of infiltration facilities
3. Rainwater vs. recycled water use
4. Maintenance of self-treating and self-retaining areas

II. LID Implementation Efforts to Date

A. Application of Current Feasibility and Infeasibility Criteria

1. Method of feasibility/infeasibility analysis (checklists, other guidance)
2. Permittees' application of feasibility/infeasibility criteria to projects during 12/11 through 6/13
   - **a.** Data collection effort
     - i. Based on FYs 11-12 and 12-13 Annual Report data for approved projects
     - ii. Survey of permittees for additional information on projects where infiltration and rainwater harvesting was feasible
   - **b.** Results of survey
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1. Barriers to infiltration

a. Technical

i. Infiltration rates of Bay area soils

b. Institutional

i. Variation in geotechnical engineers' experience and requirements

ii. Developer and municipal agency concerns about liability

2. Barriers to rainwater harvesting

a. Technical

i. Collection system, treatment, and distribution system components and complexity of system (particularly for indoor use)

ii. Lack of sufficient irrigation demand for C.3.d volume in wet season

iii. Issues related to compatibility of rainwater distribution systems with other potable and non-potable water systems

b. Institutional

i. Status of State plumbing and building codes

ii. Barriers identified in CASQA Prop 84 project "Removing Barriers to LID in Local and State Codes: Technical Assistance for Municipal Code Updates and Evaluation of the California Building Standards Code (CALGreen)"

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D. Guidance for Permittees on mechanisms for ensuring preservation and maintenance of self-treating and self-retaining areas

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Annual Reporting for FY 2011-2012

Regional Supplement for Training and Outreach

San Francisco Bay Area Municipal Regional Stormwater Permit

BASMAA

Bay Area Stormwater Management Agencies Association

September 2012

MRP Regional Supplement for Training and Outreach
Annual Reporting for FY 2011-2012

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INTRODUCTION

This Regional Supplement has been prepared to report on regionally implemented activities complying with portions of the Municipal Regional Stormwater Permit (MRP), issued to 76 municipalities and special districts (Permittees) by the San Francisco Bay Regional Water Quality Control Board (Water Board). The Regional Supplement covers training and outreach activities related to the following MRP provisions:

- Provision C.5.d., Control of Mobile Sources,
- Provision C.7.b., Advertising Campaign,
- Provision C.7.c., Media Relations – Use of Free Media,
- Provision C.7.d., Stormwater Point of Contact, and
- Provision C.9.h.i., Point of Purchase Outreach.

These regionally implemented activities 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 2012 annual reporting requirements of the specific MRP Provisions covered in this Supplement are completely met by BASMAA Regional Project activities, except where otherwise noted herein or by Permittees in their reports. Scopes, budgets and contracting or in-kind project implementation mechanisms for BASMAA Regional Projects follow BASMAA's Operational Policies and Procedures as approved by the BASMAA Board of Directors. MRP Permittees, through their program representatives on the Board of Directors and its committees, collaboratively authorize and participate in BASMAA Regional Projects or Regional Tasks. Depending on the Regional Project or Task, either all BASMAA members or Phase I programs that are subject to the MRP share regional costs.

Training

C.5.d. Control of Mobile Sources

This provision requires Permittees to develop and implement a program to reduce the discharge of pollutants from mobile businesses, including development and implementation of minimum standards and BMPs, and outreach to mobile businesses. BASMAA's long-standing Surface Cleaner Training and Recognition program addresses these aspects of the provision by focusing on the most common type of outdoor cleaning – cleaning of flat surfaces like sidewalks, plazas, parking areas, and buildings. Individual Permittees address the inspection and enforcement aspects of the provision.

Previously, BASMAA, the Regional Water Board, and mobile businesses jointly developed best management practices. The BMPs were packaged and delivered in training materials (e.g., *Pollution from Surface Cleaning* folder), and via workshops and training videos. The folder and the training video have since been translated into Spanish. Cleaners that take the training and a self-quiz are designated by BASMAA as Recognized Surface Cleaners. BASMAA also created and provides marketing materials for use by Recognized Surface Cleaners. Previously, BASMAA converted the delivery mechanism to being online so that mobile businesses would have on-demand access to the materials and the training. BASMAA continues to maintain the Surface Cleaner Training and Recognition program. Cleaners can use the website to get trained and recognized for the first time or renew their training and recognition, as required annually. Recognized cleaners can also download marketing materials from the website. Potential customers, including Permittees can use the site to verify the recognition status of any cleaner, as can municipal inspectors. In FY 10-11, BASMAA and the Permittees scoped and budgeted for a new project to enhance the existing Surface Cleaner Training and Recognition program in the following ways.

1. Expand the existing Surface Cleaner Training and Recognition Program to include two new mobile business categories - automotive washing and carpet cleaning;
2. Utilize existing resources that are available to complete the necessary tasks;
3. Develop marketing materials, training videos and self-test applications for the new categories;
4. Create Spanish tracks of information for each new business type; and
5. Create a web-based application to share information about mobile businesses.

A consultant team with expertise in best management practices and commercial training programs, videography, graphic design, web design, and translation has been selected and the project will be fully implemented in FY 12-13.

Public Information and Outreach

C.7.b. Advertising Campaign

This provision requires Permittees to participate in or contribute to advertising campaigns on trash/litter in waterways and pesticides with the goal of significantly increasing overall awareness of stormwater runoff pollution prevention messages and behavior changes in target audience. Through the BASMAA Public Information / Participation (PI/P) Committee, Permittees previously decided to take a broader view of some of its regional tasks (e.g., Regional Advertising Campaign, Regional Media Relations, *Our Water, Our World* program) to ensure that work on individual MRP provisions was coordinated and part of an overall strategy.

In FY 10-11, working with SGA, Inc., BASMAA developed broader Regional Strategic Outreach Plans – one for litter and one for pesticides – that include audiences related to the MRP provisions and ways of reaching them regarding trash/litter and pesticides (e.g., advertising, media relations, schools outreach, events). Although the scopes of the strategies are broad, the level of stormwater agency (regional, areawide program, city) implementing each part varies (i.e., each part is not implemented via BASMAA). The strategies are multi-year and also include recommendations for creative, media placement, media relations, partnerships, and evaluation.

In FY 11-12, BASMAA, again working with SGA, Inc., finished developing an Implementation Plan for the litter strategic plan, which provides more detailed tasks and budgets for the multi-year project (see attached Regional Litter Implementation Plan for details). Implementation of the "*Be the Street*" anti-litter Youth Outreach Campaign also began in FY 11-12. *Be the Street* takes a Community Based Social

Marketing approach to encourage youth to keep their community clean. The intent of the campaign is to make "no-littering" the norm among the target audience (youth between the ages of 14 and 24). The *Be the Street* Campaign is using online social marketing tools to conduct outreach. Activities in FY 11-12 included launching a website, Facebook page, a YouTube channel, and a quarterly e-newsletter. An "anti-littering" video contest was also announced and the winning entry will be promoted on television. (see attached *Be the Street* Report for details).

A pre-campaign survey of the audience was conducted (online and at 15 Bay Area high schools) in March and April 2012 to obtain information on the audiences' perception on littering. A total of 353 individuals completed the survey. Respondents were selected based on age (14-24 years) and residence (the zip code that they provided was within the BASMAA region). The sample was 60% female, had a mean age of 17 years, and almost all respondents were in high school. Highlights of survey results are provided below (see attached BASMAA Baseline Evaluation Report for details):

- 86% of respondents reported littering at least one item in the past month.
- The items littered by the most respondents in the past month included chewing gum (littered by 52% of respondents in the past month), food waste (41%), and food or beverage-related packaging (40%).
- The items littered by the fewest respondents in the past month were cigarette butts (littered by 7% of respondents in the past month), disposable utensils (14%), and bottle caps (21%).
- Among those who littered an item at least once in the past month, frequent littering varied considerably by trash item: littering items at least once per week ranged from 35% for beverage containers to 43% for chewing gum to 74% for cigarette butts.
- Littering at school was more common relative to other settings: 25%, 10%, and 7% of respondents littered at least sometimes at school, at home, and at work, respectively.
- The vast majority of the sample (91%) indicated that trash/recycling can placement deterred them from littering. Additionally, 71% of respondents stated that feelings of guilt discouraged them from littering.
- 88% of respondents indicated that they picked up trash that was not their own at least once in the past month.
- Respondents rated their likelihood of littering in the next month on a 7-point scale ranging from (1) Very unlikely – (7) Very Likely. The mean score was 2.79 (SD=1.67), meaning that on average, respondents intended not to litter.
- Respondents also rated their likelihood of participating in a number of activities related to the campaign. The activity that most respondents were at least somewhat likely to do was expressing disapproval if s/he saw a friend littering: 69% of respondents reported they were at least somewhat likely to do so.

Additionally, 62% of respondents were at least somewhat likely to pick up litter that was not their own, and 40% were at least somewhat likely to participate in a litter cleanup day.

C.7.c. Media Relations – Use of Free Media

This provision requires Permittees to participate in or contribute to a media relations campaign, maximize use of free media/media coverage with the objective of significantly increasing the overall awareness of stormwater pollution prevention messages and associated behavior change in target audiences, and to achieve public goals. The Annual Reporting requirement includes providing the details of each media pitch, such as the medium, date, and content of the pitch. BASMAA has conducted a Regional Media Relations project since FY 96-97 that assists Permittees in complying with this type of provision. The FY 11-12 BASMAA Regional Media Relations project made seven pitches (see attached Media Relations Program Report for details):

- Save the Bay/Trash Hot Spots,
- Don't Burn Holiday Gift Paper,
- Rainy Season public service announcements (PSAs),
- Baseline Litter Survey,
- Car Washing PSAs,
- Pools and Spas,
- Pesticides: Exterior Spraying PSAs.

C.7.d. Stormwater Point of Contact

This provision requires Permittees to individually or collectively create and maintain a point of contact, e.g., phone number or website, to provide the public with information on watershed characteristics and stormwater pollution prevention alternatives. The Annual Reporting requirement states that any change in the contact be reported in annual reports subsequent to FY 09-10 annual report. There was no change in FY 11-12 to the point of contact provided by BASMAA. BASMAA assists with this provision by using the regional website: BayWise.org to list or link to member programs' lists of points of contact and contact information for the stormwater agencies in the Bay Area.

Pesticides Toxicity Control

C.9.h.i. Point of Purchase Outreach

This provision requires Permittees to:

- Conduct outreach to consumers at the point of purchase;
- Provide targeted information on proper pesticide use and disposal, potential adverse impacts on water quality, and less toxic methods of pest prevention and control; and
- Participate in and provide resources for the "Our Water, Our World" program or a functionally equivalent pesticide use reduction outreach program.

The Annual Reporting requirement allows Permittees who participate in a regional effort to comply with C.9.h.i. to reference a report that summarizes these actions. Below is a report of activities and accomplishments of the *Our Water, Our World* program for FY 11-12.

- Coordinated program implementation with major chains Home Depot, Orchard Supply Hardware (OSH), and Ace Hardware National. Corporate office of OSH (San Jose) and Home Depot (Atlanta) directed support of the program with their stores.

- Coordinated master print run of the following: fact sheets, shelf talkers, literature rack signage, beneficial bug brochure, magnet, Pest or Pal activity guide for kids, pocket guide, and Pests Bugging You? booklet.

- Updated less-toxic Product Lists: OSH and Home Depot-specific lists/labels.

- Maintained *Our Water, Our World* website.

- Provided Ask-the-Expert service—which provides 24-hour turnaround on answers to pest management questions.

- Provided and staffed exhibitor booths.
  - Excel Gardens Dealer Show, Las Vegas (August 2011) (see photo attached)
  - L&L Dealer Show, Reno (October 2011) (see photo attached)
  - NorCal trade show (February 2012) (see photo attached)

- Provided article for L&L distributor trade show magazine (see attachment—also includes *Our Water, Our World* ad). This magazine reaches over 5,000 industry professionals.

- Provided on-call assistance (e.g., display set-up, training, IPM materials review) to specific stores (e.g., OSH, Home Depots) (see photo attached).

- Worked with pesticide manufacturers to set up eco-friendly displays of less-toxic pesticides in Home Depot.

- Provided print advertising and articles – Chinook Coupon Book (see ad attached), Chinook Mobile Coupon Pack (see ad attached), and sponsorship of Save the Bay 50th Anniversary Gala.

- Provided print advertising – Bay Nature magazine (see ad attached); Bringing Back the Natives Garden Tour's garden guide (see ad attached).

Additionally, BASMAA, in partnership with the UC IPM Program, continued to develop and implement a Pest Management Alliance grant from the Department of Pesticide Regulation for the *IPM Advocates for Retail Stores* project. The project's purpose is to develop and implement a program that will recruit, train, and mentor individuals to help retail stores implement the *Our Water, Our World* program. The project kicked off in December 2010. In FY 11-12, the project team:

- conducted classroom and field training of 10 IPM Advocate candidates learning from a curriculum developed by the project team;
- developed and implemented a post-training coordination and monitoring program for the Advocates;
- through the Advocates, worked with the stores to set up displays and conduct trainings of store employees;
- created an IPM Advocates web page with links to online information and materials from UC IPM and *Our Water, Our World* that provides one-stop shopping for store employees, store managers, and IPM Advocates interested in keeping up with the latest IPM and product-related developments; and
- started to identify ways to sustain IPM Advocates after the grant expires (2013).

ATTACHMENTS

C.7.b. Advertising Campaign

Regional Litter Implementation Plan

Be the Street Report

BASMAA Baseline Evaluation Report

Bay Area Stormwater Management Agencies Association

Five-Year Regional Litter Implementation Plan

Plan Submitted: September 20, 2011

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CREATIVE MESSAGING • BEHAVIOR CHANGE • STRATEGIC PLANNING • REGIONAL EFFORT • WATER QUALITY

Tasks	Timing	Budget	Permittee Actions*	Measuring Success	MRP
Phase A - Laying the Groundwork and Starting up the Youth Panel					Municipal Regional Permit Sections C.7.b, C.7.b.1, C.7.b.ii
Collect information about high school and college environmental clubs, civic organizations, and other stakeholders populated by 16-24 year olds in the BASMAA region.	Sept-Nov	$8,400.00	Provide any info for any relevant orgs they are working with -------------------------------------- Optional: Help consultant establish contact at organization via introductory email		
Research and create a list of youth related (and eco related) organizations in the region.		$3,000.00	Provide info (name and general contact information) on known interested organizations they are working with -------------------------------------- Optional: 1) Provide a contact name at a known interested organization 2) Write an an introductory email to your contact introducing the the consultant and the outreach campaign.	Compile 50 organizations.	
Research and create a list of eco clubs and service clubs at High Schools, Colleges & Universities.		$5,400.00	Provide info (name and general contact information) on known interested school they are working with -------------------------------------- Optional: 1)Provide a contact name at a known interested school 2) Write an an introductory email to your contact at interested school introducing the consultant and the outreach campaign	Compile 100 organizations.	
Set up integrated email list serve/ e-Newsletter program	Aug-Sept	$10,000.00	Review/approval		
Create an email marketing account with a service like Constant Contact or Mail Chimp		$1,500.00	N/A		
Create an email newsletter template to send out general announcements.		$5,500.00	Review emails/newsletters	Send out 4 emails to our email list and achieve at least a 23% open rate (industry standard)	
Send enrolling email newsletter each quarter with links to forward to friends	Aug-ongoing through year 3	$3,000.00	Optional: Forward newsletters/emails to local contacts	Collect 800 email addresses	
Conduct a pre-evaluation survey assessment	Aug-Oct	$21,905			
Note: Dr. Nicole Sintov has now officially joined the SGA ranks. She has her Phd in Psychology with an emphasis in behavior change from USC. She has published studies in half a dozen journals including titles such as "Effectiveness of a Web-based Intervention in Promoting Energy Conservation in a University Residential Setting." I had Nicole take a look at the outreach approach and make recommendations regarding what she thinks would be our best evaluation options. Her thoughts were very closely aligned with the school site model we had discussed at the last meeting. Please visit this link (http://bit.ly/qxFcGT) to see her write-up.					
Engage Residential Youth Participation Through Events	Sept-Oct	$15,750			Municipal Regional Permit Section C.7.b.ii.1 (litter only)

Build strategic partnerships with local community event organizers. If amenable, event representative receives the materials from the program (i. e. consultant) and the event organizer would set up and break down the booth display.		$3,750.00	Send over a list of event organizers that would be valuable to reach out to --- Optional: Reach out to contacts that you have relationships with and ask if they are interested in hosting a booth in a box	Develop partnerships with 20 organizations.	
Create booth materials, raffle prize, and sign up sheets available for cities and counties that will be hosting a booth at an event.		$6,000.00	Review materials		
Design a rotating display that can be easily used and transported at events. The display will focus on getting passerby to join the program in some way (e.g. email sign-up, take a picture, enter a raffle, etc).		$5,000.00	Review display		
Produce and print 5 displays to rotate throughout the various cities.		$2,500.00	N/A		
Coordinate with permitees to collect data from the raffle, sign ups, newsletter and continue adding to CRM database. Data includes age and city.		$6,000.00	Request and host materials at community events they are already slated to attend	Host materials at a minimum of 12 events	
Before the event, coordinate with individual permitees to receive and set up the display for their event.		$3,000.00	Coordinate with consultant to set-up displays		
After the event, coordinate with individual permitees to collect the event sign-ups and enter the sign-ups to the email list.		$3,000.00	Provide information to consultant ------------------------------------- Optional: Enter sign-ups received from their events directly into the database		
Create and Partner with Youth Panel	Oct-	$10,000	Approval and (if desired) review of potential panel members	Create a panel with at least 15 youth participants	Municipal Regional Permit Section C.7.b.ii.2
Develop criteria for eligible youth to serve on an advisory Youth Panel (16-24 year olds currently living in the BASMAA region)		$2,400	Review criteria		
Passively recruit Youth Panel participants by spreading the word through existing City & County networks		$2,000			
Create user-friendly private forum to host online discussions (e.g. private invite-only Facebook page)		$2,600	N/A	Spontaneous idea suggestions & volunteer posts from Youth Panel	
Reach out to Youth Panel on an as-needed basis		$3,000		Sporadic check-ins and input requests throughout the year	
Phase B – Designing Tactical Elements & Launching the Video Contest					Municipal Regional Permit Section C.7.b.ii.2
Develop concepts for partnership engagement with corporations; enlist them on sponsorships, cleanups and other promotional opportunities	Dec-Feb	$6,500	Review/approval	Sponsorship quality and prizes equivalent of a $500 monetary value equivalent	
Develop corporation list of historically interested, related industries and also those with charitable giving arms for additional sponsorship possibilties. Create contact list and add to tracking database		$1,200	--------------------------- Optional: Provide contact information for relevant organizations.	Develop a contact list with 15 organizations	
Coordinate with Youth Panel to gauge their feedback on the attractiveness of potential prizes		$1,500	N/A		

Outreach to potential sponsors and secure partnership(s) and contest prizes for the campaign		$3,800	N/A		
Design look/brand of campaign	Dec-Jan	$9,800	Review/approval	Ongoing feedback, synergy with Youth Panel	
Develop the creative brief to kick start the design process		$1,400	Review and approve creative brief		
Create 2-3 initial design mock-ups of a video contest flyer for the group to choose from		$5,400	Review and provide comments		
Write the text for the flyer		$1,800	Review and provide comments		
Design various iterations of the flyer in order to set the tone for the "look" of the campaign		$3,600	Review and provide comments		
After two rounds of edits, finalize the video contest flyer as well as the campaign aesthetic		$3,000	Final Review	Establish the colors, font and style of the campaign's design	
Develop the PSA Advertising Contest opportunity to engage high school organizations, local colleges and universities and other stakeholders	Nov-Mar	$37,000	Review/approval	Assess initial popularity with key interested parties and make modifications as needed	
Reach out to some key interested parties (e.g. high school principals, college film professors, youth film networks, etc) to gauge interest/thoughts about the contest and modify the approach accordingly.		$1,800	Optional: If you have any contacts in this category, provide their contact information to consultant	Get feedback from half a dozen people	
Define the specifications of the contest (e.g. what type of subject matter) and get feedback from the Youth Panel		$840	Review contest specifications		
Line out all of the campaign logistics including rules, deadlines, eligibility requirements, etc.		$3,000	Review		
Design the needed campaign materials. May include: poster, email blast, bookmark, etc.		$5,160	Revew	Design 1 and print needed campaign materials to publicize the contest	
Present options and decide which additional material would be best to create (receive feedback from committee and youth panel)		$960	Provide feedback		
Design 1 additional handout such as a poster (includes two rounds of revisions)		$4,200	Revew		
Work closely with early adopters to submit a video and seed interest.		$7,800	N/A		
Reach out directly to teachers, film related orgs and youth panel to scout potential early adopters for the contest.		$1,800	N/A		
Identify 3-5 early adopters and provide any support they may need to ensure they submit videos and help seed interest in the contest.		$6,000	N/A		
Promote the contest		$14,400	Optional: Distribute materials locally to promote contest	Distribute the materials directly to 60 teachers throughout the County	
Work through early adopters and the previously developed list of teachers, film organizations, college resident advisors, etc to promote the contest by mailing handouts for distribution to their members/students		$14,400	Optional: Actually post flyers/posters on high school and college campuses		
Expenses: Printing expenses		$4,000			
Design Website/Blog that is run by a Content Management System (CMS)	Jan-	$18,600	Review/approval	Create a website with up to 8 pages	
Example: SGA created the LA Team Effort website that was originally used to launch LA Stormwater's "team effort" advertising campaign. Website has since evolved to be available indefinitely as a portal for people who want to help protect water quality.					
Write and develop all of the content for the site		$3,840	Review content		
Map the website navigation bar structure		$1,200	N/A		
Create homepage and internal page wireframes (e.g. skeletal layouts of what the pages will look like)		$1,800	N/A		
Design the website "look"		$3,000	Review		

Program the website pages, include capacity for people to upload videos for the contest		$7,800	N/A		
Configure content to make it Search Engine Optimization (SEO) friendly		$960	N/A	200+ visitors per month as per Google Analytics calculations	
Media Engagement/Press Releases for video contest	Mar-Apr	$24,840	Review/approval		
Coordinate with BASMAA's already existing media relations effort to ensure that the contest is tied into media pitches		$2,400	Help coordinate into BASMAA's media relations effort		
Outreach to online portals such as bloggers, podcast series, online news sites, etc to promote the contest		$14,040	N/A	Placement in at least 15 online blogs	
Create a list of potential locations to reach out to		$3,000	Optional Activities -Recommend online portals		
Develop a general pitch for reaching out to the bloggers or editors		$840	Review		
Customize the pitch accordingly and reach out directly to bloggers and editors. Field questions as needed and follow up with contacts to get coverage of the contest.		$7,800	Review		
Track placements of the contest online		$2,400	N/A		
Work with local jurisdictions to send out email announcements to their already established email lists as well as promote the contest through newsletters and City publications		$8,400	Distribute info locally through city/county email lists & government publications and websites	Placement in at least 15 online, print city publications or email list send outs	
Prepare files (i.e. text only and with images) that the individual cities can use to send out and announce the contest		$2,400			
Coordinate with BASMAA reps to provide the needed info along with the email template		$3,600			
Follow up with BASMAA reps to track send outs in their individual jurisdictions		$2,400			
Launch & maintain the Facebook page	Mar-	$35,000	Provide event photos and local City related updates for posting on the page.	100 fans 60 user interactions from our fans (posts, comments, 'likes', links, photos)	
Example: SGA created and maintains the LA Stormwater program's FB page: facebook.com/lastormwaterprogram. You can see our latest promotion, the Pet N Water photo contest, on the wall.					
Assumptions: The budget/time allocation for this task has been done using a blended rate of $120; however, during the implementation SGA's actual rates will be used (i.e. higher than this for a Project Manager and lower than this for a Project Coordinator). This task also assumes coordination and input from the committee. The budget assumes that the committee will want to give approval on each of the consultant's wall posts. If this is not the case and a general approval is given when the page is first launched then the price will adjust down accordingly. I feel more comfortable leaving as is until we start implementing the task and are then able to re-assess how much committee involvement is part of the implementation.					
Coordinate with Youth Panel to get feedback about topics and areas of interest for the Facebook page. Use this information to create the Facebook strategy.		$950.00	N/A		
Create the Facebook page and recruit an initial base of fans		$8,550	-------------------------- ------------ Optional: If your agency has a Facebook page, follow or like the BASMAA Litter page		
Research and compile a list of related Facebook pages. Reach out to the Facebook pages with a "nice to meet you" and a wall post.		$2,400.00	-------------------------- ------------ Optional:Provide information on related Facebook pages		

Create and place Facebook ads.		$4,400.00	Review ads -------------------------- Optional: If budget available, use the ad in local promotions.		
Create a Facebook invite and send it out to people in our email list.		$1,750.00	Forward the invite to local contacts		
Maintain the Facebook page with posts at least 3 x's a month and run mini promotions to engage fans. This also includes checking and responding to comments on a daily basis as well as posting "trust agent" (trustagent.com/) comments on partner Facebook pages in order to create meaningful online partnerships.		$25,500.00	Review promotions and wall posts If your agency has a FB page, "like" or "share" the BASMAA posts	Secure partnerships (e.g. posting on our wall or "liking" our page) with 10 other Facebook pages. These will be "non-stormwater program" pages, i. e., pages from organizations that are not Permittees or their partner agencies.	
Research and keep a pipeline of updates to post on the page a minimum of 3xs per month.		$4,800.00	Review ads -------------------------------------- OPTIONAL: If budget available, use the ad in local promotions.		
Respond to fan comments and likes (frequency depends on amount of interaction received from fans).		$3,600.00	N/A		
Visit other Facebook pages approx once a week and post comments and likes on their posts as part of our trust agent comments.		$3,600.00	N/A		
Run mini Facebook promotions approx every 6 weeks. Promotions are characterized by encouraging fans to interact with the page and receiving a t-shirt or kudos in return (e.g. tell 1 friend about our page and both you and your friend will receive one of our nifty t-shirts)		$12,000.00	Review promotions -------------------------------------- OPTIONAL: Promote promotions on local FB pages.		
Expenses: advertisements, giveaways for promotions (in some cases).		$1,500.00			
Create distribution plan for PSA winner(s) (online and offline)	Feb-Apr	$4,250	Review/approval		
Create advertising plan detailing points of distribution for winning contest entry			Review advertising plan		
Research a list of potential outlets, taking into account demographics, geographic reach and relevance to issue, to distribute the video					
Get pricing options for the select outlets					
Explore opportunities for un-paid exposure of the ads (e.g. film festivals, school announcements, etc)					
Create a plan detailing which locations will feature the PSA					

Engage our audience and our audience's social networks to review and vote on the best PSAs	May	$10,800			
Review contest entries to ensure they are complying with the rules (e.g. no foul language) and are relevant.		$3,600.00	Optional: Review contest entries		
Post the appropriate entries to make them available for viewing.		$3,600.00	N/A		
Create a YouTube channel to feature the contest entries		$3,600.00	N/A		
Phase C – Distributing the Winning Video					Fulfills Municipal Regional Permit Section C.7.b.ii.2
Advertising - PSA Online and Offline Releases	Jun-Jul	$44,760	Review/approval	Winning entry celebrated in 15 or more outlets (e.g. local city channels, film festivals, movie theaters, art museum exhibit)	
Regular Check-in meetings with Youth Panel to survey effectiveness, awareness, knowledge, trends		$1,320	N/A		Municipal Regional Permit Section C.7.b.ii.2
Format video into different file extensions to allow it to be posted on different mediums (e.g. online, t.v., etc)		$3,600			
Actively distribute the winning contest entry to the outlets noted in the ad buy plan. Purchase limited ad buy space, if needed.		$6,000	-- Optional: If budget available, place BASMAA ads locally		
Coordinate with individual cities and counties to have the PSA run on local access channels and via an embedded video on government websites and Facebook pages		$3,840	Post the PSA on local city television channels and website	Placement in at least 7 city stations.	
Expenses: Advertising space, contractor for the video conversion		$30,000			
	Year 1 Total	$257,605			

YEAR 2

Tasks	Timing	Budget	Permittee Actions*	Measuring Success	MRP
Phase A – Maintain Buzz and Continue to Grow Presence					
Program Check-In	Ongoing	$3,000.00			

Conduct assessment of what worked and what didn't work from Year 1. Modify Year 2 implementation plan accordingly		$3,000.00			
Facebook page	Ongoing	$25,500.00	Provide event photos and local City related updates for posting on the page.	350 fans and 200 user interactions from our fans (posts, comments, 'likes', links, photos)	
Maintain the Facebook page with posts at least 3 x's a month and run mini promotions to engage fans. This also includes checking and responding to comments on a daily basis as well as posting "trust agent" (trustagent.com/) comments on partner Facebook pages in order to create meaningful online partnerships.		$25,500.00	Review promotions and wall posts ----------------------------------- Optional: If your agency has a FB page, "like" or "share" the BASMAA posts	Secure partnerships (e.g. posting on our wall or "liking" our page) with 10 other Facebook pages	
Research and keep a pipeline of updates to post on the page a minimum of 3xs per month.		$4,800.00	N/A		
Respond to fan comments and likes (frequency depends on amount of interaction received from fans).		$3,600.00	N/A		
Visit other Facebook pages approx once a week and post comments and likes on their posts as part of our trust agent comments.		$3,600.00	N/A		
Run mini Facebook promotions approx every quarter. Promotions are characterized by encouraging fans to interact with the page and receiving a t-shirt or kudos in return (e.g. tell 1 friend about our page and both you and your friend will receive one of our nifty t-shirts)		$12,000.00	Review promotions ------------------------------------ Optional:Promote promotions on local FB pages.		
Expenses: advertisements, giveaways for promotions (in some cases).		$1,500.00	Review giveaway ides.		
Website	Ongoing	$20,440	Review website and provide input as needed		
Keep the website maintained		$16,440.00			
Review website content after the end of the video contest. Modify content and layout as needed to keep the website updated and current.		$3,000.00			
Monthly website checks to ensure all links and pages are functioning correctly		$4,800.00			
Post new content on the website monthly either through articles, links, images or videos to ensure the website is being updated frequently.		$8,640.00		New monthly website content	
Do Search Engine Optimization (SEO) to increase the website's ranking on search engines		$4,000.00		500+ visitors per month as per Google Analytics calculations	
Develop and distribute campaign branded promotional item like a t-shirt, hat, tote bag, etc. (Distribute based on participants taking some type of action to further engage them in pollution prevention/litter reduction)	Sept-Nov	$8,600	Review/approval		
Research potential giveaways and consult Youth Panel on appropriate items		$500	Review/approval		
Create initial design concepts and receive input (includes up to two rounds of edits)		$3,600	Review/approval		
Finalize the design concept		$1,000	Review/approval		
Price and place order		$1,000	-- Optional: purchase giveaways for local outreach	100-200 prize giveaways depending on pricing	
Outline criteria for who is to receive a giveaway item. Distribute items (e.g. shipping or distributing to BASMAA members) to be distributed to target audience.		$1,500	N/A		
Expenses: Printing of items and shipping costs for distributing the giveaways.		$1,000			
Email Marketing	Ongoing	$23,040			

Coordinate with fan base regarding some key areas of interest. Send out at least 4 emails.		$17,040.00	Review email content	List of 1,000 email subscribers with an open rate of 23% or more (industry standard)	
Develop topic ideas for the year's emails		$3,480.00			
Write the content for the emails (4)		$4,800.00			
Design the emails (4)		$6,600.00			
Send out the emails and track the statistics to inform future correspondences (i.e. what worked and what didn't)		$2,160.00			
Manage the list (e.g. clean out bounces, add new names, generate reports, etc)		$6,000.00			
YouTube channel	Ongoing	$15,640		2,500 views and 25 channel subscribers	
Maintain the channel by responding to comments and posting videos that are relevant and were created by cities that are part of BASMAA or other partner organizations		$8,640.00	Provide video content as it becomes available		
Create 1 new video to post on the channel		$7,000.00	Review/approval		
Youth Panel Updates	Ongoing	$6,000		Receive 60 interactions/comments from our youth panel	
Continue to engage Youth Panel Facebook group for input on an as needed basis		$6,000.00	N/A	Check in with the youth, at minimum, once a month	
Phase B – Increase the Level of Commitment (get new people to join the campaign but also get Year 1 people to step it up)				Recruit 200 new newsletter subscribers and 250 new Facebook fans.	
Take Action-- Volunteer!	Oct-Jul 13	$36,600	Review/Approval		
Host a "Give a Day" volunteer and win online contest to encourage people to volunteer for a water related event (e.g. clean-up, tree planting, etc)		$36,600.00	Review contest/event idea. -- Optional: conduct local outreach to promote contest/event		
Set up the infrastructure (i.e. new custom programmed tab on the Facebook page) to allow people to upload a photo volunteering in order to be entered for a chance to win a cool prize		$6,000.00	N/A		
Coordinate with last year's sponsors to secure a prize		$1,500.00	N/A		
Create contest rules, requirements, etc		$2,700.00	Review/Approve		
Design the Facebook landing pages and a flyer to promote the giveaway		$7,000.00	Review/Approve		
Promote the contest with local organizations that are hosting volunteers as well as through existing City/County networks with tactics such as, but not limited to: sending out emails to existing listservs, placing announcements in local newsletters, mailing flyers for distribution, posting the promo on external websites		$14,000.00	Reach out to existing networks of other organizations and non-profits	Partner with, at least, 10 organizations and/or schools	
Track entries and award the prize		$5,400.00	N/A	Receive 120 entries	
	Year 2 Total	$138,820			

YEAR 3

Tasks	Timing	Budget	Permittee Actions*	Measuring Success	MRP

Phase A – Maintain systems, strategies that worked during Year 2					
Program Check-In	Ongoing	$3,000.00			
Conduct assessment of what worked and what didn't work from Year 2. Modify Year 3 implementation plan accordingly		$3,000.00			
Facebook page	Ongoing	$25,500.00		700 fans and 300 user interactions (posts, comments, 'likes', links, photos)	
Maintain the Facebook page with posts at least 3 x's a month and run mini promotions to engage fans. This also includes checking and responding to comments on a daily basis as well as posting "trust agent" (trustagent.com/) comments on partner Facebook pages in order to create meaningful online partnerships.		$25,500.00	Review promotions and wall posts ------------------------------------ Optional: If your agency has a FB page, "like" or "share" the BASMAA posts	Secure partnerships (e.g. posting on our wall or "liking" our page) with 10 other Facebook pages	
Research and keep a pipeline of updates to post on the page a minimum of 3xs per month.		$4,800.00	N/A		
Respond to fan comments and likes (frequency depends on amount of interaction received from fans).		$3,600.00	N/A		
Visit other Facebook pages approx once a week and post comments and likes on their posts as part of our trust agent comments.		$3,600.00	N/A		
Run mini Facebook promotions approx every quarter. Promotions are characterized by encouraging fans to interact with the page and receiving a t-shirt or kudos in return (e.g. tell 1 friend about our page and both you and your friend will receive one of our nifty t-shirts)		$12,000.00	Review promotions ------------------------------------ Optional:Promote promotions on local FB pages.		
Expenses: advertisements, giveaways for promotions (in some cases).		$1,500.00	Review giveaway ides.		
Website	Ongoing	$16,440		1,000+ visitors per month as per Google Analytics calculations	
Keep the website maintained		$16,440.00			
Modify content and layout as needed to keep the website updated and current.		$3,000.00			
Monthly website checks to ensure all links and pages are functioning correctly		$4,800.00			
Post new content on the website monthly either through articles, links, images or videos to ensure the website is being updated frequently.		$8,640.00		New monthly website content	
Email Marketing	Ongoing	$23,040		List of 1,000 email subscribers with an open rate of 23% or more (industry standard)	
Coordinate with fan base regarding some key areas of interest. Send out at least 4 emails.		$17,040.00	Review email content		
Develop topic ideas for the year's emails		$3,480.00			
Write the content for the emails (4)		$4,800.00			
Design the emails (4)		$6,600.00			
Send out the emails and track the statistics to inform future correspondences (i.e. what worked and what didn't)		$2,160.00			
Manage the list (e.g. clean out bounces, add new names, generate reports, etc)		$6,000.00			
YouTube channel	Ongoing	$16,140		2,500 views and 35 channel subscribers	
Maintain the YouTube channel by recruiting subscribers		$8,640.00			

Post updated video content on the channel (new or repurposed) in order to keep it fresh		$7,500.00	Review videos ----------------------------------- Provide videos that have been developed locally for posting on the channel	Posting 2 additional videos on the channel	
Database Maintenance & Youth Panel Updates	Ongoing	$4,000			
Continue to engage Youth Panel Facebook group for input on an as needed basis		$4,000.00			
Phase B – Engage New People in the Campaign and Involve Another Group (e.g. the art community)					Municipal Regional Permit Section C.7.b
Increased Commitment for the Year-- Get crafty!	Oct-May 14	$44,580			
Set up the details for an art related/water quality contest (e.g. painted rain barrels, painted storm drains, found litter art, etc). Secure sponsors for the prizes/giveaways.		$5,400.00	Review/approve ideas		
Coordinate with interested parties (e.g. art museums, high school and college art teachers) to pique interest and gauge their interest in the promotion		$3,000.00		Reach out to at least 15 organizations	
Promote the contest		$17,400.00			
Design the materials to promote the contest and encourage entries/involvement		$3,000.00	Review/approve	Flyer & email blast announcing the promotion	
Reach out to teachers and school clubs to spread the word		$5,400.00			
Send out messages to our existing online networks		$2,760.00			
Reach out to online bloggers & other Facebook pages to spread the word about the promo		$6,240.00			
Track, review and, if appropriate, judge entries		$5,640.00			
Tie in with BASMAA's already existing media relations efforts to promote the entries. In addition, possibly host a media event to showcase the art installations that will be featured throughout the counties		$9,000.00			
Promote the contest entries on the social media channels and with our network		$2,640.00		Receive 120 entries	
Expenses: printing of flyers, other misc		$1,500.00			
Conduct a post- evaluation survey assessment	Feb-Apr 14	$20,000			
Note: Dr. Nicole Sintov has now officially joined the SGA ranks. She has her Phd in Psychology with an emphasis in behavior change from USC. She has published studies in half a dozen journals including titles such as "Effectiveness of a Web-based Intervention in Promoting Energy Conservation in a University Residential Setting." I had Nicole take a look at the outreach approach and make recommendations regarding what she thinks would be our best evaluation options. Her thoughts were very closely aligned with the school site model we had discussed at the last meeting. Please visit this link (http://bit.ly/qxFcGT) to see her write-up.					
Put together the final report	May 14.	$9,000			
	Year 3 Total	$161,700			
	GRAND TOTAL	$558,125			

* This indicates the minimum level of effort the consultant would be asking for of the permittees. If permittees are interested in getting more involved then wonderful! I didn't include this here because I thought it would be best to plan budget around the assumption that we would not be getting additional involvement. If permittees provide more assistance than originally anticipated then we can put the budget savings in other places.					

BASMAA Evaluation Approach

The two objectives of the BASMAA "advertising" campaign are to decrease litter and to increase engagement. The following write-up provides our approach to how to evaluate these two goals.

DECREASE LITTER

Evaluation approach

- Two-pronged approach to evaluating success of program to include self-reported surveys and observational data collection

Survey component

- Select 4 schools (high schools or universities or community colleges) throughout the entire geographic area.
- Engage the school network at all 4 schools
    - e.g., teachers, administration, student groups, athletic teams – to promote survey taking and involvement in outreach programs.
    - A few preliminary ideas include:
        - Teachers providing an extra credit opportunity for survey participation
        - Offering raffle prizes as incentives for survey taking
        - Provide a survey item where students write in names of friends who referred them to survey. Give student referrers incentives/FB recognition
            - Similar ideas for teachers who get their students to participate
- Administer baseline survey prior to program implementation
    - Surveys administered online
        - To address online survey validity issues, we'll include a simple random/careless responding check to enable identification of bogus responses
    - Suggested sample size = 300 students total at baseline
    - As part of surveys, gather contact information from student participants – this is a highly mobile population with frequent changes in contact information.
        - Obtain cell phone, home phone, email address.
- Throughout program
    - Reach out to students on FB, through e-newsletters, and through other avenues to keep them in touch with program throughout years 2 & 3
- Post-outreach (end of year 3)
    - Follow-up with same students who participated in initial survey

Observational component

The observational component will supplement the self reported surveys above. Since the ultimate goal is to reduce litter, this will help to bolster the validity of the findings.

- At same 4 schools above
    - Conduct a pre-outreach trash assessment after school lunch one day where amount/type of litter is assessed.
    - Conduct similar trash assessment after outreach complete.

Why did we go with this approach?

- Focusing on existing cohesive communities has the following benefits:
    - Increases likelihood of program success because:
        - Increases likelihood that program will be noticed by target audience members
        - Offers better opportunity to leverage social norms
    - Likely to result in greater sample size for surveys
    - Makes observational data collection a reasonable supplement versus obtaining observational measures in the community at large where outreach effects will be extremely dilute and probably not detectable
- Provides for direct evaluation of outreach success
- Multi-method approach (self-report surveys plus observational data) is stronger relative to one that uses a single measure of program success
- Enhanced efforts to keep in touch with participants likely to result in higher follow-up rate

What are the drawbacks to this approach?

- In general, the broad nature of the program we are implementing doesn't lend itself well to contained evaluation (as opposed to a program that was designed to specifically take place within the schools).
- May be difficult to work with constraints of schools
- School subsample may not be entirely representativeness of entire target audience
    - To address this: Youth who access outreach elements and surveys from sources outside of the 4 schools would also be able to participate, so we will be able to:
        - Assess level of involvement in outreach as well as recruitment source in baseline and follow-up surveys and adjust statistically for these effects

INCREASE ENGAGEMENT
YEAR ONE

Build database of high school and college environmental clubs, civic organizations, and other stakeholders populated by 16-24 year olds in the BASMAA region.

- Research and create a list of 50 youth related (and eco related) organizations in the region and add it to the database.
- Research and create a list of 100 eco clubs and service clubs at High Schools, Colleges & Universities and add them to the database.

Set up integrated email list serve/ e-Newsletter program

- Send out 4 emails to our email list and achieve at least a 23% open rate (industry standard)
- Collect 800 email addresses

Engage Residential Youth Participation through Events

- Develop partnerships with 20 event organizers.
- Host materials at least 12 events

Create and Partner with Youth Panel

- Create a panel with at least 15 youth participants
- Reach out to panel, at least, every other month

Develop concepts for partnership engagement with corporations; enlist them on sponsorships, cleanups and other promotional opportunities

- Sponsorship quality and prizes equivalent of a $500 monetary value equivalent
- Develop a contact list with 15 corporations

Develop the PSA Advertising Contest opportunity to engage high school organizations, local colleges and universities and other stakeholders

- Get feedback from half a dozen people from the Youth Panel
- Design 1 and print needed campaign materials to publicize the contest
- Distribute the materials directly to 60 teachers throughout the Bay Area

Design Website/Blog that is run by a Content Management System (CMS)

- Create a website with up to 8 pages
- 200+ visitors per month as per Google Analytics calculations

Media Engagement/Press Releases for video contest

- Placement in at least 15 online blogs
- Placement in at least 15 online, print city publications or email list send outs

Launch & maintain the Facebook page

- 100 fans 60 user interactions from our fans (posts, comments, 'likes', links, photos)
- Secure partnerships (e.g. posting on our wall or "liking" our page) with 10 other Facebook pages. These will be "non-stormwater program" pages, i.e., pages from organizations that are not Permittees or their partner agencies.

Engage our audience and our audience's social networks to review and vote on the best PSAs

- Have at least 5 viable videos for voting

Advertising - PSA Online and Offline Releases

- Winning entry celebrated in 15 or more outlets (e.g. local city channels, film festivals, movie theaters, art museum exhibit)
- Placement in at least 7 city stations.

Develop and distribute campaign branded promotional item like a t-shirt, hat, tote bag, etc. (Distribute based on participants taking some type of action to further engage them in pollution prevention/litter reduction)

- 200-300 prize giveaways depending on pricing

YEAR TWO

Facebook page

- 350 fans and 200 user interactions from our fans (posts, comments, 'likes', links, photos)

- Secure partnerships (e.g. posting on our wall or "liking" our page) with 10 other Facebook pages

Website
- 600+ visitors per month as per Google Analytics calculations
- Secure 10 in bound links

Email Marketing
- List of 1,000 email subscribers with an open rate of 23% or more (industry standard)

YouTube channel
- 2,500 views and 25 channel subscribers

Database Maintenance & Youth Panel Updates
- Receive 60 interactions/comments from our youth panel
- Check in with the youth, at minimum, once a month

Increase the Level of Commitment (get new people to join the campaign but also get Year 1 people to step it up)
- Recruit 200 new newsletter subscribers and 250 new Facebook fans. Ideally, 40% of the contest entries would be from already existing program fans to show an increased level of commitment.

Take Action-- Volunteer!
- Partner with, at least, 10 organizations and/or schools
- Receive 120 entries

YEAR THREE

Facebook page
- 700 fans and 300 user interactions (posts, comments, 'likes', links, photos)
- Secure partnerships (e.g. posting on our wall or "liking" our page) with 10 other Facebook pages

Website
- 1,000+ visitors per month as per Google Analytics calculations

Email Marketing
- List of 1,000 email subscribers with an open rate of 23% or more (industry standard)

YouTube channel
- 2,500 views and 35 channel subscribers

Increased Commitment for the Year-- Get crafty!
- Reach out to at least 15 organizations
- Receive 120 entries

The following list contains items described both through numeric achievements and through narrative performed by S. Groner Associates on behalf of the Bay Area Stormwater Management Agencies Association during Fiscal Year 2011-12 as related to regional efforts to mitigate trash/litter TMDLs.

Facebook:

- We created and launched the Be the Street Facebook page (https://www.facebook.com/BetheSt)
- 406 fans
- 683 visits
- 26 interactions
- We also created and implemented a Facebook ad geared towards Bay area youth ages 14-24 years old to gain Facebook page fans. The ad had the following text:
- "Join Be the Street to Keep Our Community Clean & Enter Free Contests to Win Cool Prizes!"
- The ad ran for one month:
    - Gained 379 fans.
    - 471,701 impressions
    - Social Reach (measure of how many unique Facebook users saw their friends like Be the Street) 9,372
- In addition, the Facebook page integrates other outreach elements by including an link to the website (www.BetheStreet.org), an option to signup for the Be the Street eNewsletter and a link to the Be the Street YouTube channel (http://www.youtube.com/bethestreet).

YouTube:

- We created and launched the Be the Street YouTube channel (http://www.youtube.com/bethestreet) on February 15, 2012. The channel is used as a social media tool to present anti-litter and pollution prevention related videos online. The channel offers quick access to online videos and links to share the videos. We maintained the channel and posted one program video highlighting the PSA video contest. Here are some of the stats:
- 812 channel views
- Similar to the other social media tools, it offers an opportunity for viewers to comment or give feedback on anti-litter and pollution prevention material. The Be the Street YouTube channel allows for a positive visual association with the program and attracts new interest.

Brand

- Developed and finalized Be the Street Brand, including:
    - Created 27 mock ups
    - Released and analyzed 3 surveys to Committee
- Developed and released Branding Guidelines Document to outline use of Be the Street brand by other parties

eNewsletter:

- Created Basmaa newsletter template and a welcome e-blast template ;
- Wrote 3 articles for the eNewsletter;
- Total number of subscribers: 181
- Sent out 1 e-newsletter issue to 164 subscribers;
- Sent out 3 welcome emails to new subscribers;
- Achieved an overall open rate of 26.8% and a click rate of 34% (% of those who opened the newsletter and clicked on at least 1 link);
- Sent out $20 iTunes gift cards to 4 subscribers that subscribed at events.

Events:

- Proposed 3 options for grassroots campaigns;
- Finalized a concept proposal for grassroots campaigns and designed materials for it (image template and backdrop template);
- Designed 1 *Sign up for our eNewsletter* poster;
- Designed 1 *Events eNewsletter Signup Sheet*.

Website

- We launched the website, www.bethestreet.org, on May 2
- Developed all content on the website including: About Us, Homepage, Selected Videos, Contact Us and Youth Resource Council article
- Debugged and tested video voting feature in preparation to go live with item in FY 12/13
- Included submission forms accessible via standard viewing and mobile viewing
- We reached 427+ visits from target area (excludes Long Beach, other states and out of country visits)

Video Contest:

- Outreach to 50 schools
- Outreach to 49 organizations
- Outreach to 10 clubs
- Outreach to 8 summer media camps
- Video Submissions: 1, well ahead of our deadline which is October 30, 2012
- Developed and released a flier to promote the Video Contest
- Developed and posted a short video to promote the Video Contest: http://www.youtube.com/watch?v=jqdWZj2DmDo&feature=plcp

Youth Resource Council

- Reached out to 129 organizations
- Obtained 44 members
- Posted 27 threads
- Received 65 comments from members
- 1 thread started my member
- YRC Signup sheet was created for signups at events

Survey:

- Created and finalized online survey tool
- Disseminated survey to schools:
- Completed Surveys: 337
    - Completed WITH Partially Completed Surveys: 419
    - Outreached to 63 Schools
    - 15 Schools participated in Survey
        - Woodside (San Mateo)
        - Oceansiana (San Mateo)
        - Carlmont Highschool- (San Mateo)
        - Redwood High School (San Mateo)
        - Sequoia High School (San Mateo)
        - Independence (Santa Clara)
        - San Jose City College (Santa Clara)
        - Evergreen Valley College (Santa Clara)
        - Ohlone College (Alameda)
        - Las Positas- (Alameda)
        - Chabot College (Alameda)
        - University of California- Berkeley (Alameda)
        - San Leandro High School (Alameda)
        - Jesse Bethel High School (Vallejo)
        - Fairfield High School (Fairfield-Suisun)

BASMAA Baseline Evaluation Report

September 7

2012

This report describes littering behavior and predictors of littering among youth in the Bay Area region.

1. Executive Summary

The goal of this project was to assess and describe littering behavior and perceived social norms related to littering among youth living in the Bay Area. The data collected stand alone to characterize Bay Area youth, and also will serve as a baseline against which data from a future follow-up survey will be compared following outreach campaign implementation.

A 5-minute online survey was made available in Spring 2012. The survey assessed littering behavior, contextual factors related to littering, peer-to-peer interactions about to littering, and willingness to participate in various campaign activities (e.g., art contest). Recruitment for the survey included outreach to Bay Area high schools and colleges, and placement of an ad on the social networking website www.Facebook.com.

A total of 353 individuals were eligible for inclusion in the sample based on age (14-24 years) and residence (provided zip code that was within the BASMAA region). The sample was 60% female, had a mean age of 17 years, and almost all respondents were in high school. Select results are highlighted below.

- 86% of respondents reported littering at least one item in the past month
- The items littered by the most respondents in the past month included chewing gum (littered by 52% of respondents in the past month), food waste (41%), and food or beverage-related packaging (40%).
- The items littered by the fewest respondents in the past month were cigarette butts, (littered by 7% of respondents in the past month), disposable utensils (14%), and bottle caps (21%).
- Among those who littered an item at least once in the past month, frequent littering varied considerably by trash item: littering items at least once per week ranged from 35% for beverage containers to 43% for chewing gum to 74% for cigarette butts.
- Littering at school was more common relative to other settings: 25%, 10%, and 7% of respondents littered at least sometimes at school, at home, and at work, respectively.
- The vast majority of the sample (91%) indicated that trash/recycling can placement deterred them from littering. Additionally, 71% of respondents stated that feelings of guilt discouraged them from littering.
- 88% of respondents indicated that they picked up trash that was not their own at least once in the past month.
- Respondents rated their likelihood of littering in the next month on a 7-point Likert[1] scale ranging from (1) Very unlikely – (7) Very Likely. The mean score was 2.79 (SD=1.67), meaning that on average, respondents intended not to litter.
- Respondents also rated their likelihood of participating in a number of activities related to the campaign. The activity that most respondents were at least somewhat likely to do was

[1] Likert scale: A Likert scale is a type of psychometric scale frequently used in surveys and questionnaires. Scales are bipolar, measuring either positive or negative response to a statement. A Likert item is simply a statement which the respondent is asked to evaluate according to any kind of subjective or objective criteria; generally the level of agreement or disagreement is measured. It is considered symmetric or "balanced" because there are equal amounts of positive and negative positions.

expressing disapproval if s/he saw a friend littering: 69% of respondents reported they were at least somewhat likely to do so. Additionally, 62% of respondents were at least somewhat likely to pick up litter that was not their own, and 40% were at least somewhat likely to participate in a litter cleanup day.

- Results of regression analyses indicated that females and those who had stronger disapproval ratings of their own and their friends' littering behavior had significantly greater likelihood of several prosocial[2] things (e.g., express disapproval of friends' littering, not littering)

2. Introduction

The goal of the Bay Area Stormwater Management Agencies Association (BASMA) anti-litter campaign was to reduce littering, promote peer-to-peer interaction regarding littering, and raise awareness of pollution related to the audience found to be most often littering, namely, 14-24 year olds. As part of this campaign, a branding concept called Be The Street was developed. This brand had a youthful look and feel in an effort to reach and connect with teenagers and young adults. Under this brand, the state of the "street" is a reflection of the youth who use it. By exploring problems and solution related to community and environmental issues, street-by-street, participants are rewarded with the pride, and the fun, of having created the kind of "street" they have always wanted to live on. Be The Street also leverages social norms by empowering youth as the "voice" of community betterment related to litter, encouraging youth-to-youth contact regarding littering. Prior to implementation of any campaign activities, a survey was created and administered to youth to assess baseline levels of littering and potentially important items of interest related to littering.

Purpose

The goal of the baseline survey was to describe littering behavior and perceived social norms among youth living in the Bay Area. This survey was designed to serve as a baseline against which data from a follow-up survey will be compared following outreach campaign implementation.

3. Methods

Materials

A survey was constructed to assess littering behavior, situational predictors of littering, peer-to-peer interactions related to littering, and willingness to participate in various campaign activities (e.g., art contest). The survey also collected information on demographics and technology use to be used in targeting campaign outreach efforts. The survey was available online via secure online survey administration tool Qualtrics. The questions and summary answers are available in Appendix A.

Procedures

Potential participants could access the survey 24 hours per day, 7 days per week from January through March 2012. It took approximately five minutes to complete.

[2] Prosocial behavior, or voluntary behavior intended to benefit another, consists of actions that benefit other people or society as a whole, such as helping, sharing, donating, co-operating, and volunteering.

Recruitment

Participants were recruited by reaching out to schools within the BASMAA region via phone and email. Specifically, administrators and faculty at high schools and colleges in the counties of Alameda, San Mateo, Vallejo, Santa Clara, and Fairfield-Suisun were contacted and asked to encourage their students to participate in the survey. Towards the end of the recruitment period, environmental science teachers were targeted, as they tended to be more willing to help with the project than others; many of these teachers also agreed to distribute surveys to all of their classes to reduce sample bias. These locations were selected because they fall within the areas that participate in BASMAA.

Initial calls were made to the schools; these were followed-up with an email that recapped the above information, the link to the survey, and a flyer (attached in Appendix B). School faculty and staff were told that BASMAA was working on an anti-littering campaign geared towards youth that leveraged youth as leaders of their communities. They were also informed that a video contest was included as part of the campaign and that the winning video would be aired on television. They were instructed not to inform students that the survey was related to littering in order to minimize bias, and were offered a script to assist in describing the survey to students. The script is available in Appendix C. If schools agreed to participate, they were followed up with 1-2 weeks later if no survey responses from their schools had been added to the database.

No incentives were offered to the schools themselves for distributing survey. However, some schools offered extra credit to students that could be applied towards courses for participation, but most distributed the survey without an incentive.

Additionally, an advertisement on social networking website www.Facebook.com was placed, targeting youth aged 14-24 living in the counties of Santa Clara, Alameda, San Mateo, Fairfield-Suisun, and Contra Costa. It ran for one month from late February to late March 2012. Content for the ad is attached in Appendix D.

Participants

To participate, individuals had to be 14-24 years of age and residents of zip codes covered by BASMAA. A total of 416 individuals began the survey; these included preview results (i.e., school administrators who “previewed” the survey before distributing to students), which were not identifiable in the data other than by applying inclusion and exclusion criteria. The initial sample size goal of n=500 was designed to account for attrition and provide sufficient statistical power for the detection of changes in littering behavior from baseline to follow-up. Of the 416 respondents who began the survey, 34 were excluded because they completed less than 10% of survey questions (in most cases, individuals completed less than 2 questions). A total of 25 respondents were ineligible for the survey because they were older than 24 years, younger than 14 years of age, or did not provide their date of birth. In addition, 4 participants were excluded for residing outside of the bay area or failing to provide their zip code. The final sample included 353 participants.

The sample included more females than males (41% male). The mean age of respondents was approximately 17 years old (SD = 1.37). The majority (97%) of respondents identified as high school students. Just over 3% identified as community college students, one identified as a 4-year college student, and one was not a student. The sample had a mean high school GPA of 3.26, which is somewhat above a “B” average. This suggests that the sample consisted largely of high school students performing at an above average academic level. See table 1 for details.

Table 1. Demographic characteristics of sample (N=353).

Gender (% male)	41.36
Mean age in years (SD)	17.03 (1.37)
Student status	%
High school	96.6
Community college	2.8
4-year college	0.3
Trade school	0.0
Graduate school	0.0
Not a student	0.3
Mean high school GPA (SD)	3.26 (0.70)

4. **Analysis approach**

The goal of the baseline survey was to describe baseline levels of littering behavior and perceived social norms among youth living in the Bay Area. Analyses were limited to eligible individuals (n=353), and addressed the following specific questions:

- What types of litter were most commonly and least commonly littered?
- In what contexts were respondents relatively more likely to litter?
- What did technology saturation look like in the sample?
- To what extent were respondents willing to participate in campaign activities?
- What did participants perceive as barriers to littering?
- To what extend did respondents disapprove of their own and their friends’ littering behavior?
- How was willingness to participate in campaign activities related to environmental concern and perceived social and personal norms?
- What was the relationship between future likelihood of littering and environmental concern and perceived social and personal norms?

5. **Results**

Respondents answered a number of questions about their access to various devices and frequency with which they accessed internet-based services. The vast majority of the sample (91%) had a cell phone; 61% with a cell phone had a “smart” phone. Additionally, 88% of the sample had computer access at home. Only about one quarter of the sample had access to a tablet device (e.g., iPad). Respondents were heavy users of internet-based services. Respondents were defined as either regular users who used a given service at least once weekly (once per week, 2-3 times per week, daily) versus infrequent users who accessed a given service less than weekly (2-3 times per month, once per month, less than once per month, never). Internet use was ubiquitous among the sample: over 95% of the sample used the Internet at least weekly. As well, 86% of the sample used Facebook at least once per week, and 82% checked email weekly. Three-quarters of the sample used YouTube weekly, and fewer respondents used blogs (37%) and Twitter (24%). See Table 2 for details.

Table 2. Technology access and frequency of Internet service use.

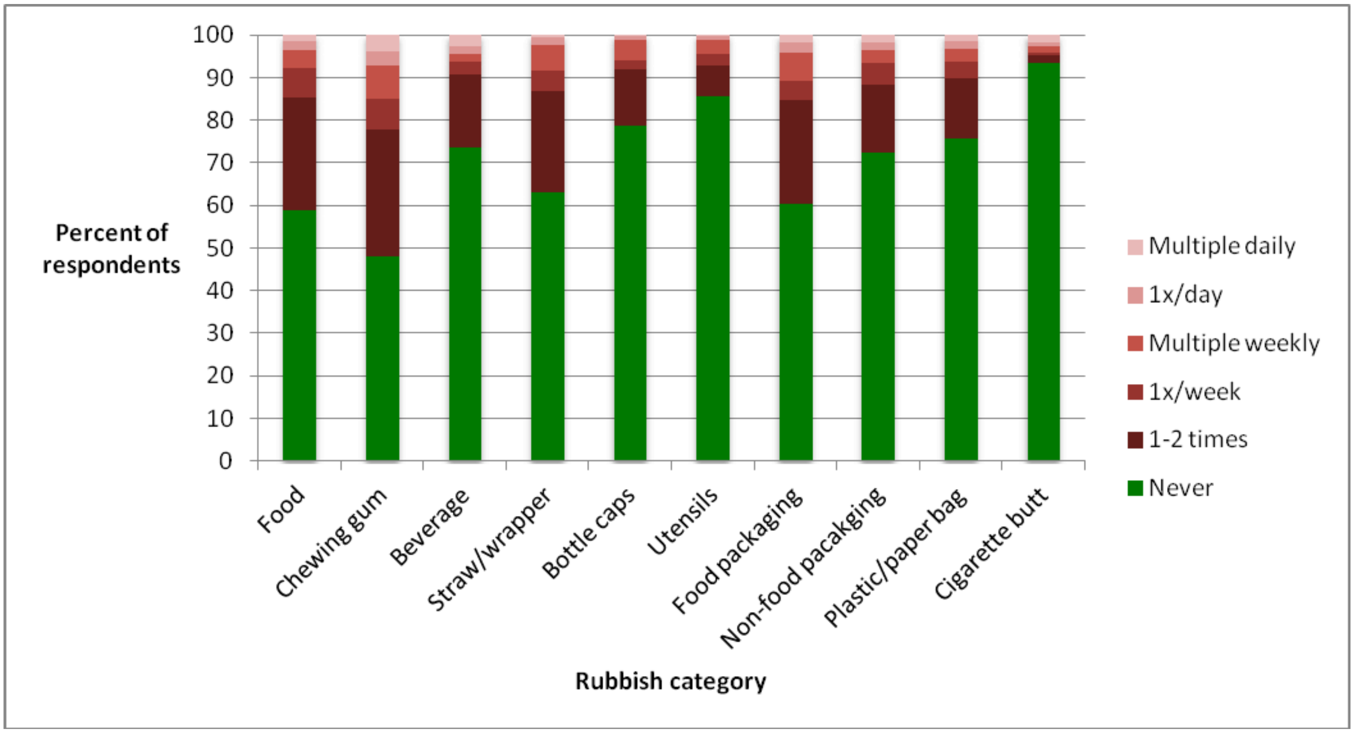
Device type	% with access	
Cell phone	91	
Basic cell	29	
Smart phone	61	
Computer	88	
Tablet	26	
Internet service type	**Less than weekly (%)**	**Weekly or more (%)**
Search internet	4.89	95.11
Use Facebook	14.00	86.00
Check email	17.71	82.29
Use YouTube	28.16	71.84
Read or write blogs	63.40	36.60
Use Twitter	76.22	23.78

[a] Reflects general type of user: regular user vs. sporadic user.

Types of Litter

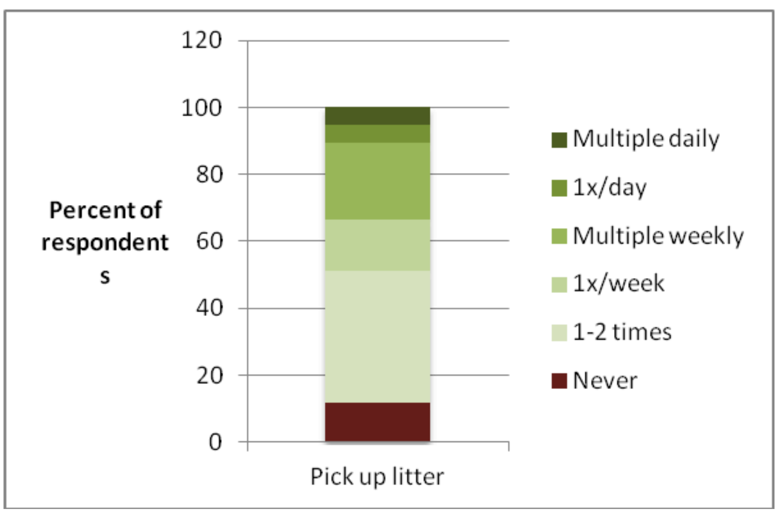
Frequency of littering differs across distinct litter items. The survey assessed frequency of past month littering for various rubbish categories. Past month was selected as the time scale to a) provide an opportunity to "catch" littering behavior that may be infrequent and b) tap into regular behavior. Approximately 86% of respondents reported littering at least one item in the past month. The results are displayed in figure 1 below. As can be seen in the figure, the most common frequency of littering across all categories of rubbish was "never". However, prevalence of littering at all (i.e., at least once in the past month) varied considerably among rubbish categories. The most commonly littered item was chewing gum, which 52% of respondents reported littering at least once in the past month. Of these, approximately 43% reported littering gum at least weekly. Next, 41% of respondents reported littering food waste at least once in the past month. Of these, only 36% littered weekly or more. Finally, 40% of respondents said that they littered food or beverage-related packaging at least once in the past month; of these, 42% littered packaging weekly or more. The least commonly littered item was cigarette butts: only 7% of respondents littered these in the past month. However, of the youth who littered cigarette butts at all, 74% did so weekly or more. It is likely that the low prevalence of cigarette butt littering is related strongly to prevalence of smoking rather than littering per se (no screening question was included to assess smoking status). Following cigarette butts as the second and third least littered items were disposable utensils (86% never littered in past month) and bottle caps (79% never littered in past month). Taken together, the results indicate that the majority of the sample littered regularly. Although the most common past-month frequency of littering for each rubbish type was "never", the proportion of respondents who littered at least once varied widely (from 7% for cigarette butts to 52% for chewing gum). This indicates that littering is a heterogeneous behavior that is specific to type of rubbish. Littering items from individual rubbish categories may be most appropriately conceptualized as separate target behaviors, and different intervention strategies may need to be applied to these different target behaviors. Additionally, among those who littered an item at least once in the past month, frequency of littering was relatively low across items, but also varied widely: the prevalence of littering items once per week or more ranged from 35% for beverage containers to 43% for chewing gum to 74% for cigarette butts. Again, this suggests that littering different types of rubbish may best be thought of as distinct behaviors.

Figure 1. Frequency of past month littering for various rubbish categories.



Respondents were also asked how frequently they picked up litter that was not theirs in the past month. 88% of respondents indicated that they did so at least once. The most common response was 1-2 times at 39%, and, notably, nearly half of respondents reported picking up litter that was not theirs at least weekly. See figure 2 for details.

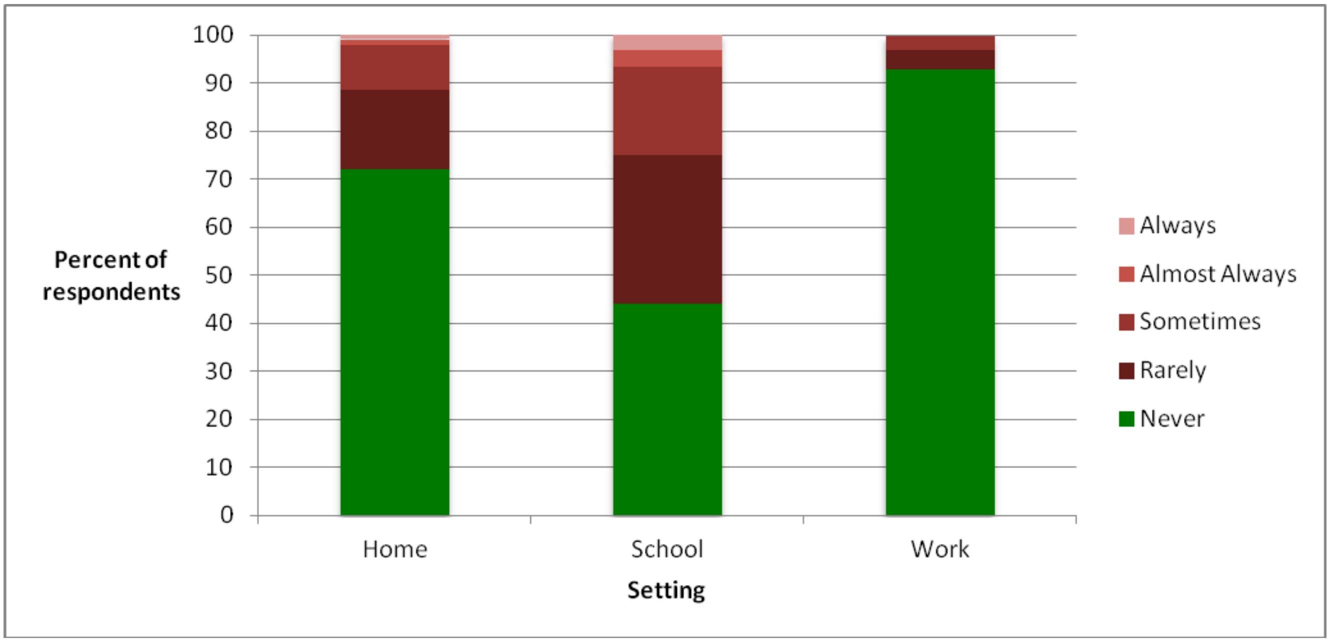
Figure 2. Frequency of picking up someone else's litter in the past month.



Littering situations

Previous studies of littering have found that littering frequency is related to context and setting. To explore this in the present sample, respondents were asked a series of questions related to the frequency with which they littered in different settings. Figure 3 displays the results for three common contexts: home, school, and work. The results show that littering at work was quite infrequent, with about 93% of respondents indicating they never litter at work. At school, the most common response was ‘never’; however, littering at school was more common relative to other settings: 25% of respondents littered at least sometimes at school. This suggests that campaign efforts at schools may be a prime target for intervention efforts.

Figure 3. Frequency distributions for littering at home (n=335), school (n=335), and work (n=287).



Barriers to littering

Respondents were asked to indicate which of several options served as barriers that prevented them from littering. Results are detailed in table 3 below. Briefly, the vast majority of the sample (91%) indicated that trash/recycling can placement deterred them from littering. The next most commonly endorsed response was that 71% of respondents would feel guilty if they littered. Next, 63% of respondents stated that they wanted to keep a certain area clean.

Table 3. Proportion of respondents who endorsed various perceive barriers to littering

Perceived Barrier	%
Trash cans/recycling bins near	91
I’d feel guilty	71
I want to keep area clean	63
Others would complain	54
Area already litter- free	45
No clean up crew	32
Anti-litter signs posted	22

Social Interactions and Social Norms

One of the campaign goals was to promote peer-to-peer interactions regarding litter. Toward this end, the survey assessed baseline frequency and impact of conversations about littering. Approximately one third of the sample also reported that they spoke with friends about littering in the past month, and of these, half stated that the conversations made them think littering was an important issue. Only 3% said that the conversations made them think littering was not an important issue, 21% said their opinion were not influenced, and 25% said that different friends had different influences on their opinions. These data will be used as a baseline against which comparisons are made using follow-up survey data.

The survey assessed social and personal norms concerning littering. First, respondents were asked how frequently they thought their friends littered. Response options were never, rarely, sometimes, frequently, all the time. Results were fairly normally distributed, with the most common response being "sometimes", and the extremes being the least endorsed options. Next, respondents gave ratings related to social (dis)approval related to littering. Respondents rated their level of approval of friends' littering. The mean score indicated that respondents slightly disapproved of friends littering. When asked to appraise their own (self) littering, respondents' disapproval was greater than that of their friends, on average. In other words, respondents disapproved more of their own littering behavior than their friends' littering behavior. Finally, respondents were asked to what extent their friends would disapprove of [respondents] littering. Notably, the modal response was that friends would neither approve nor disapprove of littering. Whereas respondents tended to disapprove of their own littering and their friends littering, their perception, on average, was that friends would not have strong opinions if they (the respondent) littered. This may be related to the psychological phenomenon called illusory superiority, whereby people overestimate their positive qualities and underestimate their shortcomings. In any case, the results suggest the value of leveraging personal norms in the anti-littering campaign. Results are detailed in table 4.

Table 4. Mean self-and social approval ratings related to littering.

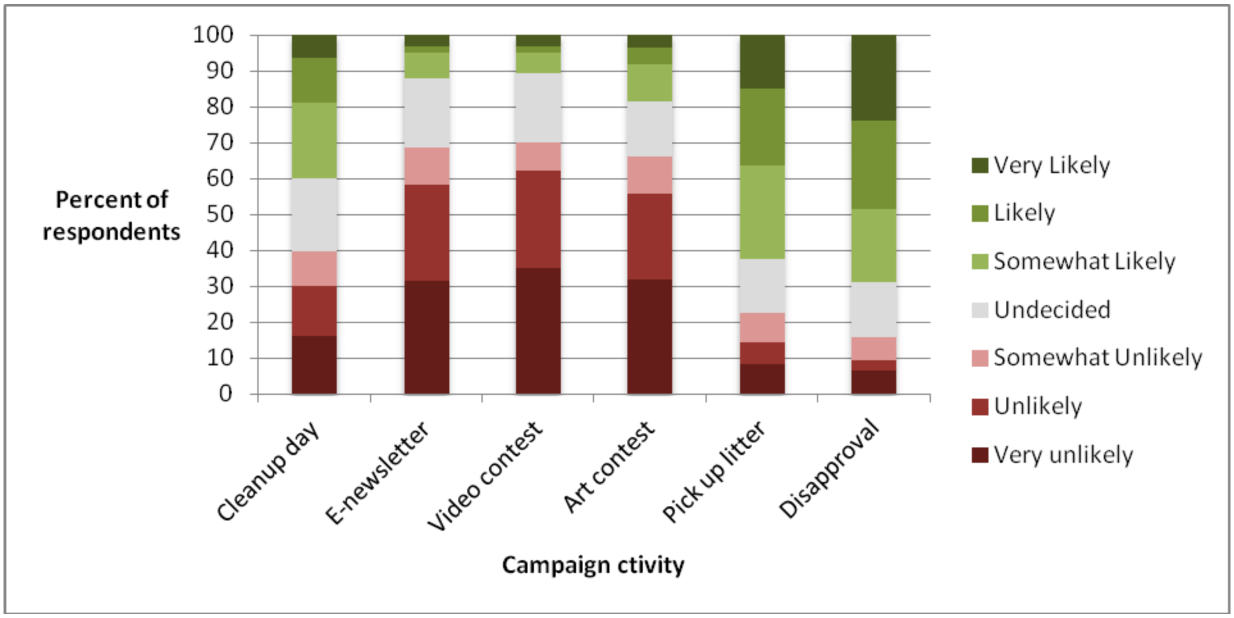
Approval rating of friends' littering	2.63 (1.18)
Self-approval rating	**2.30 (1.17)**
Estimated friend approval rating of respondent littering	**3.31 (1.13)**

Table note. Responses were rated on a 1 (strongly disapprove) – 7 (strongly approve) scale, so a "4" indicates a neutral score, scores lower than 4 indicate disapproval, and scores higher than 4 indicate approval.

Key outcomes: Willingness to participate in campaign activities & Likelihood of littering next month

Among the key outcomes assessed were willingness to participate in campaign activities, and likelihood of littering in the next month. Respondents were asked to rate their likelihood of participating in a number of activities related to the campaign. Results are displayed below in figure 4. The activity that most respondents were at least somewhat likely to do was to express disapproval if s/he saw a friend littering:, 69% of respondents reported they were at least somewhat likely to do so. Additionally, 62% of respondents were at least somewhat likely to pick up litter that was not their own, and 40% were at least somewhat likely to participate in a litter cleanup day.

Figure 4. Frequency distributions for willingness to participate in campaign activities.



Respondents also rated their likelihood of littering in the next month on a 7-point Likert scale ranging from (1) Very unlikely – (7) Very Likely. The mean score was 2.79 (SD=1.67), meaning that on average, respondents rated themselves as unlikely to litter. In fact, two thirds of respondents were at least somewhat unlikely to litter.

Inferential tests

Whereas the above analyses were all descriptive, we also examined inferential relationships between variables using linear multiple regression analyses. In particular, we examined predictors of eight prosocial outcomes(numbers 1-6 are campaign activities):

1. Intentions of volunteering for a litter cleanup day
2. Intentions of signing up for email newsletter
3. Intentions of entering video contest
4. Intentions of entering art contest
5. Intentions of picking up someone else's litter
6. Intentions of saying something to express disapproval or try to stop a friend from littering
7. Intentions of littering in the next month
8. Frequency of picking up someone else's litter in the past month

Potential predictors included: age (coded as continuous), gender (1=male, 2=female), high school GPA (coded as continuous on a 4.0 scale), guilt as a perceived barrier to littering (0=no, 1=yes), level of environmental concern[3] (rated on a 1-7 Likert scale where 1=low and 7=high), self-approval rating of past littering behavior (self-disapproval; rated on a 1-7 Likert scale where 1=strongly disapprove and 7=strongly approve), approval rating of friends littering (disapproval of friends; rated on a 1-7 Likert scale where 1=strongly disapprove and 7=strongly approve), and estimated friends' approval of self (respondent) littering (perceived friend disapproval; rated on a 1-7 Likert scale where 1=strongly disapprove and 7=strongly approve).

The dataset was limited to the 302 individuals who had complete data on all outcome and potential predictor variables. A step-wise model building procedure was used to construct final regression models: preliminary linear multiple regression models were run to identify important predictors for retention in final models, and then final models were run. For the preliminary models, potential predictors were broken down into conceptual blocks: demographics (including age, gender, and high school GPA) and norms (self-disapproval, disapproval of friends, and perceived friend disapproval). Additionally, environmental concern and guilt as a barrier to littering were tested separately as potential covariates. Each outcome was regressed on each of the conceptual blocks as well as the two covariates separately. In total, four separate preliminary models were run for each outcome. A decision criterion was applied for retaining predictors in the final models: a predictor that was significantly related to any outcome in a preliminary model was retained in the final model for all outcomes. This method was chosen so that all final models were based on the same set of predictors. Following this rule, age and injunctive norm[4] were dropped; the rest of the predictors were significantly related to at least one outcome in the preliminary models and therefore retained in final models. Appendix E displays the correlations among all outcome and predictor variables excluding demographics.

The final linear multiple regression models were then run with each of the eight prosocial outcomes regressed on the same set of predictors. Table 5 displays the standardized regression coefficients for these final models. All final models were significant, meaning that the set of chosen predictors was significantly associated with every outcome. Regression results showed that females had stronger anti-litter intentions than did males: they were significantly less likely to litter in the next month than were males, more likely to enter the art contest, and more likely to express disapproval of friends' littering. GPA was related to only one outcome; a higher GPA significantly predicted lower likelihood of littering in the next month. For every point increase in GPA, likelihood of littering in the next month declined by .15 standard deviation units. Not surprisingly, level of environmental concern was related to nearly all outcomes in the predicted direction with small – moderate effect sizes: greater level of concern was significantly associated with higher likelihood of picking up someone else's litter in the past month, and higher likelihood of participating in all of the campaign activities. Paradoxically, it was not related to likelihood of littering in the next month.

Next, whether participants cited guilt as a barrier to littering was related to likelihood of participating in two campaign activities: if participants reported guilt as a barrier, they were more likely to sign up for the e-newsletter and pick up someone else's litter. Disapproval of friends'

[3] Environmental concern was assessed using a single item that asked participants to rate their level of agreement with the following statement: "Environmental issues are important to me". Responses were provided on a 1-7 Likert scale ranging from Strongly Disagree (1) to Strongly Agree (7).
[4] Injunctive norm: people's perceptions of what is commonly approved or disapproved of within a particular culture.

littering behavior was significantly related to likelihood of littering in the next month, willingness to participate in the campaign's art contest, and willingness to express disapproval of a friend who litters. Specifically, greater disapproval of friends' littering was associated with lower intentions of littering in the next month. As well, the greater the disapproval, the more willing a respondent was to express disapproval towards a friend who was littering. One odd finding was that a lower level of disapproval of friends' littering was associated with greater willingness to participate in the campaign video contest. This could be a spurious relationship, or perhaps those who strongly disapprove of friends littering are simply unlikely to participate in the video contest because they prefer to focus their energies on alternate anti-litter strategies. Finally, higher levels of self-disapproval were associated with greater willingness to express disapproval of friends' littering behavior, and lower likelihood of littering in the next month.

Summarizing, probably the most important outcome was likelihood of littering in the next month; this was lower among females, those with relatively higher high school GPAs, and those who had stronger disapproval ratings of their own and their friends' littering behavior. As gender and GPA are not amenable to intervention, these results suggests that interventions that can beget a sense of disapproval of self and others' littering behavior may show promise for minimizing littering, at least in the short term.

Table 5. Standardized regression beta weights for final models (n=302).

Predictor	Outcome							
	Pick up past month	Likelihood litter next month	Clean up day	E-news-letter	Video contest	Art contest	Pick up else's litter	Express Disapproval
Gender[a]	-0.12 (p<.06)	-0.11 (p<.05)	0.06 (p<.31)	0.10 (p<.88)	0.004 (p<.95)	0.20 (p<.002)	0.07 (p<.24)	0.20 (p<.0001)
GPA	-0.04 (p<.57)	-0.15 p<.01	0.05 (p<.36)	0.001 p=.99	-0.06 p<.32	-0.01 (p<.93)	0.02 (p<.67)	0.05 (p<.32)
Environmental concern	0.20 (p<.01)	0.02 (p<.83)	0.15 (p<.02)	0.29 (p<.0001)	0.30 (p<.0001)	0.12 (p<.05)	0.24 (p<.0001)	0.20 (p<.0001)
Guilt	0.07 (p<.31)	-0.09 (p<.10)	0.050 (p<.39)	0.14 (p<.03)	0.09 (p<.17)	0.01 (p<.88)	0.17 (p<.004)	0.05 (p<.36)
Disapproval of friends	-0.11 (p<.17)	0.24 (p<.001)	-0.06 (0<.42)	0.02 (p<.86)	0.17 (p<.04)	0.02 (p<.77)	-0.13 (p<.07)	-0.28 (p<.0001)
Self-disapproval	0.06 (p<.42)	0.15 (p<.03)	-0.14 (p<.07)	0.09 (p<.23)	-0.03 (p<.68)	-0.03 (p<.75)	-0.07 (p<.32)	-0.13 (p<.05)
Model F	3.29 p<.003	16.48 p<.0001	6.25 P<.0001	5.23 p<.0001	4.76 p<.0001	3.19 p<.005	13.36 p<.0001	27.73 p<.0001
Model R^2	.0663	.2624	.1189	.1014	.0932	.0645	.2239	.3744

Table note: Standardized betas are reported. Green highlighting indicates result is significant at the .05 level.
[a]1=male; 2=female.

6. Conclusions

The goal of this project was to assess and describe littering behavior and perceived social norms related to littering among youth living in the Bay Area, thereby establishing a baseline from which the efficacy of the ensuing campaigns could be judged. The data collected stand alone to characterize Bay Area youth, and also will serve as a baseline against which data from a future follow-up survey will be compared following outreach campaign implementation.

In terms of past month littering prevalence, 86% of respondents reported littering at least one item in the past month. The most commonly littered items were chewing gum, food waste, and food or beverage-related packaging. The least commonly littered items included cigarette butts, disposable utensils, and bottle caps. Although the most common past-month frequency of littering for each rubbish type was "never", the proportion of respondents who littered at least once varied widely (from 7% for cigarette butts to 52% for chewing gum). Similarly, among those who littered an item at least once in the past month, frequency of littering was relatively low across items, but also varied widely: the prevalence of littering items once per week or more ranged from 35% for beverage containers to 43% for chewing gum to 74% for cigarette butts. This shows that littering is a heterogeneous behavior that is specific to type of rubbish. Littering items from individual rubbish categories may be most appropriately conceptualized as separate target behaviors.

Previous work has found that littering frequency is related to context and setting. Littering at school was more common relative to other settings: 25% of respondents littered at least sometimes at school. This suggests that campaign efforts at schools may be a prime target for intervention efforts.

Perceived barriers to littering were also assessed by the survey. The vast majority of the sample (91%) indicated that trash/recycling can placement deterred them from littering. The next most commonly endorsed response was that 71% of respondents would feel guilty if they littered.

In terms of prosocial behavior, 88% of respondents indicated that they pick up trash that was not their own at least once in the past month. Respondents also rated their likelihood of littering in the next month on a 7-point Likert scale ranging from (1) Very unlikely – (7) Very Likely. The mean score was 2.79 (SD=1.67), meaning that on average, respondents rated themselves as unlikely to litter. In fact, two thirds of respondents were at least somewhat unlikely to litter.

Respondents also rated their likelihood of participating in a number of activities related to the campaign. The activity that most respondents were at least somewhat likely to do was expressing disapproval if s/he saw a friend littering; 69% of respondents reported they were at least somewhat likely to do so. Additionally, 62% of respondents were at least somewhat likely to pick up litter that was not their own, and 40% were at least somewhat likely to participate in a litter cleanup day. These behaviors may be "low hanging fruit" for intervention programs.

Finally, a series of regression models were run to predict eight prosocial outcomes (past month frequency of picking up others' litter, intentions of littering in the next month, and likelihood of participating in each of six campaign activities) based on demographics, guilt as a barrier to littering, level of environmental concern, and personal and social norms. Summarizing, females, those with relatively higher high school GPAs, and those who had stronger disapproval ratings of their own and their friends' littering behavior were significantly associated with several prosocial outcomes in the desired direction, with small to moderate effect sizes. As gender and GPA are not amenable to intervention, the findings suggests that interventions that can beget a sense of disapproval of self and others' littering behavior may show promise for minimizing littering, at least in the short term.

Appendix A: Survey

Q1 Hello! Thank you for your interest in our campaign. Please respond to the following questions as honestly as possible. Your answers will remain confidential. There are no right or wrong answers; we are interested in hearing about your true opinions!

What is your birthday? MM/DD/YYYY

What is your gender?
- Male (1)
- Female (2)

What is your home zip code?

Please indicate your current status.
- I am a high school student. (1)
- I am a student at a 4-year university (2)
- I am a community college student (3)
- I am a trade school student (4)
- I am a graduate student (5)
- I am not a student (6)

Answer If Please indicate your current status. I am not a student Is Not Selected
Please indicate which school you attend.

Answer If Please indicate your current status. I am a high school student. Is Selected
What is your high school GPA (e.g., 3.1)?

Answer If Please indicate your current status. I am a student at a 4-year university Is Selected Or Please indicate your current status. I am a community college student Is Selected Or Please indicate your current status. I am a trade school student Is Selected Or Please indicate your current status. I am a graduate student Is Selected
What is your current GPA (e.g., 3.1)?

What are the initials of your first and last name? For example, John Smith = JS.(If you have multiple first or last names, use the initials of your first first name and first last name. For example: Maria Eugenia Garcia Alvarez = MG.)

Which of the following do you have access to (select all that apply)?

- ❑ Basic cell phone without internet access (1)
- ❑ Smart phone (e.g., iPhone, Blackberry, Droid) with internet access (2)
- ❑ Desktop or laptop computer with internet connection at home (3)
- ❑ Tablet device with internet (e.g., iPad) (4)

How often do you do the following?

Search for things online/ on the internet (1)	❍	❍	❍	❍	❍	❍	❍
Check email (2)	❍	❍	❍	❍	❍	❍	❍
Use Facebook (3)	❍	❍	❍	❍	❍	❍	❍
Use Twitter (4)	❍	❍	❍	❍	❍	❍	❍
Check out or post videos on Youtube (5)	❍	❍	❍	❍	❍	❍	❍
Read or write Blogs (6)	❍	❍	❍	❍	❍	❍	❍
Use other internet-based service (please specify) (7)	❍	❍	❍	❍	❍	❍	❍

Environmental issues are important to me.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Somewhat Disagree (3)
- ❍ Neither Agree nor Disagree (4)
- ❍ Somewhat Agree (5)
- ❍ Agree (6)
- ❍ Strongly Agree (7)

This survey asks questions about littering, which is defined as: Any waste item that is discarded, placed, thrown, or dropped in a public or private area, and is not immediately removed. This includes waste items large and small, discarded intentionally or accidentally. In short, litter is waste in the wrong place!

In the past month, how often have you littered each of the following items?

Food (1)	❍	❍	❍	❍	❍	❍
Chewing gum (2)	❍	❍	❍	❍	❍	❍
Beverage bottles, cans, cups, and/or cartons (3)	❍	❍	❍	❍	❍	❍
Straw or straw wrapper (4)	❍	❍	❍	❍	❍	❍
Bottle caps (5)	❍	❍	❍	❍	❍	❍
Disposable utensils (e.g., forks, spoons) (6)	❍	❍	❍	❍	❍	❍
Wrappers, bags, or other food or beverage packaging (7)	❍	❍	❍	❍	❍	❍
Packaging from non-food or beverage items (8)	❍	❍	❍	❍	❍	❍
Plastic or paper bag (9)	❍	❍	❍	❍	❍	❍
Cigarette butts (10)	❍	❍	❍	❍	❍	❍
Other (please specify) (11)	❍	❍	❍	❍	❍	❍

In the past month, how often have you picked up a piece of litter that was not yours and disposed of it?

- ❍ Never (1)
- ❍ Maybe 1-2 times (2)
- ❍ About one time per week (3)
- ❍ A few times per week (4)
- ❍ About one time per day (5)
- ❍ Multiple times per day (6)

People may or may not litter in different situations. Please indicate how frequently you litter in each of the following situations:

Prior to / after eating or drinking something (1)	❍	❍	❍	❍	❍	❍
When I have to put out my cigarette (2)	❍	❍	❍	❍	❍	❍
When I'm in a vehicle (3)	❍	❍	❍	❍	❍	❍
At home (4)	❍	❍	❍	❍	❍	❍
At school (5)	❍	❍	❍	❍	❍	❍
At work (6)	❍	❍	❍	❍	❍	❍
Other (please specify) (7)	❍	❍	❍	❍	❍	❍

What prevents you from littering (select all that apply)?

- ❑ Trash cans / recycling bins are nearby (1)
- ❑ There are anti-litter signs posted (2)
- ❑ When an area is already litter-free (3)
- ❑ When I feel that I want to keep a certain area clean (4)
- ❑ Friends, family, or others would complain about my behavior if I littered (5)
- ❑ I know there is no clean-up crew for a given area (6)
- ❑ I would feel guilty if I littered (7)
- ❑ Other (please specify) (8) ____________________

How often do you think your friends litter?

- ❍ Never (1)
- ❍ Rarely (2)
- ❍ Sometimes (3)
- ❍ Frequently (4)
- ❍ All the time (5)

When I see my friends littering, I _________ of their behavior.

- ❍ Strongly disapprove (1)
- ❍ Disapprove (2)
- ❍ Somewhat Disapprove (3)
- ❍ Neither approve nor disapprove (4)
- ❍ Somewhat approve (5)
- ❍ Approve (6)
- ❍ Strongly approve (7)

If my friends saw me litter, they would __________ of my behavior.

- ❍ Strongly disapprove (1)
- ❍ Disapprove (2)
- ❍ Somewhat Disapprove (3)
- ❍ Neither approve nor disapprove (4)
- ❍ Somewhat approve (5)
- ❍ Approve (6)
- ❍ Strongly approve (7)

When I think of times that I have littered, I ___________ of my behavior.

- ❍ Strongly disapprove (1)
- ❍ Disapprove (2)
- ❍ Somewhat Disapprove (3)
- ❍ Neither approve nor disapprove (4)
- ❍ Somewhat approve (5)
- ❍ Approve (6)
- ❍ Strongly approve (7)

In the past month, have you spoken with friends about littering?

- ❍ No (1)
- ❍ Yes (2)

Answer If In the past month, have you spoken with friends about lit... Yes Is Selected

How do you think these conversations influenced your opinions about littering/

- They made me think that littering is an important issue (1)
- They made me think littering is not an important issue (2)
- They didn't influence my opinion about littering (3)
- It depended who I was talking to; different friends had different effects (4)

In the next month, how likely is it that you will litter? Remember, litter is defined as discarding, placing, throwing, or dropping any waste item in a public or private area and not immediately removing it. This includes waste items large and small, discarded intentionally or accidentally.

- Very Unlikely (1)
- Unlikely (2)
- Somewhat Unlikely (3)
- Undecided (4)
- Somewhat Likely (5)
- Likely (6)
- Very Likely (7)

How willing are you to participate in the following activities?

Volunteer for a litter cleanup day (1)	❍	❍	❍	❍	❍	❍	❍
Sign up for our campaign email newsletter (2)	❍	❍	❍	❍	❍	❍	❍
Enter the video contest for our campaign (3)	❍	❍	❍	❍	❍	❍	❍
Enter an art contest that is part of the campaign (4)	❍	❍	❍	❍	❍	❍	❍
Pick up someone else's litter (5)	❍	❍	❍	❍	❍	❍	❍
If I see a friend littering, say something to express disapproval or try to stop her/him from littering (6)	❍	❍	❍	❍	❍	❍	❍

We may want to follow up with you in the future to see if your opinions of littering have changed. Please provide your contact information below. Your privacy will be respected and the information you provide will not be shared with anyone outside of the survey team.

Email (1)

Cell Phone (xxx-xxx-xxxx) (2)

Home Phone (xxx-xxx-xxxx) (3)

If you need proof of survey participation, you must do the following:1. Confirm your email address below2. Print out this page & take it to your teacher or supervisor3. Hit the next button to end the survey. If you DO NOT need proof of participation, hit the next button to end this survey.

Email confirmation (1)

BASMAA Survey Report

Question: Year born	Count (%) n=353	Gender	
		Male n= 146	Female n= 207
1988	2 (0.57)	1 (0.68)	1 (0.48)
1989	1 (0.28)	0 (0.00)	1 (0.48)
1990	2 (0.57)	0 (0.00)	2 (0.97)
1991	2 (0.57)	1 (0.68)	1 (0.48)
1992	3 (0.85)	0 (0.00)	3 (1.45)
1993	21 (5.95)	11 (7.53)	10 (4.83)
1994	94 (26.63)	37 (25.34)	57 (27.54)
1995	92 (26.06)	36 (24.66)	56 (27.05)
1996	100 (28.33)	44 (30.14)	56 (27.05)
1997	36 (10.20)	16 (10.96)	20 (9.66)

Question: What is your gender	Count (%) n=353
Male	146 (41.36)
Female	207 (58.64)

Question: Please indicate current status	Count (%) n=353	Gender	
		Male n= 146	Female n= 207
I am a high school student	341 (96.60)	144 (98.63)	197 (95.17)
I am a student at a 4-year university	1 (0.28)	0 (0.00)	1 (0.48)
I am a community college student	10 (2.83)	2 (1.37)	8 (3.86)
I am a trade school student	0 (0.00)	0 (0.00)	0 (0.00)
I am a graduate student	0 (0.00)	0 (0.00)	0 (0.00)

I am not a student	1 (0.28)	0 (0.00)	1 (0.48)

Question: Please indicate which school you attend.	Count (%) n=350	Gender	
		Male n= 145	Female n= 205
Alameda High School	3 (0.86)	0 (0.00)	3 (1.47)
Carlmont High School	39 (11.14)	20 (13.80)	19 (9.28)
Chabot College	2 (0.57)	1 (0.69)	1 (0.49)
Evergreen	1 (0.21)	1 (0.69)	0 (0.00)
Fairfield High School	107 (30.56)	46 (31.73)	61 (29.76)
Indpendence High School	10 (2.86)	6 (4.14)	4 (1.95)
Jesse Bethel High School	2 (0.57)	1 (0.69)	1 (0.49)
Las Positas Community College	5 (1.43)	0 (0.00)	5 (2.45)
Oceana High School	100 (28.56)	41 (28.28)	59 (28.79)
Ohlone College	1 (0.29)	0 (0.00)	1 (0.49)
Redwood High School	9 (2.57)	2 (1.38)	7 (3.42)
San Leandro High School	1 (0.29)	0 (0.00)	1 (0.49)
Sequioa High School	29 (8.29)	9 (6.21)	20 (9.76)
University of California-Berkeley	1 (0.21)	0 (0.00)	1 (0.49)
Woodside High School	35 (10.00)	15 (10.35)	20 (9.77)
Other	5 (1.43)	3 (2.07)	2 (0.98)

Question	Mean n=331	Gender	
		Male n= 139	Female n= 192
What is your high school GPA?	3.26	3.10	3.38

Question	Mean n=10	Gender	
		Male	Female

	n=10	n= 2	n= 8
What is your current GPA?	3.34	2.85	3.46

Question: Which of the following do you have access to (select all that apply)	**Count n=752**	**Gender**	
		Male n= 311	**Female n= 441**
Basic cell phone without internet access	130	59	71
Smart phone (e.g., iPhone, Blackberry, Droid) with internet access	217	88	129
Desktop or laptop computer with internet connection at home	312	128	184
Tablet device with internet (e.g., iPad)	93	36	57

Question: How often do you do the following?	**Count (%)**	**Gender**	
		Male	**Female**
Search for things online/on the internet	**n = 348**	**n = 144**	**n = 204**
Never	0 (0.00)	0 (0.00)	0 (0.00)
Less than Once a Month	2 (0.57)	0 (0.00)	2 (0.98)
Once a Month	3 (0.86)	1 (0.69)	2 (0.98)
2-3 Times a Month	12 (3.45)	6 (4.17)	6 (2.94)
Once a Week	15 (4.31)	9 (6.25)	6 (2.94)
2-3 Times a Week	74 (21.26)	37 (25.69)	37 (18.14)
Daily	242 (69.54)	91 (63.19)	151 (74.02)
Check email	**n = 350**	**n = 144**	**n = 206**
Never	8 (2.29)	6 (4.17)	2 (0.97)
Less than Once a Month	16 (4.57)	9 (6.25)	7 (3.40)
Once a Month	13 (3.71)	5 (3.47)	8 (3.88)
2-3 Times a Month	25 (7.14)	14 (9.72)	11 (5.34)
Once a Week	50 (14.29)	25 (17.36)	25 (12.14)
2-3 Times a Week	80 (22.86)	32 (22.22)	48 (23.30)
Daily	158 (45.15)	53 (36.81)	105 (50.97)
Use Facebook	**n = 350**	**n = 144**	**n = 205**

Never	37 (10.57)	21 (14.58)	16 (7.77)
Less than Once a Month	4 (1.14)	2 (1.39)	2 (0.97)
Once a Month	1 (0.29)	1 (0.69)	0 (0.00)
2-3 Times a Month	7 (2.00)	3 (2.08)	4 (1.94)
Once a Week	16 (4.57)	7 (4.86)	9 (4.37)
2-3 Times a Week	44 (12.57)	20 (13.89)	24 (11.65)
Daily	241 (68.86)	90 (62.50)	151 (73.30)
Use Twitter	**n = 349**	**n = 143**	**n = 206**
Never	243 (69.63)	114 (79.72)	129 (62.62)
Less than Once a Month	15 (4.30)	2 (1.40)	13 (6.31)
Once a Month	4 (1.15)	2 (1.40)	2 (0.97)
2-3 Times a Month	4 (1.15)	2 (1.40)	2 (0.97)
Once a Week	8 (2.29)	1 (0.70)	7 (3.40)
2-3 Times a Week	14 (4.01)	1 (0.70)	13 (6.31)
Daily	61 (17.48)	21 (14.69)	40 (19.42)
Check out or post videos on Youtube	**n = 348**	**n = 143**	**n = 205**
Never	40 (11.49)	11 (7.69)	29 (14.15)
Less than Once a Month	23 (6.61)	7 (4.90)	16 (7.80)
Once a Month	13 (3.74)	3 (2.10)	10 (4.88)
2-3 Times a Month	22 (6.32)	8 (5.59)	14 (6.83)
Once a Week	32 (9.20)	9 (6.29)	23 (11.22)
2-3 Times a Week	89 (25.57)	34 (23.78)	55 (26.83)
Daily	129 (37.07)	71 (49.65)	58 (28.29)
Read or write Blogs	**n = 347**	**n = 142**	**n = 205**
Never	157 (45.24)	77 (54.23)	80 (39.02)
Less than Once a Month	37 (10.66)	13 (9.15)	24 (11.71)
Once a Month	16 (4.61)	8 (5.63)	8 (3.90)
2-3 Times a Month	10 (2.88)	4 (2.82)	6 (2.93)
Once a Week	22 (6.34)	9 (6.34)	13 (6.34)
2-3 Times a Week	35 (10.09)	10 (7.04)	25 (12.20)
Daily	70 (20.17)	21 (14.79)	49 (23.90)
Use other internet-based service (please specify)	**n = 256**	**n = 112**	**n = 144**

Never	152 (59.38)	68 (60.71)	84 (58.33)
Less than Once a Month	4 (1.56)	2 (1.79)	2 (1.39)
Once a Month	2 (0.78)	1 (0.89)	1 (0.69)
2-3 Times a Month	7 (2.73)	4 (3.57)	3 (2.08)
Once a Week	6 (2.34)	3 (2.68)	3 (2.08)
2-3 Times a Week	12 (4.69)	4 (3.57)	8 (5.56)
Daily	73 (28.520	30 (26.79)	43 (29.86)
Specific answers:			
Aim			
AT&T			
craigslist.com			
Deviant art. Art posting site			
Everything			
formspring			
Forum			
games			
goodreads, blackboard			
google			
google +			
Grades			
hulu			
Infinite Campus, etc			
Instagram			
Internet shopping			
ipod			
kids.yahoo			
Lap Top			
livemocha			
Music Sites(grooveshark.com			
Nuts			
Online classes			
Online video games			
Other social networks, forums			
pandora.com			

plastation network
porn
read biographies
read manga
Read Online Articles
Reading and playing games
reddit
shopping
Skype
spanish translator
sports
Study online
Tumblr
Video Games
watch anime
watch drama
Webcomics
WorldStarHipHop
Xbox Time
yahoo
youtube.com

Question: Environmental issues are important to me	**Count (%) n= 346**	**Gender**	
		Male n= 143	**Female n= 203**
Strongly Disagree	4 (1.16)	1 (0.70)	3 (1.48)
Disagree	4 (1.16)	3 (2.10)	1 (0.49)
Somewhat Disagree	2 (0.58)	2 (1.40)	0 (0.00)
Neither Agree nor Disagree	20 (5.78)	11 (7.69)	9 (4.43)
Somewhat Agree	68 (19.65)	35 (24.48)	33 (16.26)
Agree	170 (49.13)	65 (45.45)	105 (51.72)
Strongly Agree	78 (22.54)	26 (18.18)	52 (25.62)

Question: In the past month, how often have you littered each of the following items?	Count (%)	Gender	
		Male	Female
Food	n= 347	n= 143	n= 204
Never	204 (58.79)	79 (55.24)	125 (61.27)
Maybe 1-2 times	92 (26.51)	40 (27.97)	52 (25.49)
About one time per week	24 (6.92)	11 (7.69)	13 (6.37)
A few times per week	15 (4.32)	8 (5.59)	7 (3.43)
About one time per day	7 (2.02)	1 (0.70)	6 (2.94)
Multiple times per day	5 (1.44)	4 (2.80)	1 (0.49)
Chewing gum	n = 347	n = 143	n = 204
Never	167 (43.13)	57 (39.86)	110 (53.92)
Maybe 1-2 times	103 (29.68)	47 (32.87)	56 (27.45)
About one time per week	25 (7.20)	14 (9.79)	11 (5.39)
A few times per week	27 (7.78)	15 (10.49)	12 (5.88)
About one time per day	12 (3.46)	4 (2.80)	8 (3.92)
Multiple times per day	13 (3.75)	6 (4.20)	7 (3.43)
Beverage bottles, cans, cups, and/or cartons	n = 347	n = 143	n = 204
Never	255 (73.49)	97 (67.83)	158 (77.45)
Maybe 1-2 times	60 (17.29)	28 (19.58)	32 (15.69)
About one time per week	10 (2.88)	6 (4.20)	4 (1.96)
A few times per week	6 (1.73)	5 (3.50)	1 (0.49)
About one time per day	7 (2.02)	2 (1.40)	5 (2.45)
Multiple times per day	9 (2.59)	5 (3.50)	4 (1.96)
Straw or straw wrapper	n = 347	n = 143	n = 204
Never	219 (63.11)	90 (62.94)	129 (63.24)
Maybe 1-2 times	82 (23.63)	31 (21.68)	51 (25.00)
About one time per week	17 (4.90)	6 (4.20)	11 (5.39)
A few times per week	21 (6.05)	15 (10.49)	6 (2.94)
About one time per day	6 (1.73)	1 (0.70)	5 (2.45)
Multiple times per day	2 (0.58)	0 (0.00)	2 (0.98)
Bottle caps	n = 344	n = 141	n = 203

Never	271 (78.78)	103 (73.05)	168 (82.76)
Maybe 1-2 times	45 (13.08)	24 (17.02)	21 (10.34)
About one time per week	7 (2.03)	3 (2.13)	4 (1.97)
A few times per week	17 (4.94)	11 (7.80)	6 (2.96)
About one time per day	3 (0.87)	0 (0.00)	3 (1.48)
Multiple times per day	1 (0.29)	0 (0.00)	1 (0.49)
Disposable utensils (e.g., forks, spoons)	**n = 343**	**n = 142**	**n = 201**
Never	294 (85.71)	120 (84.51)	174 (86.57)
Maybe 1-2 times	24 (7.00)	9 (6.34)	15 (7.46)
About one time per week	10 (2.92)	5 (3.52)	5 (2.49)
A few times per week	11 (3.21)	7 (4.93)	4 (1.99)
About one time per day	3 (0.87)	0 (0.00)	3 (1.49)
Multiple times per day	1 (0.29)	1 (0.70)	0 (0.00)
Wrappers, bags, or other food or beverage packaging	**n = 346**	**n = 142**	**n = 204**
Never	209 (60.40)	84 (59.15)	125 (61.27)
Maybe 1-2 times	84 (24.28)	35 (24.65)	49 (24.02)
About one time per week	16 (4.62)	5 (3.52)	11 (5.39)
A few times per week	22 (6.36)	12 (8.45)	10 (4.90)
About one time per day	9 (2.60)	5 (3.52)	4 (1.96)
Multiple times per day	6 (1.73)	1 (0.70)	5 (2.45)
Packaging from non-food or beverage items	**n = 343**	**n = 141**	**n = 202**
Never	248 (72.30)	95 (67.38)	153 (75.74)
Maybe 1-2 times	55 (16.03)	25 (17.73)	30 (14.85)
About one time per week	17 (4.96)	10 (7.09)	7 (3.47)
A few times per week	11 (3.21)	8 (5.67)	3 (1.49)
About one time per day	6 (1.75)	2 (1.42)	4 (1.98)
Multiple times per day	6 (1.75)	1 (0.71)	5 (2.48)
Plastic or paper bag	**n = 343**	**n = 140**	**n = 203**
Never	259 (75.51)	99 (70.71)	160 (78.82)
Maybe 1-2 times	49 (14.29)	26 (18.57)	23 (11.33)
About one time per week	13 (3.79)	5 (3.57)	8 (3.94)
A few times per week	11 (3.21)	6 (4.29)	5 (2.46)

About one time per day	6 (1.75)	3 (2.14)	3 (1.48)
Multiple times per day	5 (1.46)	1 (0.71)	4 (1.97)
Cigarette butts	**n = 345**	**n = 142**	**n = 203**
Never	322 (93.33)	134 (94.37)	188 (92.61)
Maybe 1-2 times	6 (1.74)	1 (0.70)	5 (2.46)
About one time per week	2 (0.58)	0 (0.00)	2 (0.99)
A few times per week	6 (1.74)	4 (2.82)	2 (0.99)
About one time per day	3 (0.87)	0 (0.00)	3 (1.48)
Multiple times per day	6 (1.74)	3 (2.11)	3 (1.48)
Other (please specify)	**n = 171**	**n = 72**	**n = 99**
Never	161 (94.15)	65 (90.28)	96 (96.97)
Maybe 1-2 times	2 (1.17)	1 (1.39)	1 (1.01)
About one time per week	4 (2.34)	2 (2.78)	2 (2.02)
A few times per week	0 (0.00)	0 (0.00)	0 (0.00)
About one time per day	0 (0.00)	0 (0.00)	0 (0.00)
Multiple times per day	4 (2.34)	4 (5.56)	0 (0.00)
Specific answers:			
clothes			
Condoms			
Dust/Crumbs/etc.			
fruit peels			
I don't litter anything except for my dead skin cells.			
None			
paper			
paper, yogurt cups			
processed food wrappers			
sometimes I drop gum wrappers			
spit			
sunflower seeds			
tissues			
vegetables			

Question: In the past month, how often have you picked up a piece of litter that was not yours and disposed it?	Count (%) n= 337	Gender	
		Male n= 136	Female n= 201
Never	40 (11.87)	14 (10.29)	26 (12.94)
Maybe 1-2 times	132 (39.17)	57 (41.91)	75 (37.31)
About one time per week	52 (15.43)	17 (12.50)	35 (17.41)
A few times per week	77 (22.85)	31 (22.79)	46 (22.89)
About one time per day	18 (5.34)	7 (5.15)	11 (5.47)
Multiple times per day	18 (5.34)	10 (7.35)	8 (3.98)

Question: In the past month, how often have you picked up a piece of litter that was not yours and disposed it?	Count (%)	Gender	
		Male	Female
Prior to/after eating or drinking something	**n= 340**	**n= 138**	**n= 202**
Never	141 (41.47)	47 (34.06)	94 (46.53)
Rarely	122 (35.88)	48 (34.78)	74 (36.63)
Sometimes	61 (17.94)	35 (25.36)	26 (12.87)
Almost Always	7 (2.06)	4 (2.90)	3 (1.49)
Always	7 (2.06)	3 (2.17)	4 (1.98)
Not applicable	2 (0.59)	1 (0.72)	1 (0.50)
When I have to put out my cigarette	**n = 340**	**n = 138**	**n = 202**
Never	261 (76.76)	109 (78.99)	152 (75.25)
Rarely	4 (1.18)	1 (0.72)	3 (1.49)
Sometimes	7 (2.06)	2 (1.45)	5 (2.48)
Almost Always	5 (1.47)	3 (2.17)	2 (0.99)
Always	3 (0.88)	2 (1.45)	1 (0.50)
Not applicable	60 (17.65)	21 (15.22)	39 (19.31)
When I'm in a vehicle	**n = 336**	**n = 135**	**n = 201**
Never	208 (61.90)	83 (61.48)	125 (62.19)
Rarely	81 (24.11)	34 (25.19)	47 (23.38)
Sometimes	31 (9.23)	14 (10.37)	17 (8.46)
Almost Always	5 (1.49)	4 (1.48)	3 (1.49)
Always	3 (0.89)	0 (0.00)	3 (1.49)

Not applicable	8 (2.38)	2 (1.48)	6 (2.99)
At home	**n = 337**	**n = 137**	**n = 200**
Never	241 (71.51)	99 (72.26)	142 (71.00)
Rarely	55 (16.32)	19 (13.87)	36 (18.00)
Sometimes	31 (9.20)	15 (10.95)	16 (8.00)
Almost Always	4 (1.19)	3 (2.19)	1 (0.50)
Always	4 (1.19)	0 (0.00)	4 (2.00)
Not applicable	2 (0.59)	1 (0.73)	1 (0.50)
At school	**n = 339**	**n = 137**	**n = 202**
Never	147 (43.36)	46 (33.58)	101 (50.00)
Rarely	104 (30.68)	44 (32.12)	60 (29.70)
Sometimes	62 (18.29)	33 (24.09)	29 (14.36)
Almost Always	11 (3.24)	8 (5.84)	3 (1.49)
Always	11 (3.24)	4 (2.92)	7 (3.47)
Not applicable	4 (1.18)	2 (1.46)	2 (0.99)
At work	**n = 337**	**n = 137**	**n = 200**
Never	266 (78.93)	102 (74.45)	164 (82.00)
Rarely	12 (3.56)	9 (6.57)	3 (1.50)
Sometimes	8 (2.37)	5 (3.65)	3 (1.50)
Almost Always	0 (0.00)	0 (0.00)	0 (0.00)
Always	1 (0.30)	0 (0.00)	1 (0.50)
Not applicable	50 (14.84)	21 (15.33)	29 (14.50)
Other (please specify)	**n = 157**	**n = 66**	**n = 91**
Never	122 (77.71)	48 (72.73)	74 (81.32)
Rarely	4 (2.55)	1 (1.52)	3 (3.30)
Sometimes	9 (5.73)	5 (7.58)	4 (4.40)
Almost Always	1 (0.64)	1 (1.52)	0 (0.00)
Always	1 (0.64)	1 (1.52)	0 (0.00)
Not applicable	20 (12.74)	10 (15.15)	10 (10.99)

	Count n=	**Gender**	

Question: What prevents you from littering (select all that apply)?	Count n= 1364	Male n= 578	Female n= 846
Trash cans/ recycling bins are nearby	322	131	191
There are anti-litter signs posted	77	97	40
When an area is already litter-free	160	55	105
When I feel that I want to keep a certain area clean	221	80	141
Friends, family, or others would complain about my behavior if I littered	191	79	112
I know there is no clean-up crew for a give area	114	36	78
I would feel guilty if I littered	252	91	161
Other (please specify)	27	9	18

Specific answers:
Because it goes against my ethics
camping
Guilty
habitual - never litter
i care about the enviorment too much
i don't like to litter
I dont like trash on the ground
I dont mind walking to a trash can.
i know littering is wrong / bad
i like to recycle for money
I protect the Eath as much as possible
If I have been carrying my trash for days.
im a green academy student
I'm not a selfish lazy person, and I care about the environment
It is disrespectful to the Earth and to other people
It's gross
La Migra
My Mom is a Janitor
My parent
no point in littering
O.C.D
People Watching.

small enough for my pocket Teachers The world would be one big garbage can if we just littered, and i like the world i live in now. Who would want to live in a world were there is garbage everywhere. To help the earth to keep the world clean Was taught otherwise

Question: How often do you think your friends litter?	Count (%) n= 337	Gender	
		Male n= 136	Female n= 201
Never	18 (5.34)	2 (1.47)	16 (7.96)
Rarely	51 (15.13)	14 (10.29)	37 (18.41)
Sometimes	162 (48.07)	66 (48.53)	96 (47.76)
Frequently	75 (22.26)	38 (27.94)	37 (18.41)
All the time	31 (9.20)	16 (11.76)	15 (7.46)

Question: When I see my friends littering, I ________ of their behavior.	Count (%) n= 339	Gender	
		Male n= 138	Female n= 201
Strongly disapprove	61 (17.99)	11 (7.97)	50 (24.88)
Disapprove	112 (33.04)	39 (28.26)	73 (36.32)
Somewhat Disapprove	76 (22.42)	36 (25.09)	40 (19.90)
Neither approve nor disapprove	81 (23.89)	47 (34.06)	34 (16.92)
Somewhat approve	4 (1.18)	3 (2.17)	1 (0.50)
Approve	2 (0.59)	1 (0.72)	1 (0.50)
Strongly approve	3 (0.88)	1 (0.72)	2 (1.00)

Question: If my friends saw me litter, they would ______ of my behavior.	Count (%) n= 336	Gender	
		Male n= 136	Female n= 200

Strongly disapprove	24 (7.14)	3 (2.21)	21 (10.50)
Disapprove	59 (17.56)	18 (13.24)	41 (20.50)
Somewhat Disapprove	73 (21.73)	25 (18.38)	48 (24.00)
Neither approve nor disapprove	161 (47.92)	79 (58.09)	82 (41.00)
Somewhat approve	13 (3.87)	6 (4.41)	7 (3.50)
Approve	1 (0.30)	0 (0.00)	1 (0.50)
Strongly approve	5 (1.49)	5 (3.68)	0 (0.00)

Question: When I think of times that I have littered, I ________ of my behavior.	**Count (%) n= 338**	**Gender**	
		Male n= 137	**Female n= 201**
Strongly disapprove	93 (27.51)	20 (14.60)	73 (36.32)
Disapprove	122 (36.09)	46 (33.58)	76 (37.81)
Somewhat Disapprove	69 (20.41)	34 (24.82)	35 (17.41)
Neither approve nor disapprove	44 (13.02)	29 (21.17)	15 (7.46)
Somewhat approve	5 (1.48)	5 (3.65)	0 (0.00)
Approve	2 (0.59)	1 (0.73)	1 (0.50)
Strongly approve	3 (0.89)	2 (1.46)	1 (0.50)

Question: In the past month, have you spoken with friends about littering?	**Count (%) n= 337**	**Gender**	
		Male n= 138	**Female n= 199**
No	226 (67.06)	103 (74.64)	123 (61.81)
Yes	111 (32.94)	35 (25.36)	76 (38.19)

Question: How do you think these conversations influenced your opinions about littering?	**Count (%) n= 110**	**Gender**	
		Male n= 35	**Female n= 75**
They made me think that littering is an important issue	57 (51.82)	20 (57.14)	37 (49.33)
They made me think littering is not an important issue	3 (2.73)	2 (5.71)	1 (1.33)
They didn't influence my opinion about littering	23 (20.91)	3 (8.57)	20 (26.67)
It depended who I was talking to; different friends had different effects	27 (24.55)	10 (28.57)	17 (22.67)

Question: In the next month, how likely is that you will litter? Remember, litter is defined as dicarding, placing, throwing, or dropping any waste item in a public or private area and not immediately removing it. This includes waste items large and small, discarded intentionally or accidentally.	Count (%) n= 338	Gender	
		Male n= 137	Female n= 201
Very Unlikely	95 (28.11)	27 (19.71)	68 (33.83)
Unlikely	89 (26.33)	24 (17.52)	65 (32.34)
Somewhat Unlikely	40 (11.83)	21 (15.33)	19 (9.45)
Undecided	54 (15.98)	30 (21.90)	24 (11.94)
Somewhat Likely	33 (9.76)	12 (8.76)	21 (10.45)
Likely	19 (5.62)	16 (11.68)	3 (1.49)
Very Likely	8 (2.37)	7 (5.11)	1 (0.50)

Question: How willing are you to participate in the following activities?	Count (%)	Gender	
		Male	Female
Volunteer for a litter cleanup day	**n= 313**	**n= 128**	**n= 185**
Very Unlikely	50 (15.97)	29 (22.66)	21 (11.35)
Unlikely	44 (14.06)	18 (14.06)	26 (14.05)
Somewhat Unlikely	30 (9.58)	12 (9.38)	18 (9.73)
Undecided	64 (20.45)	30 (23.44)	34 (18.38)
Somewhat Likely	66 (21.09)	22 (17.19)	44 (23.78)
Likely	39 (12.46)	8 (6.25)	31 (16.76)
Very Likely	20 (6.39)	9 (7.03)	11 (5.95)
Sign up for our campaign email newsletter	**n = 313**	**n = 128**	**n = 185**
Very Unlikely	99 (31.63)	49 (38.28)	50 (27.03)
Unlikely	83 (26.52)	28 (21.88)	55 (29.73)
Somewhat Unlikely	33 (10.54)	12 (9.38)	21 (11.35)
Undecided	60 (19.17)	24 (18.75)	36 (19.46)
Somewhat Likely	22 (7.03)	10 (7.81)	12 (6.49)
Likely	6 (1.92)	0 (0.00)	6 (3.24)
Very Likely	10 (3.19)	5 (3.91)	5 (2.70)
Enter the video contest for our campaign	**n = 313**	**n = 128**	**n = 185**

Very Unlikely	110 (35.14)	49 (38.28)	61 (32.97)
Unlikely	85 (27.16)	30 (23.44)	55 (39.73)
Somewhat Unlikely	24 (7.67)	10 (7.81)	14 (7.57)
Undecided	61 (19.49)	25 (19.53)	36 (19.46)
Somewhat Likely	17 (5.43)	8 (6.25)	9 (4.86)
Likely	6 (1.92)	1 (0.78)	5 (2.70)
Very Likely	10 (3.19)	5 (3.91)	5 (2.70)
Enter an art contest that is part of the campaign	**n = 313**	**n = 128**	**n = 185**
Very Unlikely	100 (31.95)	52 (40.63)	48 (25.95)
Unlikely	75 (23.96)	34 (26.56)	41 (22.16)
Somewhat Unlikely	32 (10.22)	12 (9.38)	20 (10.81)
Undecided	48 (15.34)	17 (13.28)	31 (16.76)
Somewhat Likely	32 (10.22)	7 (5.47)	25 (13.51)
Likely	15 (4.79)	3 (2.34)	12 (6.49)
Very Likely	11 (3.51)	3 (2.34)	8 (4.32)
Pick up someone else's litter	**n = 313**	**n = 128**	**n = 185**
Very Unlikely	26 (8.31)	16 (12.50)	10 (5.41)
Unlikely	19 (6.07)	8 (6.25)	11 (5.95)
Somewhat Unlikely	26 (8.31)	17 (13.28)	9 (4.86)
Undecided	47 (15.02)	19 (14.84)	28 (15.14)
Somewhat Likely	81 (25.88)	36 (28.13)	45 (24.32)
Likely	67 (21.41)	16 (12.50)	51 (27.57)
Very Likely	47 (15.02)	16 (12.50)	31 (16.76)
If I see a friend littering, say something to express disapproval or try to stop her/him from littering	**n = 312**	**n = 127**	**n = 185**
Very Unlikely	20 (6.41)	14 (11.02)	6 (3.24)
Unlikely	9 (2.88)	7 (5.51)	2 (1.08)
Somewhat Unlikely	20 (6.41)	11 (8.66)	9 (4.86)
Undecided	48 (15.38)	26 (20.47)	22 (11.89)
Somewhat Likely	64 (20.51)	35 (27.56)	29 (15.68)
Likely	77 (24.68)	22 (17.32)	55 (29.73)
Very Likely	74 (23.72)	12 (9.45)	62 (33.51)

Appendix B: School Recruitment Flyer

Join other Bay Area schools in making a difference in your community!

The survey is for the Bay Area Stormwater Management Agencies Association – also known as BASMAA. Please respond to the survey questions as honestly as possible. Your answers will remain confidential. There are no right or wrong responses. Your feedback will help build a campaign for Northern California's communities so we're interested in hearing your true and honest opinions!

The survey is available online every day- 24 hours a day at:

http://bit.ly/BayAreaSurvey

Survey's must be completed by ~~March 16, 2012~~* ***Extended deadline: March 27, 2012*

Thank you for your participation!

www.BetheStreet.org

Be the Street You Want to See.

http://basmaa.org/

Appendix C: Script

The script provided to teachers to assist with survey distribution read:
Join other Bay Area schools in making a difference in your community. This survey is for the Bay Area Stormwater Management Agencies Association – also known as BASMAA. Please respond to the survey questions as honestly as possible. Your answers will remain confidential. There are no right or wrong responses. Your feedback will help build a campaign for Northern California's communities so we're interested in hearing your true and honest opinions.

Appendix D: Facebook Ad

BASMAA SURVEY FACEBOOK AD (155 #2-2):

Image (attached to email):

Title/Name:
Bay Area Stormwater Management Agencies Association

Tagline:
Click here to join Bay Area communities in giving your FEEDBACK! It only takes 5 minutes to make your voice heard!

Link to survey:
http://bit.ly/BayAreaSurvey

Appendix E: Pearson correlations among key variables in regression models (n=302 with complete data on all variables).

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Pick up other's litter	--												
2. Envi. Concern[a]	0.206 p<.0003	--											
3. Guilt[b]	.0.159 p<.09	0.342 p<.08	--										
4. Disapproval of friends	-0.140 p<.02	-0.357 p<.0001	-0.498 p<.07	--									
5. Perceived friend disapproval	0.022 p<.71	-0.129 p<.03	-0.136 p<.09	0.403 P<.0001	--								
6. Self-approval	-0.064 p<.27	-0.345 p<.0001	-0.495 p<.07	0.640 P<.0001	0.263 P<.0001	--							
7. Intent to litter	-0.017 p<.77	-0.202 p<.0004	-0.395 p<.08	0.436 P<.0001	0.257 P<.0001	0.413 P<.0001	--						
8. Cleanup	0.203 p<.0004	0.257 p<.0001	0.282 p<.08	-0.257 p<.0001	-0.169 P<.004	-0.282 P<.0001	-0.144 P<.02	--					
9. eNews-letter	0.207 p<.0003	0.289 p<.0001	0.255 p<.08	-0.089 P<.13	0.037 p<.52	-0.065 P<.262	-0.069 P<.24	0.424 P<.0001	--				
10. Video contest	0.203 p<.0002	0.261 p<.0001	0.122 p<.09	0.015 p<.79	0.96 p<.10	-0.052 p<.37	0.096 P<.10	0.260 P<.0001	0.556 P<.0001	--			
11. Art contest	0.129 p<.03	0.167 p<.004	0.134 p<.09	-0.094 p<.11	-0.040 p<.49	-.122 p<.04	-0.064 P<.27	0.271 P<.0001	0.412 P<.0001	0.598 P<.0001	--		
12. Pick up else's	0.436 p<.0001	0.366 p<.0001	0.454 p<.07	-0.365 p<.0001	-0.160 p<.006	-0.350 p<.0001	-0.273 P<.0001	0.424 P<.0001	0.356 P<.0001	0.296 P<.0001	0.223 P<.0001	--	
13. Express disapproval	0.215 p<.0002	0.400 p<.0001	0.386 p<.08	-0.512 p<.0001	-0.278 p<.0001	-0.470 p<.0001	-0.321 P<.0001	0.424 P<.0001	0.258 P<.0001	0.183 P<.002	0.230 P<.0001	0.576 P<.0001	--

[a]Variable was square-transformed to better approximate normality.

[b]Polychoric correlation coefficient reported for all correlations with this variable.

ATTACHMENT

C.7.c. Media Relations – Use of Free Media

BASMAA Media Relations Campaign Final Report

BASMAA
Media Relations Campaign
Final Report FY 2011-2012

Submitted by O'Rorke Inc
June 25, 2011

During the fiscal year 2011-2012, O'Rorke Inc. continued to serve as BASMAA's media relations contractor.

Early in the year O'Rorke worked directly with project manager Sharon Gosselin and the PIP committee to brainstorm pitch topics. The result was several planned pitches and distributing radio/online public services announcements on key stormwater issues as well as monitoring of breaking news opportunities. Additionally, O'Rorke provided localized templates of many of the press releases developed for the regional campaign as a way to assist local programs with their own media efforts. O'Rorke also spearheaded the inclusion of more stormwater information and tips on BayWise.org. This helped enormously in allowing BayWise.org to be included as a resource in pitch materials and as a call to action is PSA copy.

In FY 2011-12 seven pitches were done and one was prepared and will be completed in the next fiscal year. The pitches resulted in forty-eight total media placements. The report that follows gives a synopsis of each pitch and the number and type of placements each garnered. A coverage report for the year is attached.

Additionally, O'Rorke developed a local press release on car washing and localized regional releases as well.

Save the Bay/Trash Hot Spots
In September, O'Rorke reached out to Save the Bay to partner on their annual Trash Hot Spots pitch. O'Rorke provided a quote from Executive Director Geoff Brosseau to convey BASMAA's core message about litter being an entirely preventable source of pollution and to call out the work of local programs.

A story ran in the San Francisco Chronicle and was also carried on SFGate.com.

Don't Burn Holiday Gift Wrap
O'Rorke was able to get BASMAA included in the Bay Area Air Quality Management District's (BAAQMD) press release regarding not burning holiday gift wrap.

BASMAA and BayWise.org were mentioned in an extensive story on holiday gift wrap (greener options, not burning it) on KRON-TV.

Rainy Season PSAs
PSA copy was sent to all Bay Area radio stations, calling attention to major influxes of stormwater pollution after the first significant storms of the season.

Interviews ran on KEAR and KMKY (Radio Disney); these stations also ran the PSAs.

Baseline Litter Survey
This pitch focused on the results of the Baseline Litter Survey. Because this study was new and actually quantified the litter load in the region, the pitch was extremely well-received. The first media hit came in the form of a major story in the San Jose Mercury News and led to widespread coverage both regionally and nationally.

The pitch garnered more than thirty placements, including Huffington Post, KCBS-AM, KGO-AM, and KTVU-TV.

Car Washing PSAs
These PSAs encouraged use of car washes as a way to prevention stormwater pollution. O'Rorke also developed a press release for use by local programs.

The PSAs were aired by eight stations, including KSOL and KCBS.

Pools & Spas
This pitch dealt with proper pool maintenance and drainage information. Stories ran with the Marin Independent Journal and the San Jose Mercury News (print and online) and with KKIQ.

Pesticides: Exterior Spraying PSAs
These PSAs provided information about exterior spraying a a source of pollution, directing the audience to BayWise.org for more information and to find pest control professionals certified in less-toxic techniques.

These PSAs ran on KCBS, and in Spanish on KLOK, KBRG, KSOL, and KSQL.

Pesticides: Exterior Spraying/New DPR Regulations
This pitch began at the end of the FY and the release focuses on the new exterior spraying regulations from the Department of Pesticide Regulation as a way to give a new angle to this story.

O'Rorke reached out to DPR for cooperation on this and for DPR to provide a quote. O'Rorke has secured this, but because of timing involved with getting the regulations passed, DPR has requested the pitch begin in early July.

Recommendations for FY 2012-13

- Continue to look to new local/regional studies as a jumping off point for pitching. Timeliness and a sense of having real news to share were absolutely key factors in the success of the Baseline Litter Survey pitch.

- Continue to pitch FM radio stations and seek out public affairs coverage via PSAs or direct pitches. Public affairs directors have been receptive to BASMAA messages.

- Utilize BayWise.org in pitches as a resource; have homepage and content updated as needed to keep site relevant to media relations efforts.

- Develop of photo library to have courtesy pictures readily available to the media as a way to ensure more coverage. Media outlets need photos and a press release with a free-to-use picture is more likely to get used by the media.

ATTACHMENTS

C.9.h.i. Point of Purchase Outreach

Photos of *Our Water, Our World* booth at trade shows

Article and ad in trade show magazine

Photo of Bay Area OSH store managers' orientation training

Copies of *Our Water, Our World* advertisements


healthy home and garden
visit www.ourwaterourworld.org
Look for this symbol before you buy
DR. EARTH
OUR WATER OUR WORLD

Choose less toxic products for a healthy home and garden
visit www.ourwaterourworld.org
Look for this symbol before you buy
FLEA
OUR WATER OUR WORLD
557


Got Bugs? Get Answers!
Choose less toxic products for a healthy home and garden
visit www.ourwaterourworld.org
Look for the symbol before you buy
TRAPPING
SKUNKS
RACCOONS
POSSUMS
FERAL CATS
WILD PIGS
SNAKES

Got Bugs? Get Answers!

Choose less toxic products for a healthy home and garden

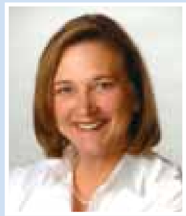
visit www.ourwaterourworld.org

Look for this symbol before you buy

MAKE A STATEMENT

COME TO OUR BOOTH AND WE'LL SHOW YOU HOW!!

CRITICAL THINKING AND IPM



Annie Joseph
ACCN PRO and Master Gardener,
Ann Jospeh Consulting

Definition: Critical thinking, in general refers to higher-order thinking that questions assumptions. -*Wikipedia*

"The intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action." Skriven M. and Paul R.W. *'Critical Thinking as Defined by the National Council for Excellence in Critical Thinking',* 1987.

98% of the landscape problems our customers bring to us are customer induced. Though they may want to buy a bottle of 'Fix it All', the skillful nursery person or hardware store employee will spend a few minutes determining where the real problem lies. Frequently, I see nursery professionals feeling pressured to snap back with an immediate answer, when there may be more to the problem than meets the eye. Many of these situations require us to use our critical thinking skills. Trouble shooting pest or disease problems in this way, is the first step in IPM, or Integrated Pest Management. This discipline involves looking at the whole system of a garden, including cultural practices that are frequently the origin of the problem.

It is by examining the dynamic of the home gardener's watering, soil type, spray habits and fertilizing techniques that we will most often help them to find to sustainable solutions. This can lead to truly successful gardeners, and make you ***the*** source for reliable garden advice.

IPM Consists of the Following 5 Steps

Step 1: Monitoring and observation — Pests and diseases are much easier controlled early in the process.

Step 2: Cultural Controls — use horticultural practices of our customers.

Step 3: Physical Controls — use copper barriers for slugs and snails.

Step 4: Biological Controls — using ladybeetles, beneficial nematodes, lacewing larvae, and encouraging birds in the garden.

Step 5: Chemical Controls — Recommend insecticidal soaps, oils, pyrethrins, and sometimes more powerful pesticides, but only when warranted.

By educating our employees and customers to use this 5-step process we can usually find the answers to the problem by deduction.

1. Monitor and Observe

Identify the plant and does it have a pest or disease or are they bringing you a plant that is going through the normal process of shedding its leaves to give energy to the new ones? Are they bringing you lady beetle larvae that they think are eating their plants? Do they have traps for monitoring pests like codling moth, olive fruit fly and whitefly before the pests have an opportunity to take foothold? Is the ever present 'over-watering' occurring?

2. Cultural Controls

- **a.** Where is the plant placed? Is it in sun or shade, a container or the ground, indoors or outdoors?
- **b.** How often and what time of day are they watering?
- **c.** Are they fertilizing the plant? If so how often and what type?
- **d.** Have they been spraying the plant with any pesticides or fungicides? If so how often?
- **e.** Have they recently transplanted the plant? If so what size of container was it in and how big is the container that it was transplanted into? How deep did they bury the plant and did they cover the crown?
- **f.** Have they pruned the plant recently? Did they disinfect their pruning shears?

3. Physical controls

Hand picking slugs and snails or using copper tape to exclude them. Applying Tanglefoot to a protective collar like Tangleguard to keep the ants from crawling up and farming aphids. Using weed fabric to prevent weeds from coming up in the planted areas. Using bird flash tape to keep the birds from eating fruit.

4. Biological Controls

Introducing ladybeetles, lacewing larvae, beneficial nematodes to the garden. Planting plants that are nectar sources will attract the beneficial insect populations. Lists of these plants are available from Our Water Our World and elsewhere.

5. Chemical Controls

Use only when needed and begin with the least toxic first so as not to disrupt the balance of beneficial insects in the garden setting. It is equally important to know how those products work and when they should be applied to be most effective. This means we need to know the pest and when it is most vulnerable to pesticide applications.

If we want our customers to come to us for sound pest advice we need to set them up with the right expectations regarding how products work. If they truly understand this, they will be successful with less toxic products, and you will be successful as the source of information and the products they need.

Some additional tips:

- When using iron phosphate baits the iron phosphate immediately binds the gut of the slug and snail. It is their last meal. They crawl away to die, so do not be disappointed because you do not see the dead slugs and snails on site.
- When using insect soaps and oils you have to thoroughly cover the insect in order to kill it. If more insects come to the area you will have to reapply.
- When using organic fertilizers it takes time for the soil microorganisms to break it down and release it back up to the plant in an available form. Soil warmth and bacterial action will begin the process. Organic fertilizers start a little more slowly than chemical fertilizers, but the payoff is much longer lasting fertilizer. They are gentler and much less likely to burn plants. Organic fertilizers do not tend to cause weak, thin walled cells that are more subject to insect damage.
- When using bacterial insecticides like Bacillus thuringiensis kurstaki for caterpillars, the insects have to feed on sprayed leaves, it paralyzes their gut, they then die and fall off the sprayed plant in a few days.
- Most ant baits are slow acting stomach poisons. This allows the ants time to take the bait back to the nest to kill the nest mates. This is a far more effective control than surface spraying.
- Cockroaches are more effectively controlled by using traps to monitor their activity, and using baits to kill them. Use caulking to seal up access from the outside, and if you still see activity, use bait stations and syringe gel treatments that have slow acting active ingredients. This allows them time to share the bait in the nest, and thereby greatly reducing the whole population.

Where to find additional resources for less toxic pest management for your store?

- **http://www.ourwaterourworld.org** The Our Water Our World website offers product lists with less toxic products that are on the market and are updated on an annual basis. There are also over 20 fact sheets in English and Spanish covering topics including ants, aphids, rose care and rodents that can easily be downloaded. Here you will also find links to other websites with information on your local Agricultural Commissioners office, Master Gardener contacts, Household Hazardous Waste locations, local creek information and much more. Visit ourwaterourworld.org to take advantage of the *"Ask Our Expert Feature"* with experts from the Bio-Integral Resource Center in Berkeley. This is a non-profit with over 25 years in expertise in IPM, which answers pest questions and will get back to you or your customers within 24 hours regarding any questions they may have.
- **http://www.ipm.ucdavis.edu/training/ The UC Statewide IPM Program website**

  Here you will find two free online training modules for retailers who sell pesticides.

  a. *Introduction to Pesticides for Retail Employees* offers information on reading a pesticide label, how to apply and properly dispose of pesticides.

  b. *Moving Beyond Pesticides* offers a basic overview of Integrated Pest Management (IPM) and gives tips on how to identify, prevent, and manage insect, weed, plant pathogen and rodent pests.

  If your employees complete the trainings and pass the quizzes they will receive a personalized Certificate of Completion from the University of California. There also is a quarterly newsletter for retailers that you can sign up for and get new information on invasive pests, beneficial insects and much more. They also have a website called the UC Statewide Integrated Pest Management Program (www.ucipm.edu) where you can access great information on pest identification and invasive pests that may be coming to your area.

With our fellow nursery and garden professionals utilizing these tools we will be disseminating science based information to help troubleshoot pest and disease problems. This will help to ensure not only our customer's success in their gardening endeavors but will build trust and repeat business for all.

Avoid Pesticides to Help Protect the Bay

Wondering how to prevent pesky insects without using toxic chemicals?

Most consumers are willing to try less-toxic option for managing household and garden pests. They just need to know that alternatives do exist, and which ones they should use.

Look for this tag before you buy

Fortunately, help is available. In the Bay Area more than 170 local nurseries and hardware stores have partnered with local government to help educate consumers about less-toxic options. These retailers place tags on store shelves in front of less-toxic products, and carry fact sheets with tried and true ways to control common household and garden pests.

Visit www.OurWaterOurWorld.org to find out:

- which insects actually benefit your garden
- how to cultivate a lawn that deters weeds and other pests
- which less-toxic products can replace conventional pesticides
- how to dispose of leftover pesticides safely so they won't end up in our creeks, Bay, and Ocean
- what questions to ask before hiring a pest control company

You can even submit a question about your pest problem, and get a free personalized online response in less than 24 hours!

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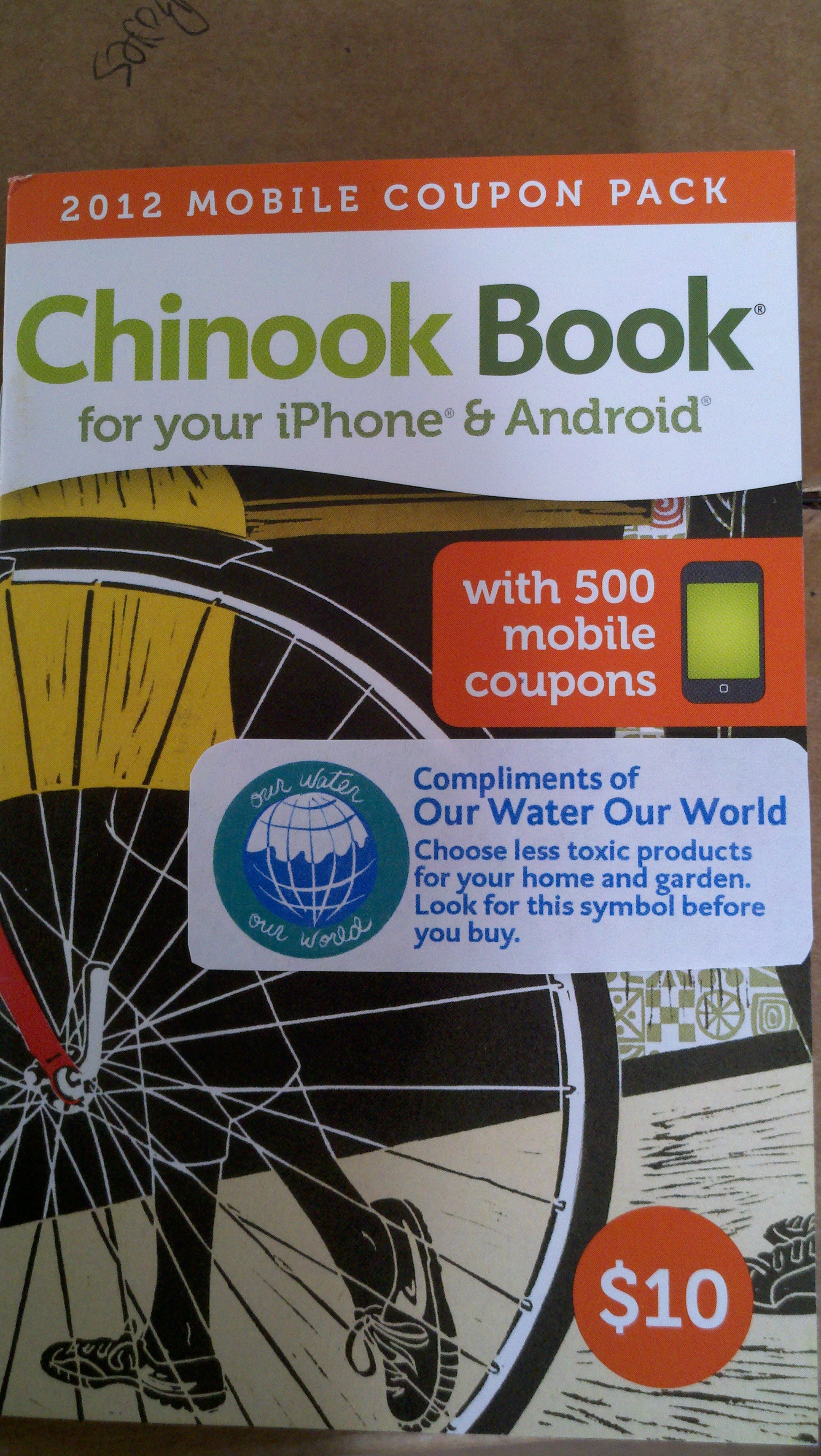
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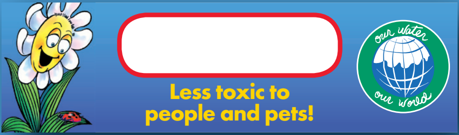

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Water Agency

Vallejo Sanitation
and Flood
Control District

B A S M A A

Regional Pollutants of Concern Report for FY 2011-2012

and

Regional Monitoring Coalition Monitoring Status Report for February-June 2012

September 11, 2012

Bay Area

Stormwater Management

Agencies Association

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INTRODUCTION

This document is divided into two main parts, each serving a different purpose. Part A, the **Regional Pollutants of Concern Report** for FY 2011-2012 (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 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 regional 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 February through June 2012.

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 MRP[1]. To conduct monitoring for the MRP as a regional collaborative, the BASMAA Regional Monitoring Coalition (RMC) was established in July 2010 to coordinate monitoring activities among BASMAA members and with other related monitoring initiatives.

[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 require implementation of 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 U.S. Environmental Protection Agency (USEPA) and California Department of Pesticide Regulation (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 2011-12 to achieve compliance with this provision. Oversight of this provision is the purview of the BASMAA Board of Directors.

Summary of participation efforts

The actual work of tracking and participating in the ongoing regulatory efforts related to pesticides was accomplished through CASQA. CASQA conducted its activities on behalf of members and coordinated funding contributions and activities through its Pesticides Subcommittee, a group of stormwater quality agencies affected by pesticides or pesticides-related toxicity listings, TMDLs, or permit requirements, as well as others knowledgeable about pesticide-related stormwater issues. One of the Subcommittee's two co-chairs is Jamison Crosby of the Contra Costa Clean Water Program (with Napa County Stormwater Pollution Prevention Program starting in FY 2012-13).

With funding collected from numerous California urban runoff programs and municipal wastewater treatment plant organizations, CASQA conducts the following activities:

- Track pesticide-related regulatory activities by USEPA, DPR, and other agencies that have significant potential to affect municipal wastewater treatment plants, municipal urban runoff programs, and surface water quality.
- Maintain open lines of communication with pesticide regulators, water board and other allies, pesticide manufacturers, professional pesticide applicators, and other key stakeholders.
- Identify highest priority pesticides-related regulatory activities.
- Obtain and review relevant new scientific information.
- Identify anticipated affect on municipal urban runoff programs and surface water quality.
- For priority items, analyze regulatory documents like environmental risk assessments, obtain related scientific information, and hold meeting and/or write comment letters regarding proposed actions and CASQA and the clean water community's concerns.
- As necessary, develop and analyze background information, such as pesticide use information, identification of priority pesticides, or data summaries on new pesticides, to inform management decisions or to document the scientific basis for a requested regulatory action.

Information Submitted and How Regulatory Actions Were Affected

FY 2011-12 was very productive. Table A.1 summarizes information submitted and how regulatory actions were affected. The participation efforts listed above produced outcomes at Outcome Level 3: Target Audience Actions (formerly Behavior Change) in the CASQA Effectiveness Assessment system.

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

There are no Annual Reporting requirements for Provision C.9.g in FY 2011-12. In the FY2012-13 Annual Report, additional information will be provided on the status of implementation activities designed to comply with this provision.

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012

Outcome in 2012	CASQA Participation Actions*
A.1.1 Adoption of California regulations, "Surface Water Protection in Outdoor Nonagricultural Settings." Regulations were completed in June 2012 and became effective July 19, 2012. The regulations reduce the quantities of pyrethroids applied on outdoor impervious surfaces by professional applicators, thus reducing the quantity of pyrethroids that can be washed directly into gutters and storm drains when it rains or when water like irrigation overflow runs across treated surfaces. Together, the regulations and new bifenthrin labeling (see below) are anticipated to reduce the amount of pyrethroid insecticides in urban stormwater runoff by 80-90%.[2] UP3 Project analysis—based on pyrethroid monitoring data, pyrethroid use data, and urban runoff modeling by U.C. Davis—suggests that the regulations (in combination with label changes described below) will largely, but not completely, end widespread water and sediment toxicity from pyrethroids in San Francisco Bay Area urban watersheds. In some watersheds, lower levels of toxicity may continue. In a larger number of watersheds, pyrethroid concentrations will continue to exceed aquatic life protection benchmarks such as the values developed by U.C. Davis with funding from the Central Valley Water Board.	Letter to DPR 12/12/11** Since the early-2000s, multiple meetings, letters, and ongoing communications with California DPR.

*The San Francisco Bay Regional Water Quality Control Board also participated in almost all of these regulatory processes, providing input that paralleled CASQA's. The State Water Resources Control Board, the Central Valley Regional Water Quality Control Board, and California municipal wastewater treatment plants also joined CASQA and the San Francisco Bay Water Board in participating in many of these processes. Outcomes should be attributed to the combined communications of all participants.
**The table lists FY 2011/12 actions and summarizes past actions that relate directly to the outcome.

[2] Jorgenson, B. C. (2011). Off-Target Transport of Pyrethroid Insecticides in the Urban Environment: An Investigation into Factors Contributing to Washoff and Opportunities for Mitigation. Ph.D. Thesis, University of California, Davis.

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.2 California Professional Bifenthrin Product Application Limitations Implemented through Product Label Changes. DPR agreed with water quality agencies that additional reductions in outdoor bifenthrin use—beyond what is required in the surface water regulations—are warranted because of bifenthrin's significant contribution to aquatic toxicity. At manufacturers' request, DPR allowed bifenthrin-specific restrictions to be implemented through label changes on bifenthrin professional product labels rather than through bifenthrin-specific regulations. For professional applicators, restrictions on pesticide labels are enforceable. New bifenthrin labels will prohibit applications to any exposed horizontal impervious surface and any building wall that abuts impervious surfaces that drain to storm drains. In fall 2011, bifenthrin manufacturers set out a relatively rapid schedule for bringing the newly labeled products to the California marketplace by summer 2012. Manufacturers jointly committed to the label changes and the aggressive implementation schedule in a Memorandum of Agreement (MOA), which signed by all manufacturers of bifenthrin professional products. In a letter concurring with the MOA, DPR promised not to include special bifenthrin restrictions in its regulations if the MOA is implemented as promised. Available evidence indicates that the label changes are occurring as promised in the MOA. For example, in May 2012, FMC, the manufacturer of one of the most popular professional bifenthrin products announced that it was shipping products reflecting the new labeling.	Since the mid 2000s, multiple meetings and ongoing communications with California DPR about bifenthrin water pollution.

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.3 Water Quality Protection Label Changes for All Types of Pyrethroid Products—Including Consumer Products—Start to Appear on Product Shelves But Are Being Implemented Slowly. In 2009, USEPA began working with pyrethroid manufacturers to modify pyrethroid product labels with instructions that provide additional water quality protections. The instructions direct users to apply only spot or "crack and crevice" treatments on impervious surfaces and contain other recommendations, such as to avoid applications when rain is forecast in the next 24 hours. USEPA required these changes for pyrethroids that went through re-registration (cypermethrin, permethrin, resmethrin, tetramethrin, sumithrin, and allethrins). For all other pyrethroids (e.g., bifenthrin, cyfluthrin, esfenvalerate), the changes are voluntary until Registration Reviews are completed late this decade. EPA's initial goal was to achieve 100% voluntary label changes and to approve both voluntary and mandatory label changes in 2010. The reality has fallen short of this goal. The first modified consumer product labels began appearing on retail shelves in fall 2011. In spring 2012, manufacturers started to ship professional products with the new labels. In May 2012, USEPA admitted that there is no current target implementation date for the new labels and that not all manufacturers are voluntarily making the label changes. DPR's adoption of the Surface Water Protection regulations was partially motivated by the delays and limited adoption of these product labels. Since DPR regulations can only address professional applicators, the USEPA label change program is the only effort underway to reduce pyrethroid water pollution from non-professional (consumer) products. For most of the pyrethroids linked to water pollution, non-professional use is relatively small. The exception is bifenthrin, for which non-professional use comprises about 20% of the market.[3]	Since the mid 2000s, multiple meetings and ongoing communications with California DPR and USEPA about pyrethroid insecticide water pollution and specific early mitigation actions, including product label language improvements. The label change process was initiated by DPR in response to October 2007 letters from CASQA and the Water Boards requesting early mitigation actions for pyrethroids in urban runoff.

[3] TDC Environmental (2010). Pesticides in Urban Runoff, Wastewater, and Surface Water: Annual Urban Pesticide Use Data Report 2010. Prepared for the San Francisco Estuary Partnership.

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.4 DPR Incorporated Surface Water Into Registration Process for Most New Pesticide Chemicals Intended for Use Outdoors in Urban Areas. On September 16, 2011, DPR announced a formal procedure to ensure that pesticides with potential to pollute surface water will be identified when they enter DPR's registration process and will be routed to DPR's Surface Water Program for review. Past DPR registration process shortcomings have allowed at least one problem pesticide (fipronil) to slip through and have constrained the quality of DPR's evaluations. DPR's new procedure should identify most pesticides likely to be water quality problems (however, there are a few critical gaps in the program, such as swimming pool chemicals). When registration is approved, DPR will have the necessary scientific basis to require appropriate mitigation measures. In parallel, DPR has established procedures to create a surface water quality "watch list," to require analytical methods when it registers pesticides on this watch list, and to track usage and annually reevaluate its monitoring program to respond to changes in use of watch list pesticides. In July 2011, just as DPR was finalizing its procedure, DPR demonstrated how the new process would work when it denied the application to register a product called Abtech Smart Sponge. The "Smart Sponge" is designed to kill bacteria in storm drains with a biocide that may also be toxic to aquatic organisms. Although USEPA's Antimicrobials Division gave minimal review of water quality implications when approving this product, DPR (in an early implementation of its new procedure) ensured that the product was fully reviewed by DPR's Surface Water Program. Because DPR Surface Water Program reviewers determined that there was insufficient information available to determine if the product would adversely impact water quality, DPR denied the registration application.	Since the early 2000s, multiple meetings, letters, and ongoing communications with California DPR.

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.5 USEPAFormally Proposed Pesticides-Water Common Effects Assessment Methodologies, Obtains Scientific Review, and Takes Other Steps Toward Pesticides-Water Harmonization. Several years ago, California input to USEPA (in combination with input from a few other states) caused USEPA to initiate a cooperative effort between the Office of Water (OW) and the Office of Pesticide Programs (OPP) to "harmonize" EPA's approach to assessing the impacts of pesticides. This project has come to be called the "OPP/OW Common Effects Assessment Project." For the last two years, the focus of the project has been work on methods to develop numbers that are scientifically similar to water quality criteria, but are developed only with the data that are typically available for most pesticides (typically a much smaller aquatic toxicity data set than would be required to develop water quality criteria). USEPA published three white papers examining various facets of this topic, which it had peer reviewed by a Scientific Advisory Panel at the end of January 2012. EPA is reviewing the Science Advisory Panel's generally supportive report, which was finalized in May, and is determining its next steps toward implementation of a common effects assessment methodology. The joint project has already opened communication between OW and OPP and generated much greater cooperation between the two offices. For example, in summer 2011, OW and OPP published a joint procedure for evaluation of aquatic toxicity data.[4] For the first time, both offices will come to the same conclusion about data acceptability. Past OPP data acceptance procedures often precluded use of studies that were not generated by pesticide manufacturers.	National Association of Clean Water Agencies (NACWA) letter to USEPA (supported by CASQA scientific work) 3/8/12 Mentioned in nearly every comment letter to USEPA about pesticide Registration Review Since 1999, letters, workshop testimony, and multiple informal meetings and telephone calls with EPA.

[4] Brady, D. Director, Environmental Fate and Effects Division, Office of Pesticide Programs, U.S. USEPA (2011). "Evaluation Guidelines for Ecological Toxicity Data in the Open Literature." Memorandum to All Managers and Staff of the Environmental Fate and Effects Division.

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.6 DPR and USEPA to Improve Ability to Model Pesticides in Urban Runoff. California input to USEPA and DPR has long encouraged development of modeling methods that USEPA and DPR can use to evaluate water quality risks associated with pesticide use in urban areas. In 2011, U.S. USEPA formalized plans to modify its pesticide runoff model (PRSM/EXAMS) to account for both pervious and impervious surfaces, to use washoff data, and to develop multiple urban modeling scenarios. In late 2011, DPR initiated a project to fill a key gap in urban runoff modeling by developing a computational model for pesticide wash-off from impervious surfaces. In June 2012, DPR provided funding to U.C. Davis to extend an existing pesticide environmental fate and transport model (HYDRUS 2/3D) to address urban runoff. Developing these improved models will help protect water quality because DPR and USEPA will be better able to predict water pollution before it occurs.	Since the early-2000s, multiple meetings, letters, and ongoing communications with USEPA and DPR about the need for predictive modeling tools to inform pesticide registration decisions.
A.1.7 USEPA Modified Fipronil Registration Review Work Plan. California agencies jointly requested that USEPA revise its preliminary work plan for fipronil registration review, which did not address urban fipronil use. The input to USEPA included specific recommendations for work plan improvements to evaluate urban fipronil uses that may entail releases into urban runoff, descriptions of the details of urban fipronil urban use, information about fipronil sources and pathways to urban runoff and surface waters, an explanation of the regulatory consequences and costs of pesticide water pollution, and a summary of fipronil monitoring data that documents increasing concentrations that are reaching levels that are toxic to sensitive aquatic organisms. In response, USEPA committed to modifying its fipronil Registration Review work plan to adopt the data requirements and review process that USEPA is using for the pyrethroids. In addition, USEPA intends to assess the cumulative impacts of fipronil's three major toxic degradates.	Teleconference meeting with USEPA 8/18/11; letter to EPA, including monitoring data summary, 8/29/11
A.1.8 USEPA Modified Permethrin Registration Review Work Plan. California agencies jointly supported EPA's general approach for permethrin registration review, while requesting improvements related to the urban runoff assessment. USEPA modified the work plan to improve the watershed modeling approach and committed to consider exposure time frames through the effort to integrate assessment methods with USEPA Office of Water.	Letter to USEPA 8/29/11

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.9 USEPA Modified Spinosad Registration Review Work Plan. California agencies jointly requested that USEPA revise its preliminary work plan for Spinosad registration review, which did not address urban spinosad use. Spinosad, an alternative to pyrethroids, is highly toxic to aquatic organisms and has toxic and persistent degradates. The input to USEPA included specific recommendations for work plan improvements to evaluate urban spinosad uses that may entail releases into urban runoff. USEPA modified the work plan to include urban uses, to explicitly address impervious surfaces, and to add an evaluation of applications in storm drain catch basins.	Letter to USEPA 11/29/11
A.1.10 USEPA Modified Imiprothrin Registration Review Work Plan. California agencies jointly requested that USEPA revise its preliminary work plan for imiprothrin registration review, which did not fully address urban imiprothrin use. Imiprothrin is a pyrethroid insecticide that currently has a limited market share. USEPA modified the work plan to explicitly address impervious surfaces and to change aquatic toxicity data requirements such that they are more complete and consistent with requirements for other pyrethroids.	Letter to USEPA 11/29/11
A.1.11 USEPA Did Not Modify Sumithrin (d-Phenothrin) Registration Review Work Plan. California agencies jointly requested that USEPA revise its preliminary work plan for Sumithrin registration review to improve urban runoff related risk assessment methodologies. EPA's responses, which were inconsistent with past commitments, clarified the need to work more broadly with USEPA address methodologies for evaluating the water quality risk associated with outdoor urban pesticide use.	Letter to USEPA 2/21/12
A.1.12 USEPA Proposed Special Regulation of Nanoparticle Pesticides. In fall 2011, USEPA proposed a policy for regulating nanoparticle pesticides based on a rebuttable presumption that nanoparticles are different than the non-nanoparticle versions of the same pesticide. Requiring separate registration of nanoparticle pesticides would provide U.S. USEPA with the ability to obtain data to characterize their potential water quality impacts. USEPA is currently considering public comments on the proposed policy, but has signaled its intent to regulate nanoparticle pesticides separately through product-specific decisions on nanosilver pesticides.	Letter to USEPA 8/17/11

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.13 DPR Will Evaluate Water Quality Risks from Proposed Silver-Containing Biocide Paint Before Making a Registration Decision. In November 2011, DPR announced its receipt of an application to register a product called Bactiblock 101, which is a silver-containing paint that product educational materials imply contains nanosilver. Comments requested a careful evaluation of the potential water quality risks associated with all proposed urban uses. The request was successful; DPR routed the application to its Surface Water program for review and will consider urban runoff and POTW discharges. DPR is currently reviewing the registration application.	Letter to DPR from Sacramento County, (supported by CASQA scientific work) 12/8/11
A.1.14 USEPA Begins Public Notification and Comment Period for Pesticide Registration Decisions. In March 2012, due in part to California communications—particularly input (completed jointly with NACWA) on the poor public notification process for the first nanosilver pesticide registration—EPA established the first-ever process to provide public notice and public input on pesticide registration decisions. Although USEPA will offer only a 30-day comment period, agencies will be able to access USEPA water quality risk assessments and will have the opportunity to offer information and guidance to address deficiencies. In the past, USEPA announced registration applications, but not decisions.	Since the late 1990s, multiple meetings and ongoing communications with USEPA expressing interest in providing information related to new pesticide registration decisions.
A.1.15 Pyrethroids Reevaluation – DPR Required the Pyrethroid Working Group (PWG) to Conduct an Urban Runoff "Pathways" Study. In summer 2011, DPR directed PWG to proceed with a small number of field-scale measurements of pyrethroids in urban runoff from single-family home facades with idealized landscaping. CASQA questioned the scientific value of the study and advised DPR to prioritize other activities. According to a May 2012 PWG progress report, the PWG's experiments, which compared pyrethroid washoff from pervious and impervious surfaces around the model facades, measured the greatest reductions in pyrethroid levels in runoff when the quantities applied on directly connected impervious surfaces were reduced.	Letter to DPR in 2010

Table A.1. Stormwater Programs' Pesticide Regulatory Process Participation and Outcomes in 2012 (continued)

Outcome in 2012	CASQA Participation Actions*
A.1.16 Application to Register Potential Pyrethroid Substitute Cyantraniliprole – Based on the limited information in EPA's and DPR's registration application public notices, it appears that cyantraniliprole could substitute for pyrethroids, and thereby could potentially see widespread use in urban areas if USEPA and DPR register it. Although there are no publicly available aquatic toxicity data for cyantraniliprole, a related chemical, (chlorantraniliprole) is very highly toxic to aquatic invertebrates and has multiple stable (and similarly toxic) degradates. Comments requested a careful evaluation of the potential water quality risks associated with all proposed urban uses of this new insecticide. Both USEPA and DPR are currently reviewing the registration application.	Letter to DPR 9/30/11; Letter to USEPA 3/26/12
A.1.17 Other Comments Were Submitted and Are Awaiting Responses. USEPA is currently considering public comments and revising its Registration Review work plans for: • Cypermethrin (a pyrethroid that is commonly detected in urban creeks) • Chlorothalonil (a fungicide that contains dioxins and hexachlorobenzene)	Two Letters to USEPA on 5/29/12

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 percent by July 1, 2014), which will set the course for additional load reductions in future years. To achieve this goal, Permittees are required to develop and implement a Short-Term Trash Loading Reduction Plan, which includes the installation and maintenance of trash full-capture devices, designed to treat a mandatory minimum level of land area, and the implementation of other control measures and best management practices to prevent or remove trash loads. To address longer-term goals of trash reduction, Permittees are required to develop a Long-Term Trash Loading Reduction Plan by February 1, 2014 in preparation for the next permit.

Activities associated with Provision C.10 requirements were conducted in FY 2011-12 directly by Permittees, and at the countywide stormwater program and regional levels on behalf of Permittees. Actions conducted by Permittees are documented in section C.10 of each Permittee's Annual Report Form. 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). All regional project deliverables are developed under the direction of the BASMAA Trash Committee and are approved by the BASMAA Board of Directors (BOD) prior to finalization.

In FY 2011-12, the BASMAA Trash Committee continued implementing the following three regional projects on behalf of all MRP Permittees in compliance with MRP C.10 provisions:

- Model Short-Term Trash Loading Reduction Plan
- Preliminary Baseline Trash Generation Rates Project; and
- Trash Load Reduction Tracking Method.

A status summary for each BASMAA regional project is 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 Permittee to submit a Short-Term Trash Loading Reduction Plan (Short-Term Plan) to the Water Board by February 1, 2012. The Short-Term 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 percent trash load reduction by July 1, 2014.

Model Short-Term Trash Loading Reduction Plan

Starting in late FY 2010-11, BASMAA began developing a *Draft Model Short-Term Trash Loading Reduction Plan* (Model Plan) to assist Permittees in complying with this requirement (C.10.a.i). The Model Plan provided Permittees with a template to use when they developed their own plans and created a consistent format among Permittees. A Draft Model Plan was released for comment by Permittees and Water Board staff in October 2011 and included model text descriptions and formats for reporting:

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

The Model Plan was revised based on comments received and finalized by the BASMAA Trash Committee in December 2011.

Trash Load Reduction Calculator

The Model Plan includes a "Summary of Trash Control Measure Enhancements" as Section 5.0. To assist Permittees with estimating the predicted trash load reductions associated with the implementation of new and enhanced trash control measures, BASMAA developed a Trash Load Reduction Calculator. The Calculator (e.g., Excel Spreadsheet) requires Permittees to input baseline trash loads and planned levels of new/enhanced control measure implementation to address the 40 percent trash load reduction goal. Estimated load reductions calculated by the calculator for each applicable control measure are consistent with the BASMAA *Trash Load Reduction Tracking Method* – version 1.0 (see description below).

C.10.a.ii Baseline Trash Load

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* and the *Baseline Trash Loading Rates Sampling and Analysis Plan*.

Preliminary baseline trash loading estimates were developed and submitted by each Permittee in Section 2.0 of their Short-Term Plans. Preliminary baseline loads were developed consistent with the *Preliminary Baseline Trash Generation Rates* developed via a BASMAA regional project.

Preliminary generation rates were developed by monitoring trash at 159 sites located in four Bay Area counties (Alameda, Contra Costa, San Mateo and Santa Clara). Each site was a storm drain inlet that was equipped with Water Board recognized trash full capture device. 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.

The results from two monitoring events (May and September 2011) were used to develop the preliminary baseline generation rates submitted by BASMAA to the Water Board on February 1, 2012. These rates were used by each Permittee to develop preliminary baseline trash loads, which are specific to the jurisdictional areas for each Permittee and incorporate the effectiveness of baseline street sweeping and stormwater conveyance system maintenance programs.

Following the development of preliminary trash generation rates, two additional monitoring events were conducted in January and April 2012. The results of these events are currently being combined with the first two events to develop refined generation rates. Additionally, two hydrodynamic separators (HDS) devices were monitored to assist in calibrating refined trash generation rates. The HDS devices were located within larger heterogeneous land uses and income categories within the Cities of San Jose and Dublin.

A final technical report is currently under development and will be submitted in the fall of 2012 to the Water Board on behalf of all Permittees. The technical report will include final trash generation rates and describe all methods used and analyses conducted to develop the rates that will be used to develop Permittee baseline trash loads.

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 percent 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 MRP provision. 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 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. After further consideration, MRP Permittees narrowed the list of trash control measures for which trash load reduction methods should be developed. This refined list of control measures was based on the potential for Permittees to implement; availability of information needed to show trash load reductions; and the expected benefit of implementation. Control measures were tentatively separated into two general types: 1) those for which quantification formulas could be created and, 2) those for which credits would need to be developed because quantification is likely not feasible (see Table A.2).

During FY 2011-12, Permittees continued discussing control measures at monthly BASMAA Trash Committee meetings. In August 2011, BASMAA distributed a first internal draft technical report of the load reduction tracking methodology which included quantification formulas and crediting methods for demonstrating trash load reductions. Revisions were made to the first draft report and a revised internal draft report was distributed to the BASMAA Trash Committee on October 10, 2011. As a courtesy, the revised internal draft report was distributed to Water Board staff. After review and incorporation of comments into the revised internal draft report, BASMAA distributed a revised draft technical report to BASMAA members and other interested stakeholders on November 11, 2011. Comments received on the draft technical report were incorporated into the final technical report. On February 1, 2012, BASMAA submitted the final technical report entitled *Trash Load Reduction Tracking Method: Assessing the Progress of San Francisco Bay Area MS4s Towards Stormwater Trash Load Reduction Goals – Version 1.0* to the Water Board (under BASMAA letterhead). This report fully describes the load reduction tracking method selected for each control measure, and the process by which load reduction tracking will take place. During FY 2012-13, BASMAA will be working with MRP Permittees to refine the Tracking Method.

Table A.2. Trash control measures for which load reduction credits or load reduction quantification formulas were developed to track progress towards trash load reduction goals.

Load Reduction Credit Control Measures
Single-use Carryout Plastic Bag Ordinances
Polystyrene Foam Food Service Ware Ordinances
Public Education and Outreach Programs
Activities to Reduce Trash from Uncovered Loads
Anti-Littering and Illegal Dumping Enforcement Activities
Improved Trash Bin/Container Management Activities
Single-use Food and Beverage Ware Ordinances
Quantification Formula Control Measures
On-land Trash Cleanups (Volunteer and/or Municipal)
Enhanced Street Sweeping
Partial-Capture Treatment Devices
Enhanced Storm Drain Inlet Maintenance
Full-Capture Treatment Devices
Creek/Channel/Shoreline Cleanups (Volunteer and/or Municipal)

JOINT MERCURY AND POLYCHLORINATED BIPHENYLS (PCBS) CONTROLS

Provisions C.11.c through Provision C.11.g for mercury are written 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 Provision C.11/12.f, MRP requirements focus on pilot studies (sites for these pilots were primarily chosen on the basis of the potential for reducing PCB loads, but consideration was given to mercury removal in the final design and implementation of the studies). Provisions C.11.i and C.12.i are also 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 methods, including site remediation, enhancements of municipal operation and maintenance activities to remove sediments with pollutants, stormwater treatment retrofitting, and diversion of stormwater to existing Publicly-Owned Treatment Works (POTWs). Table A.3 summarizes the wide range of pollutant control methods that BASMAA agencies are pilot-testing. Figure A-1 shows the five project watersheds and 10 stormwater treatment retrofits, all of which are described later in this report. 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, 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.

Integrated Monitoring Report - Part B

The MRP requires Permittees to submit an Integrated Monitoring Report (IMR) by March 14, 2014 that summarizes water quality monitoring activities and provides conclusions with regard to provisions C.8 and most of the C.11/12 pilot studies. BASMAA will assist Permittees in developing and submitting the IMR. The IMR will be separated into two parts: Part A will focus on water quality monitoring conducted per Provision C.8. Part B will provide a synthesis of data and information developed through the implementation of PCB and mercury control pilot studies (MRP provisions C.11 and C.12) and PCB and mercury specific monitoring studies conducted via the RMP. Part B will also incorporate information gained through pollutant loading station monitoring conducted per provision C.8.e. Part B will address:

- Lessons learned,
- Pilot programs and BMP cost-effectiveness,
- Load reductions, and
- Recommendations on steps and criteria to identify opportunities for future implementation.

Table A.3. Bay Area PCB/Mercury Pilot Projects

Project/Watershed Location	City/County	C.11/12.c –Pilot Property ID & Referral	C.11/12.d – Pilot Municipal O&M Enhancement	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	Yes - to be Determined Based Upon Desktop Study Results	1. Pump station - amended sand filter	Pump station stormwater to POTW diversion	No	SFBWQIF, ACCWP,
				2. West Oakland industrial area - tree well filters			SFBWQIF, Oakland
Lauritzen Channel watershed	Richmond, Contra Costa	Yes	Yes - to be Determined Based Upon Desktop Study Results	3. 1st and Cutting PG&E substation - bioretention	No	No	SFBWQIF, CCCWP, Richmond
Parr Channel watershed	Richmond, Contra Costa	Yes	Yes - to be Determined Based Upon Desktop Study Results	4. Nevin Ave. Green Street - bioretention, permeable pavement, flow through biotreatment, tree wells.[5]	No	Yes	SFBWQIF, CCCWP, Richmond

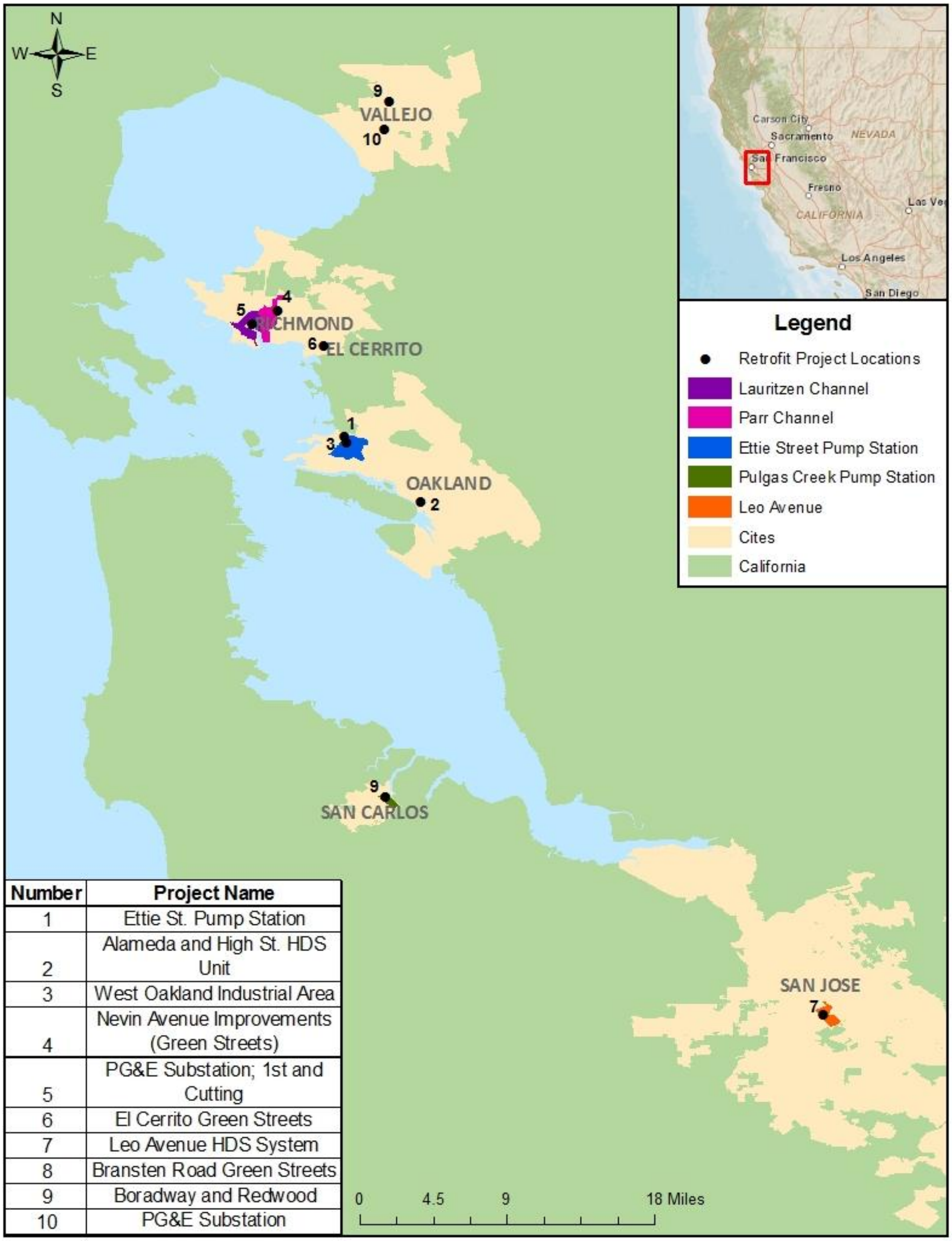
[5] The Nevin Ave. green street improvements are located partly within the Parr Channel watershed and partly within an adjacent watershed in Richmond.

Table A.3. Bay Area PCB/Mercury Pilot Projects

Project/Watershed Location	City/County	C.11/12.c –Pilot Property ID & Referral	C.11/12.d – Pilot Municipal O&M Enhancement	C.11/12.e – Pilot Stormwater Treatment Retrofit	C.11/12.f -Pilot Stormwater Diversion to POTW	Green Street	Source(s) of Funding
Pulgas Creek Pump Station watershed	San Carlos, San Mateo	Yes	Yes - to be Determined Based Upon Desktop Study Results	5. Bransten Rd. Green Street - bioretention and flow through biotreatment curb extensions	Pump station stormwater to POTW diversion	Yes	SFBWQIF, SM County VLF, SMCWPPP, San Carlos
Leo Ave. watershed	San Jose, Santa Clara	Yes	Yes - to be Determined Based Upon Desktop Study Results	6. Hydrodynamic separator for trash and sediment capture	No	No	SFBWQIF, ARRA, SCVURPPP, San Jose
North Richmond Pump Station watershed	Richmond, Contra Costa	No	No	No	Pump station stormwater to POTW diversion	No	SFBWQIF, CCCWP, CCC-FCWCD
Drainage bounded by Hamilton Ave., Bryant St., Channing Ave., and Alma St.	Palo Alto, Santa Clara	No	No	No	Stormwater diversion to POTW	No	SCVURPPP, Palo Alto
State St. Pump Station watershed	Fairfield, Solano	No	No	No	Strategic cleanout of pump station wet well to POTW	No	FSURMP

Table A.3. Bay Area PCB/Mercury Pilot Projects

Project/Watershed Location	City/County	C.11/12.c –Pilot Property ID & Referral	C.11/12.d – Pilot Municipal O&M Enhancement	C.11/12.e – Pilot Stormwater Treatment Retrofit	C.11/12.f -Pilot Stormwater Diversion to POTW	Green Street	Source(s) of Funding
San Pablo Ave. at Madison Ave. and Eureka Ave.	El Cerrito, Contra Costa	No	No	**7.** El Cerrito Green Street - bioretention	No	Yes	SFBWQIF, ARRA, CCCWP, El Cerrito
Alameda and High St. - local unnamed watershed that drains into the canal between Oakland and Alameda	Oakland, Alameda	No	No	**8.** Hydrodynamic separator for trash and sediment capture	No	No	SFBWQIF, ARRA, Oakland
Portion of Broadway (between Redwood and Valle Vista) that drains to the east (from the crown in the road) and the area between the railroad tracks and Broadway	Vallejo, Solano	No	No	**9.** Broadway and Redwood - flow-through biotreatment	No	No	SFBWQIF, FSURMP, VSFCD, Vallejo
Vallejo	Vallejo, Solano	No	No	**10.** Catch basin media filter by PG&E substation	No	No	SFBWQIF, FSURMP, VSFCD, Vallejo



Number	Project Name
1	Ettie St. Pump Station
2	Alameda and High St. HDS Unit
3	West Oakland Industrial Area
4	Nevin Avenue Improvements (Green Streets)
5	PG&E Substation; 1st and Cutting
6	El Cerrito Green Streets
7	Leo Avenue HDS System
8	Bransten Road Green Streets
9	Boradway and Redwood
10	PG&E Substation

Figure A-1. Locations of ten retrofit pilot projects catchment areas and municipal boundaries.

As part of a regional project to outline the IMR, a recent draft memorandum (Appendix A1) summarizes proposed objectives, management questions and associated MRP reporting requirements for Part B of the IMR.

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 Enhanced Municipal Operations and Maintenance 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.[6] 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).[7] A work plan was submitted to USEPA on September 23, 2009 (a final revised version is dated April 19, 2010).[8] The total project cost is $7.04 million - $5M from USEPA 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

[6] It 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, USEPA was not able to provide BASMAA with an assistance agreement until June 2010 which resulted in a project start date of July 1, 2010.

[7] Funding is through EPA's San Francisco Bay Water Quality Improvement Fund.

[8] Clean Watersheds for a Clean Bay. Proposal/Workplan prepared by BASMAA for USEPA for funding via San Francisco Bay Water Quality Improvement Fund. Submitted September 23, 2009. Revised April 19, 2010.

programs)[9] was formed at the outset of the project. Several Bay Area cities are also participating in CW4CB and send representatives to the PMT.[10] 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 four times during FY 2011/12: September 14, 2011, November 30, 2011, March 14, 2012 and June 13, 2012. The CW4CB Property Identification and Referral Workgroup (Task 3) also met twice during FY 2011/12: October 12, 2011 and November 9, 2011. In addition, the CW4CB Retrofit Workgroup (Task 5) met four times during FY 2011/12: August 24, 2011, November 30, 2011, January 10, 2012, and April 24, 2012. Meeting highlights and action items are generally memorialized in subsequent meeting agenda packages that are available upon request.

Monitoring Contractor Procurement

During FY 2011/12 the PMT conducted a competitive Request for Proposal (RFP) process (in accordance with USEPA procurement requirements) to select qualified monitoring contractors for all CW4CB field monitoring tasks (i.e., Tasks 3, 4 and 5 - see above descriptions). Two qualified teams were selected.

Technical Advisory Committee

During FY 2010/11, the PMT formed a CW4CB Technical Advisory Committee (TAC). The TAC is tasked with helping to optimize the scientific and technical soundness, integrity, and objectivity of the project. The TAC is comprised of four local and national experts in the field of stormwater pollution control:

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, P.E. (Senior Vice President, RBF Consultants)
4. Dr. Roger Bannerman (Environmental Scientist, Wisconsin Department of Natural Resources)

An initial meeting of the TAC was held on October 24, 2011. A meeting summary is available upon request. The next meeting of the TAC will tentatively be held in October 2012.

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

[9] The 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.

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

selecting five Bay Area region watersheds with relatively high levels of PCBs[11] in sediments collected from roadway and stormwater drainage infrastructure and other desirable attributes for pilot source property identification and referral investigations. Task 3 of CW4CB is conducting the investigations. Further details regarding the selection methodology and maps of the watersheds are provided in a progress report that was submitted to USEPA in April 2011.[12] 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

During FY 2011/12 Task 3 of CW4CB 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. <u>Records review</u>. 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. <u>Driving/walking survey</u>. 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. <u>Facility inspections</u>. Perform inspections of selected facilities within each pilot watershed.
4. <u>Surface soil/sediment testing</u>. 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. <u>Property referrals</u>. Where laboratory data confirm elevated pollutant concentrations, refer properties to regulatory agencies for cleanup and abatement.

BASMAA (2011)[13] is a general work plan and guidance for the Steps 1 - 3 above. During FY 2011/12, Steps 1 - 3 were implemented in each project watershed to characterize properties in the 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 the Steps 1 - 3 types of activities had been conducted to varying extents in the past and thus the extent of additional effort needed varied. The results from Steps 1 - 3 are being used to inform the development of soil/sediment sampling

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

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

and chemical analysis monitoring programs for each project watershed designed to identify potential source properties. The surface soil/sediment sampling (above Step 4) is anticipated to commence during the fall of 2012, starting with the public right-of-way and then moving to 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.

The PMT completed and submitted to USEPA during FY 2011/12 a draft CW4CB Task 3 Sampling and Analysis Plan (SAP) [14] and Quality Assurance Project Plan (QAPP)[15]. USEPA reviewed these documents and provided relatively minor comments, which are currently being addressed.

Further details regarding investigations in individual watersheds are provided in the following sections.

Ettie Street Pump Station Watershed

In FY 2011-12 Oakland City staff worked with Geosyntec Consultants (funded through ACCWP) to review previous inspection and sampling information and identify high priority sites for further site inspections and sampling. In May and June 2012, City and Geosyntec staff inspected or reinspected over 15 industrial sites to evaluate whether those properties are potential sources of PCBs.

Based on data from these inspections, over 30 locations were recommended for sampling via the CW4CB. Some of the recommended locations are industrial properties that are considered "high priority" sites based on historic sources of PCB and/or current inspection information but lack sufficient sampling data to determine if the property is a potential source. Other locations were selected to evaluate the long-term effects of sediment abatement conducted in the street right-of way during 2004. A review of the inspection summaries and additional sampling results will be used to provide referrals to the appropriate regulatory agencies.

Parr Channel and Lauritzen Channel Watershed

CCCWP completed the initial steps (data review, driving inspections, onsite property inspections) of contaminated sediment identification In FY 2010-11. That assessment was based on lessons learned from the 2000 – 2001 investigation of PCBs in MS4 sediment conducted in collaboration with other BASMAA member agencies, and follow-on investigations conducted by CCCWP and the City of Richmond in 2002 and 2005. Based on information from the assessments, one property owner was notified by the City of Richmond that they are not allowed to discharge stormwater from the

[14]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, USEPA San Francisco Bay Water Quality Improvement Fund Grant No. CFDA 66.202. Prepared by Applied Marine Sciences, Inc. DRAFT July 29, 2011.

[15]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, USEPA San Francisco Bay Water Quality Improvement Fund Grant No. CFDA 66.202. Prepared by Applied Marine Sciences, Inc. DRAFT July 29, 2011.

property into the MS4 system unless they provide detailed monitoring results for PCBs using appropriately low detection limit, and could demonstrate attainment of EPA benchmark values for other constituents. The property owner stored and re-used stormwater onsite during the 2010 – 2011 storm season.

In FY 2011-12, CCCWP coordinated with other BASMAA member agencies through the CW4CB work groups to share lessons learned by CCCWP about the onsite property inspections. In FY 2011-12 CCCWP also collected a sediment sample from a storm drain near a potential source area in the Lauritzen Channel watershed where a storm drain inlet plugged with sediment had been discovered. The sediment sampled from the storm drain was analyzed for PCBs using EPA Method 8020. PCB results were non-detect (< 250 µg/kg total PCBs), indicating that the sediment did not have PCB concentrations greater than would be expected from an industrial urban setting. Follow on investigations using lower detection limits and targeting suspected source areas in both the Lauritzen and Parr / Harbor watersheds across a wider area are scheduled to occur prior to October 15, 2012 through the CW4CB grant.

Pulgas Creek Pump Station Watershed

In FY 2011-12, the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) continued to implement tasks in the Pulgas Creek Pump Station watershed in compliance with MRP provision C.11.c and C.12.c. The program completed the CW4CB Task 3 records review process for all properties in the Pulgas Creek Pump Station. Address and parcel information on the 481 properties located within the watershed were initially obtained from the San Mateo County assessor website. The records review process identified 140 of these properties as potential source properties. Google Earth™ satellite and aerial imagery software were used to preliminarily identify current land use of properties located within the watershed, including screening out low priority properties such as residential units and commercial buildings. Google Earth™ was also 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. Program staff then conducted a driving and walking reconnaissance survey in the Pulgas Creek Pump Station watershed to collect additional information about subject properties and verify information collected during the records review. Following the survey, the list of potential source properties was reduced to 40.

Facility inspections were coordinated with the City and the San Mateo County Department of Environmental Health (SMCDEH), the agency that routinely conducts stormwater inspections in the city. Prior to property inspections, SMCDEH sent out letters to each property owner informing them of SMCWPPP's upcoming visit to inspect their sites. Inspections were conducted by Program and SMCDEH staff in April 2012. Thirty-four properties were inspected. During the inspections, Program staff asked the property owner or site manager questions about the property and surrounding area and completed facility inspection forms. Notes were kept about each property and the surrounding area, including locations of existing on-site private storm drain inlets or potential areas of concerns, which were mapped using Google Maps™. There were six properties from the list of 40 that were not inspected due to lack of access (no known owner, closed business, unsuccessful repeated attempts to contact owner). Those properties were surveyed to the extent possible from outside the property boundaries.

The results of the records review, field survey, and inspections were used to rank each inspected property as high, medium or low priority for right-of-way sampling based on the degree of evidence that PCBs may be on the property and potential for sediment mobilization via stormwater off the site. The inspections identified 8 properties with medium or high potential PCB sources on the property. Of these, five also had medium or high potential for sediment erosion. Another 8 properties had low potential PCB sources on the property, but medium or high potential for sediment erosion. In total, 15 properties were ranked medium or high priority for adjacent right-of-way sampling.

In order to inform selection of potential sediment sampling locations, Program staff ground-truthed locations of storm drain inlets and other features adjacent to medium and high priority properties in May 2012, and identified areas where sediment had accumulated. Sediment sampling locations will likely include storm drain inlets, street curbs, driveways and other areas where sediment appears to be transported off medium and high priority properties and accumulates in the streets/storm drainage system. The Program will finalize the list of right-of-way sampling locations in August/September 2012. A sampling contractor will then use this information to carry out public right-of-way sampling scheduled for September/October 2012 under the direction of Program staff. Results from sampling these right-of-way areas will inform a second round of sediment sampling on private property, to the extent that access can be obtained. Finally, based on the records review, field reconnaissance, and public right-of-way and private property sediment sampling results, the Program will submit a list of facility referrals to the Water Board for follow-up investigations at these properties.

Leo Avenue Watershed

In FY 2011-12, SCVURPPP Co-permittees continued to implement tasks in the Leo Avenue watershed City of San Jose) in compliance with MRP provision C.11.c and C.12.c. In preparation for conducting the source investigation pilot project in the Leo Avenue watershed, the Program and the City of San Jose developed a Work Plan in FY 2010-11 (see Appendix 11-1 of SCVURPPP FY 10-11 Annual Report).

SCVURPPP staff completed a records review of all properties within the Leo Avenue watershed In FY 2011-12. In total, 233 parcels were identified within the watershed and through the records review, 138 were identified as potential PCB sources. Program and City staff then carried out a driving and walking reconnaissance survey around the Leo Avenue watershed to collect additional information about subject properties and check the information collected during the records review. Notes were made to the list of properties derived from the records review to correct and/or add missing information identified during the field reconnaissance. The list of addresses increased from a total of 138 to 159, due to additional identified properties during the survey. The results of the reconnaissance survey and filtering steps using Google Earth™ led to reducing the list of 159 properties to 36. The Program and City staff then assigned an inspection priority to each of the 36 properties. Twenty-nine sites were categorized as high priority and seven as medium priority. This list was then used to determine the locations and priority for the facility inspections. In addition, four vacant facilities were identified as potential PCB sources due to insufficient information. It was determined that, although the facilities would not be inspected, they would be added to the list of right-of-way sampling sites.

In September and October 2011, City and Program staff conducted property inspections at the 36 sites. All properties were inspected within the planned budget and schedule. Prior to the inspections, the City Stormwater Inspector provided Program staff with an inspection history report, as available, for each facility. During inspections, Program staff member asked the property owner or site manager's questions about the property and surrounding area and completed facility inspection forms. In addition, for each inspection, relevant notes, such as locations of existing on-site private storm drain inlets or potential areas of concern, were drawn on a site map created using Google Maps™.

Information obtained from the inspections was entered into a spreadsheet, including a description of the survey area, evidence about potential historic and/or current PCB sources and notes regarding the potential for sediment mobilization at the site. No obvious sources of PCBs (i.e. no transformers, old hydraulic fluid, etc.) were identified during inspections. However, all sites were ranked as high, medium or low priority for right-of-way sediment sampling based on the degree of evidence that PCBs may be on the property and mobilized via stormwater/sediment transport.

Program staff intends to ground-truth priority right-of-way sampling locations and select the final sampling locations for right-of-way sampling. As part of the operation and maintenance desktop analysis, Program and City staff will ground truth locations of storm drain inlets in front and nearby priority facilities as well as on those street segments that are also considered high priority. Sediment sampling locations will likely include storm drain inlets, street curbs, driveways and other areas where sediment appears to be transported off priority properties and accumulate in the streets/storm drainage system. The Program and City will finalize the list of right-of-way sampling locations in August/September 2012. A sampling contractor will then use this information to carry out public right-of-way sampling scheduled for September/October 2012 under direction from the Program and City. Results from sampling these right-of-way areas will inform the private property sampling. Finally, based on private property sampling results, the Program and City will submit a list of facility referrals to the Water Board for follow-up investigations at these facilities.

C.11/12.d - Pilot Projects to Evaluate Enhanced Municipal Operations and Maintenance Practices

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

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[16]. The literature review identified key data gaps with respect to evaluating the effectiveness of municipal sediment management practices in reducing PCB and mercury loads to San Francisco Bay. It also provided recommendations relative to the design of future studies that evaluate the effectiveness of municipal O&M enhancement practices in relation to reducing PCB and mercury loads to the Bay.

BASMAA's FY 2010/11 Regional Pollutants of Concern Annual Report[17] provided a conceptual plan for the municipal O&M enhancement pilot studies. However, based upon the October 24, 2011 TAC meeting and subsequent discussions among BASMAA representatives and Regional Water Board staff, it was agreed that the conceptual plan would benefit from further desktop analysis. BASMAA subsequently developed a workplan[18] for such an analysis, focusing on potentially implementing pilot studies related to enhancement of the following five types of municipal O&M activities:

1. Street sweeping.
2. Storm drain inlet cleaning.
3. Street flushing.
4. Stormwater conveyance pipeline flushing.
5. Pump station maintenance (e.g., vacuuming accumulated materials from pump station wet wells).

The objectives of the desktop analysis are to inform the conceptual planning of municipal O&M enhancement pilot studies during the current permit term and develop tools that will assist future planning of O&M enhancements across a larger geographic scale. It consists of the following five tasks:

1. Create GIS graphical representations of the spatial distribution of mercury and PCB concentrations in the portions of the Bay Area subject to MRP requirements, including the five project watersheds where pilot O&M enhancement studies will occur.
2. Develop a template for a conceptual model of pollutant sources/transport/storage and a preliminary O&M enhancement decision tree, including development of a questionnaire that identifies the information needed to populate the conceptual model and apply the decision tree.
3. For each project watershed, collect the information needed to populate a conceptual model and apply the decision tree.

[16]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.

[17]BASMAA 2011. Regional Pollutants of Concern Report for FY2010-2011 and Monitoring Status Report for January-June 2011. September 12, 2011.

[18]BASMAA 2012. Desktop Analysis to Inform Pilot Testing of Municipal Operation and Maintenance Enhancements for PCB and Mercury Load Reduction. Work Plan. March 2012.

4. For each project watershed, populate a conceptual model and apply the decision tree to inform the planning of optimal O&M enhancement pilot studies.
5. Perform pollutant load reduction opportunity analyses, cost estimating, conceptual planning of pilot O&M enhancement pilot studies, and project reporting.

The desktop analysis was initiated during FY 2011/12 and the majority of the work was completed. It is anticipated that the results will be used early in FY 2012/13 to work with the CW4CB TAC to refine the conceptual plan for the pilot O&M enhancement pilot studies.

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. This task is evaluating ten Bay Area stormwater treatment retrofits to existing infrastructure for effectiveness in reducing pollutant loads. Areas in the Bay Area urban landscape with elevated PCBs are the primary targets for the retrofits, with mercury and other pollutants being a secondary consideration. At least one retrofit is being installed in each of five major Bay Area counties (Santa Clara, San Mateo, Alameda, Contra Costa, and Solano).[19] The retrofits will use proven existing technologies (e.g., filtration devices such as sand filters and green street bioretention facilities) that 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.

During FY 2010-11, a preliminary conceptual planning document[20] 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 it would likely produce the best results given existing budget and schedule constraints. After completion of the call for projects the workgroup evaluated the results and prepared a document presenting candidate locations and types of urban runoff treatment retrofits.[21]

[19]Some but not all of the retrofits are sited within the five watersheds selected for source property identification and referral described previously.

[20]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.

[21]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.

During FY 2011/12, the Retrofit Workgroup refined and finalized a list of ten selected retrofit projects. Some projects "piggy back" on existing projects that were underway or in one case was completed (the El Cerrito Green Streets), while others start from scratch. The projects vary with regard to design and construction status at the time of selection and their ongoing schedule. Appendices A2 and A3 contain tables that summarize a variety of information about the retrofit projects, including treatment types, locations and associated land uses, mercury and PCB concentrations in sediment samples collected from street and storm drain infrastructure in the vicinity of the projects, and project schedules. Appendix A4 is a map showing the retrofit project locations and concentration of PCBs in sediments with 2.5-kilometer "halos" around each data point.[22] Appendix A5 provides project concepts for the retrofits.

During FY 2011/12, the Retrofit Workgroup also conducted a competitive Request for Qualifications (RFQ) process (in accordance with USEPA procurement requirements) to select engineering design services and the projects that needed these services commenced design. In addition, Brian Currier, Ph.D. of the Office of Water Programs, California State University, Sacramento, was retained to develop a conceptual field monitoring plan to evaluate pilot retrofit effectiveness beginning with 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 2012 Annual Report the status of the risk reduction efforts. Task 6 of the CW4CB project work plan (submitted with the FY 2009-10 Annual Reporting Regional Supplement for

POCs and Monitoring) includes a description of the tasks being conducted via the 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.

[22] Based upon sediment concentrations compiled by the San Francisco Estuary Institute as part of a State of California Proposition 13 grant (http://www.sfei.org/urbanstormwaterBMPS).

This section reports on progress during FY 2011-12 for all of the above sub-tasks. Through the CW4CB project in FY 2011-12, the Permittees made significant progress on sub-tasks 1-4 as described in the CW4CB Semi-Annual Progress Reports (excerpted in Appendix A6) and below. The sub-tasks were carried out primarily by the California Department of Public Health (CDPH) under contract through the Aquatic Science Center (ASC) to BASMAA as part of what is called the "San Francisco Bay Fish Project" (SFBFP). BASMAA oversaw implementation through its participation in the SFBFP's Stakeholder Advisory Group (SAG) that also includes representatives from the Bay Area Clean Water Agencies (BACWA), Regional Water Quality Control Board, EPA, and county health departments.

The time periods covered by the CW4CB Semi-Annual Progress Reports are based on those of the funding agency – EPA, which is on the federal fiscal year (October – September). So the CW4CB Semi-Annual Progress Report that would cover the April through June 2012 time period will not be completed until after September 2012. Accordingly, progress during April through June 2012 on the four sub-tasks is reported in the Quarterly Report from CDPH (see Appendix A7). The extensive number of attachments referenced are available upon request.

C.11/12.f Pilot Stormwater Diversion Projects

Regional Overview

This status report summarizes activities by Permittees to implement actions required under provisions C.11.f and C.12.f of the MRP. These are nearly identical provisions for control of mercury and polychlorinated biphenyls (PCBs) that require the evaluation of pilot diversions of dry weather and/or first flush events to publically owned treatment works (POTWs). The pilot projects are being evaluated in parallel with other BMP pilot implementation projects. The results of pilot studies will inform decisions regarding future permit requirements for these (and possibly other) pollutants.

Results of a feasibility evaluation, coordinated through a BASMAA regional project, were included in the Regional Pollutants of Concern and Monitoring Supplement to the 2010 Annual Report. The evaluation included selection criteria for potential diversion projects, and identified candidate projects in each of the five counties regulated under the MRP. Based on input from the Water Board, a revised Feasibility Evaluation Report was submitted in December 2010. A status report on the diversion projects was submitted with the Regional Pollutants of Concern and Monitoring Supplement to the 2011 Annual Report to meet the MRP's annual reporting requirement for 2011. This report serves to meet the MRP's annual reporting requirement for 2012.

Planning activities for the diversion projects were ongoing during FY 2011-12. Agencies conducting the diversion projects each prepared internal workplan that identified project objectives, equipment and infrastructure requirements, water quality monitoring (including analytical methods), a general framework for identifying costs, benefits and operation challenges associated with the diversions, and a time schedule for monitoring, evaluation and reporting. The internal workplan were provided to the Water

Board in May 2012 along with a summary matrix explaining the evaluation approach, included as Appendix A8.

Through a regional project to outline the POCs portion of the March 2014 IMR, BASMAA will provide the agencies implementing diversion pilots with a more detailed analytical framework for elements that will be presented in the IMR's overall evaluation of diversion strategies, including:

- methods of data analysis,
- loading calculations,
- cost documentation and extrapolation of capital and O&M costs,
- refinement of future site selection criteria,
- development of analytical tools,
- consideration of POTW requirements

The following pages provide a brief overview and current status for each of the pilot diversion projects. Monitoring at four of the project sites (in Alameda, Santa Clara, San Mateo, and Solano Counties) will commence during the third quarter of 2012. Monitoring for the Contra Costa County project will commence in 1st quarter 2014, to complement information from previous characterization monitoring. Agencies will continue to communicate with Water Board staff as the projects progress, and may adapt their workplan in response to those discussions.

Alameda County

Project Overview and Objectives

ACCWP identified the Ettie Street Pump Station (ESPS) as its candidate for the pilot study located in Alameda County, based on elevated PCB and mercury concentrations found in previous studies of sediment in the ESPS and its watershed and also on the station's geographical proximity to the East Bay Municipal Utilities District (EBMUD) conveyance and wastewater treatment systems (see Figure A-2)

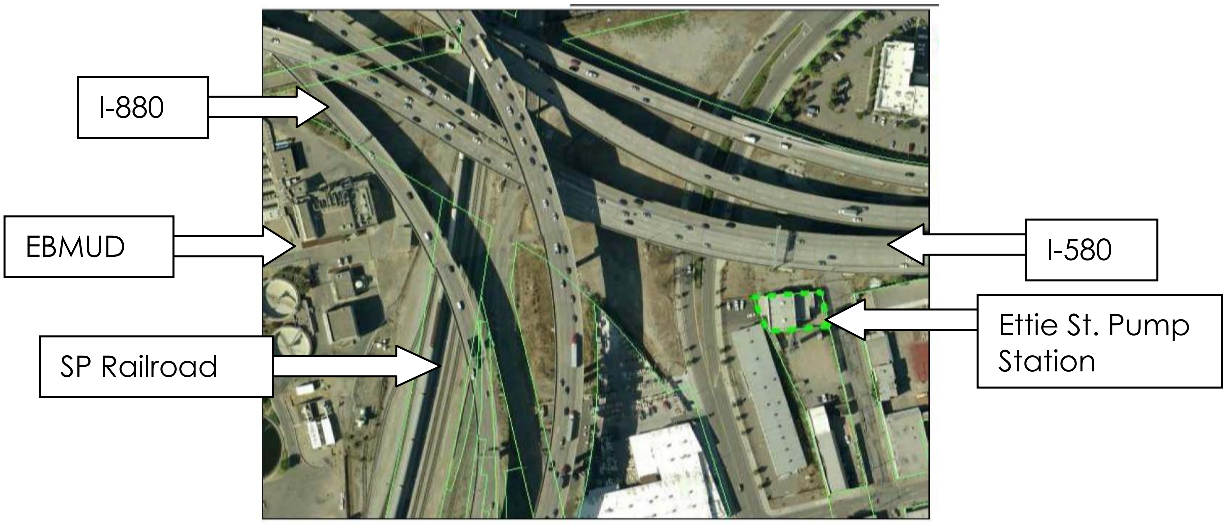

Figure A-2. Ettie Street Pump Station and vicinity, showing nearby transportation facilities and EBMUD treatment plant

EBMUD previously investigated the feasibility of a stormwater diversion at Ettie Street for consideration as a possible PCB and mercury reduction offset program, collecting composite water samples between April 2008 and February 2010 from the pump station forebay during dry weather, first flush, and wet weather events. A pilot dry weather diversion of 75 gallons per minute (gpm) was also implemented during the same time period using a connection to an existing sanitary line in the ESPS. The EBMUD study report noted that while the additional treatment volumes from the diversion would not significantly affect EBMUD discharge quality or operations, more "specific" data were needed to address the storm-to-storm variability, and that EBMUD would need to evaluate hydraulic capacity, costs and regulatory implications to clarify the acceptability of a long-term diversion project. Average PCB concentrations during first flush or ordinary wet weather averaged an order of magnitude higher than in dry weather, and were more variable. Thus the opportunities for reducing PCB loads are much higher for diversions implemented during wet weather. Infiltration in the aging sanitary conveyance system causes capacity problems at the EBMUD plant during peak runoff flows. ACCWP's study therefore focuses on diversion scenarios involving pretreatment storage of stormwater runoff prior to dry weather discharge to the sanitary sewer.

Studies of runoff loading by the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) have inaugurated the use of continuous turbidity monitoring as a more sensitive way to identify the onset of storm discharge, as well as a surrogate for characterizing the within-storm variations in transport of sediments and pollutants associated with fine sediments, such as PCBs and mercury. The Small Tributaries Loading Strategy, described in the context of MRP Provision C.8.e in Part B of this report, uses the turbidity surrogate approach as a basis for regional monitoring and modeling to address management questions about the occurrence and overall magnitude of mercury and PCB loads from local watersheds to San Francisco Bay. In the context of planning for STLS monitoring, the RMP conducted reconnaissance stormwater grab sampling during FY2010-11 in 16 watersheds; samples from the ESPS forebay collected for this study confirmed elevated pollutant concentrations and provided initial ranging values of turbidity and suspended sediment.

To support the overall goals of improving understanding of the cost-effective applications for mercury and PCB controls, this project has the following objectives:

1. Evaluate potential for PCB and mercury load reductions under scenarios of different diversion pumping regimes
2. Test use of turbidity thresholds as trigger criteria for diversion
3. Establish a site-specific relationship between particle size, concentrations of PCB and mercury and turbidity to support annual load estimates
4. Develop scenarios for larger-scale pretreatment and diversion and document additional feasibility considerations involved
5. Evaluate costs and benefits of the pilot project and larger-scale implementation scenarios
6. Coordinate system and monitoring design with pilot retrofit media filters to maximize data leverage and cost-effectiveness for both pilots.

Current Status

Installation of the turbidity probe and preliminary sampling during one storm event were conducted at the ESPS in spring 2012. Installation of a 500 gallon stainless steel storage tank for the small-scale pilot diversion will be completed in summer 2012, followed by dry season sampling and diversion. During the FY2012-13 rainy season, monitoring will be coordinated with monitoring for the treatment retrofit to be installed as described in the reporting above for Provisions C.11/12.e. The retrofit will use the same pump and pretreatment storage tank as the diversion project to supply water to the planned media filter beds.

Based on comments by Water Board staff on the previous workplan version provided in May 2012, the monitoring design will be revised to leverage the CW4CB monitoring efforts and increase the ACCWP resources directed to evaluation of costs and benefits associated with a larger scale diversion concept to be developed during FY12-13. The larger-scale diversion scenario is to incorporate the following elements:

- Larger pretreatment storage facilities constructed on adjacent land underneath the MacArthur Freeway (see Figure A-2) through either easement rights granted by the State of California to ACFCWCD or a Common Use Agreement between the State and ACFCWCD.
- Permanent diversion conveyance from ESPS to the pretreatment facility
- Permanent diversion conveyance from pretreatment to sanitary sewer. Challenges in obtaining easements for new conveyance across existing freeways and railroads will be evaluated in comparison to potential conveyance via connections to existing sanitary sewer lines owned by the City of Oakland.
- Diversion from ESPS to pretreatment that would be triggered by turbidity thresholds during wet weather and timed intervals or ESPS water levels during dry

weather. Multiple scenarios of diversion timing and volume will be developed in consideration of the characteristics and constraints of facility capacity and conveyance design.

- Estimated construction and operating costs for facilities and equipment for pumping, controls and monitoring, maintenance, sediment disposal and security for all facilities.
- Outlining terms of agreement with EBMUD for ongoing sharing of costs and TMDL load allocations for PCBs and mercury associated with the amounts transferred through stormwater diversion,

Contra Costa County

Project Overview and Objectives

The Contra Costa Clean Water Program (CCCWP) is facilitating design of a pilot project (Project) to divert urban runoff from the North Richmond Stormwater Pump Station (NRSPS) into the West County Wastewater District (WCWD). NRSPS is jointly owned by Contra Costa County (61 percent) and City of Richmond (39 percent) based on the 1974 agreement. WCWD is currently under a separate contract to maintain and operate the NRSPS.

The Project is being implemented to comply with the requirements of Provisions C.11.f and C.12.f of the Municipal Regional Permit for Urban Stormwater (MRP). The Project is being implemented by Contra Costa County Flood Control and Water Conservation District (CCC-FCWCD), a co-permittee of the Contra Costa Clean Water Program (CCCWP). CCC-FCWCD sought and obtained grant funding administered by the San Francisco Estuary Project through U.S. EPA's San Francisco Bay Area Water Quality Improvement Fund. The project is one of several in the "Estuary 2100 Phase 2: Building Partnerships for Resilient Watersheds" program. The grant provides $496,649 in USEPA funds, matched by $165,550 from CCC-FCWCD to plan, design, construct, and monitor an engineered diversion into WCWD.

In addition of the match provided by CCC-FCWCD, CCCWP is providing in-kind consultant resources from its program management consultant Brown and Caldwell. Brown and Caldwell assists with coordination and development of plans, designs, and cost estimates for the pilot diversion project.

The North Richmond Storm Drain Project, of which the NRSPS is a part, is designed to control the stormwater flooding conditions for the unincorporated area of North Richmond. The project consists of a network of stormwater collection sewers which drain into the wet well of the pump station. The stormwater is then pumped into the discharge channel of the pump station which drains by gravity into a 78-inch discharge pipeline.

As shown on Figure A-3 the project site is located in a watershed comprised mainly of industrial and residential land uses in the unincorporated area adjacent to the north boundary of the City of Richmond. The North Richmond Storm Drain System (NRSDS) delivers stormwater to the NRSPS located on the southwest corner of Gertrude Avenue and Richmond Parkway. The station's 78-inch discharge pipeline runs westward from the pump station along an easement on the Chevron Chemical Company's property just south of Gertrude Avenue. At about 950 feet downstream of the pump station, the pipeline expands into an 8-foot by 4-foot box culvert which crosses Gertrude Avenue and runs into a trapezoidal earth channel that drains to Wildcat Creek.

The NRSPS consists of a 3-level main structure and a discharge channel. The discharge pipes from the storm water pumps rise vertically from the wet well and enter the discharge channel by going through the west wall of the main structure. In order to prevent the stormwater in the discharge channel from flowing back into the wet well, an overflow weir is built around the end of each of the discharge pipes from the larger pumps, and flap gates are installed at the ends of the discharge pipes from the smaller pumps.

Table A.4 summarizes current pump station information as of April 2012 provided by WCWD Maintenance staff.

Figure A-3. Site Map of North Richmond Stormwater Pump Station Diversion Project

Table A.4. Information Summary for North Richmond Stormwater Pump Station

NRSPS Components	Original Design	Current Condition [1]	Notes
Wet weather pumps:	4 vertical, propeller type, natural gas engine driven pump rated at 45,000 gpm with a TDH of 19.2 feet.	3 pumps are in service, 1 pump is out of order	
Dry weather pumps:	2 vertical, propeller type, electric motor driven pump rated at 3,500 gpm with a TDH of 11 feet.	Both pumps are out of order	Rehabilitation or replacement of the dry weather pumps should be done as soon as possible.
Wet Well Dewatering pumps	2 submersible nonclog type, electric motor driven pump rated at 40 gpm with a TDH of 21 feet.	Both pumps are out of order and removed.	New submersible pumps should be installed with fittings that would allow flow diversion to WCWD.
Wet weather discharge	48-inch	48-inch	
Dry weather discharge	14-inch	14-inch	
Pump operation	Controlled by water level in the wet well. Wet Weather pumps operate only when inflow is high, such as during a rainfall event.	Wet Weather pumps operate approximately 5-10 minutes every day to lower the wet well water level.	This mode of operation is very inefficient and may lead to possible damage to the pump drives.
Wet weather Flow	10-year storm, 135,000 gpm	-	Flow rate check based on CCC-FCD Rational Method: 10-year 60-min storm, 130,000 gpm
Dry weather Flow	1.0 cfs (0.65 mgd)	0.55 cfs (0.36 mgd)	Based on the daily pumping records from 2009.

Objectives identified for the NRSPS diversion project include:

1. Evaluate PCB and mercury loads avoided through pump station maintenance conducted in conjunction with diversion to a POTW.
2. Design a diversion pilot project that can be permitted for discharge to West County Wastewater District
3. Evaluate operating techniques that can treat first flush without adversely impacting POTW capacity

Current Status

Brown and Caldwell has been directed by CCCWP to develop a preliminary design report. Key activities of the approved work plan and estimated schedule are summarized below.

<u>February - March 2012 Tasks Completed</u>

1. Met with CCC-FCWCD, CCCWP, City of Richmond, and during the week of February 28, 2012.
2. Gathered Information related to:
   - Existing monitoring data from San Francisco Estuary Institute (SFEI)
   - As-Built drawing for the existing North Richmond Stormwater Pump Station (NRSPS).
   - GIS layers: sewer system, street, parcel, aerial photo, ground surface elevation, etc.
   - Meeting notes, plans, and communications
   - Treatment efficiency data for West County Wastewater Treatment Plant(WCWTP)

<u>March – April 2012 Tasks Completed</u>

1. Reviewed collected data
2. Met with SFEI to go over monitoring data and lessons learned (Initial meeting; completed, final Data in review)
3. Prepared water quality review Tech Memo to answer:
   - What's in the dry weather and wet weather flow?
   - What are expected pollutant load reductions from dry weather and wet weather diversions?
   - What would be potential impact on the WCWTP effluent from dry weather and wet weather diversions?
   - Does the dry weather and wet weather flow water quality meet WCWTP local limits?
   - Are there any obvious fatal flaws to a dry weather or wet weather diversion, based on water quality?

<u>May – October Agency Coordination Tasks Planned and Completed</u>

1. Briefed SFRWQCB Assistant Executive Officer, Tom Mumley, on approach and status (Completed)
2. Site visit to North Richmond Pump Station (Completed)
3. Initial scoping meeting with WCWD (Completed)
4. Follow-on meetings with WCWD and SFRWQCB Staff (Completed)
5. Present diversion concept to WCWD Board (Planned for September 2012)
6. Pre-treatment Permit Application (Planned for October 2012)

San Mateo County

Project Overview and Objectives

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) pilot diversion project will evaluate the diversion of dry weather and first flush flows of stormwater from near the Pulgas Creek Pump Station to the sanitary sewer collection system served by the South Bayside System Authority's (SBSA) regional wastewater treatment plant. As described in last fiscal year's annual report, SMCWPPP selected the City of San Carlos' Pulgas Creek Pump Station watershed for the pilot diversion project and other CW4CB studies because of the relatively high concentrations of PCBs found in pump station and storm drain sediments. The approximately 330-acre watershed draining to the Pulgas Creek Pump Station is comprised of current and historic industrial land uses.

In FY 2012/13 the pilot diversion project will conduct wet and dry weather pilot scale diversions of urban runoff from the north Pulgas Creek storm drain line. A flow meter and turbidity sensor will be installed in the north Pulgas Creek storm drain line manhole, located immediately upstream from the pump station. Water will be collected for diversion through a small submersible pump that will send water through a flexible conduit to a 500 gallon storage tank located in the yard adjacent to the pump station. Water from the storage tank will be collected and transported by the City of San Carlos' vactor truck for disposal through a sanitary sewer connection at the City of San Carlos' corporation yard.

Targeted wet weather diversions will include, to the extent feasible, the first rainfall event of the 2012-2013 wet season, plus up to three additional events. During each of the targeted storm events, discrete water quality samples will be collected from the north Pulgas Creek storm drain line and tested for PCBs, mercury, and suspended sediment concentrations. In addition, as required by SBSA, testing will also be conducted during disposal of diverted stormwater collected during two events. These samples will be collected from the vactor truck discharge to the corporation yard's sanitary sewer connection. Testing of these samples will be for copper, mercury, and PCBs as the total of 40 congeners. Sampling will also be conducted in connection with several dry weather diversion events between July and October 2012.

The pilot diversion project will also evaluate the projected costs and benefits of a larger scale and more permanent dry and/or wet weather diversion at the Pulgas Creek Pump station in order to have the technical information needed to evaluate the feasibility of diversions as part of future stormwater NPDES permit terms. The evaluation will also include how to coordinate possible plans for a long-term, more permanent sewer diversion with the City of San Carlos' planned upsizing of sewer pipelines along Industrial Road and Brittan Road in the vicinity of the Pulgas Creek Pump Station. One of the major problems with trying to divert stormwater to the sanitary sewer system in the Pulgas Creek Pump Station drainage area is that the sewer system is undersized in the Pulgas Creek Pump Station area, and the City of San Carlos is already at its maximum capacity for discharging wastewater to SBSA.

Current Status

This section describes the progress and current status of the Pulgas Creek Pump Station pilot diversion project in the following areas: confirmation of relatively elevated PCB levels in stormwater flowing to the pump station; preparation of an internal project work plan provided to the Water Board in May 2012; procurement of a wastewater discharge permit from SBSA; and identification and mobilization of equipment needed for the pilot diversion project.

Confirmation of Relatively Elevated PCB Levels in Stormwater

As part of a stormwater runoff characterization study conducted for the Small Tributaries Loading Strategy of the Regional Monitoring Program, analyses of PCBs and mercury were performed on stormwater samples from the two storm drain lines that flow to the Pulgas Creek Pump Station. The PCB results in Table A.5 show that the stormwater contained between about 19,000 and 84,500 picograms per liter (pg/l) of total PCBs, which is relatively elevated compared to the 886 pg/l Event Mean Concentration of total PCBs calculated by SFEI from stormwater runoff sampling with similar methods from a parking lot and recreation area in Daly City.

Table A.5. Total PCBs (pg/l – total of 40 congeners) in Stormwater Runoff to Pulgas Creek Pump Station in San Mateo County

Sampling Date*	North Pulgas Creek Storm Drain Line	South Pulgas Creek Storm Drain Line
Feb. 17, 2011	46,896	53,894
	43,339	19,060
March 18, 2011	84,490	31,043
	66,554	21,883
Average	60,320	31,470

*Samples collected on the same dates were collected at different times.

The data also show that the concentrations of total PCBs from the north Pulgas Creek storm drain line appear to be higher than those found in the south Pulgas Creek storm drain line.

Pilot Diversion Project Internal Work Plan Provided to Water Board in May 2012

As requested by the Water Board staff, the Countywide Program prepared and on May 4, 2012 submitted to the Water Board an internal project work plan titled "Pulgas Creek Pump Station Pilot Urban Runoff Diversion Evaluation." This internal work plan describes the current approach for how the pilot diversion project will be implemented. The work plan describes the project background, objectives, tasks, implementation, and schedule. This internal work plan may be modified iteratively in order to take advantage of new information as it is developed.

SBSA's Wastewater Discharge Permit

One of the essential requirements of the pilot diversion project is to be able to dispose diverted dry weather urban runoff and stormwater to the City of San Carlos' sanitary sewer system. From the city's collection system flows continue to SBSA's collection system for treatment at SBSA's regional wastewater treatment plant. The Countywide Program staff worked with SBSA and City of San Carlos' staff to obtain a wastewater discharge permit for the City of San Carlos.

In June 2012 SBSA staff distributed a draft permit, and based on discussions among City of San Carlos, SBSA, and Countywide Program staff, modifications to the draft were proposed and accepted. The final permit was executed during the first half of July 2012 when it was signed by SBSA's Plant Manager and the City of San Carlos' acting City Engineer. The permit authorizes the diversion of limited volume of dry weather urban runoff and stormwater for a one-year period between July 1, 2012 and June 30, 2013. The permit describes discharge, monitoring, and reporting requirements, and it incorporates as an attachment A the internal project work plan provided to the Water Board in May 2012. The discharge permit is subject to revision at any time for the purposes of protecting the sanitary sewerage facilities and workers and to accommodate new regulations and NPDES permit requirements that may be imposed on SBSA.

Equipment Identification and Mobilization

The equipment that will be needed to implement the pilot diversion project has been identified and is in the process of being procured and installed so that the project may be initiated with the first dry weather sample.

Santa Clara County

Project Overview and Objectives

The pilot diversion project that is currently being implemented by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), in cooperation with the City of Palo Alto, is an evaluation of an existing dry and wet weather diversion structure located in the City of Palo Alto (Figure A-4). The diversion structure was constructed in 1993 to divert a limited volume of urban runoff from the stormwater conveyance system to the Palo Alto Regional Water Quality Control Plant. The area draining to the diversion structure is roughly 50 acres and is bound by Hamilton Avenue, Bryant Street, Channing Avenue and Alma Street. The site was originally selected by the City of Palo Alto because of the land use in the drainage area (commercial, light industrial, multi-family residential), proximity of the 27" sewer trunk line to the storm drain line, and because the sewer trunk line had excess capacity. The structure was designed to divert urban runoff flows into the sanitary sewer at a rate of no more than 0.5 million gallons per day (MGD).

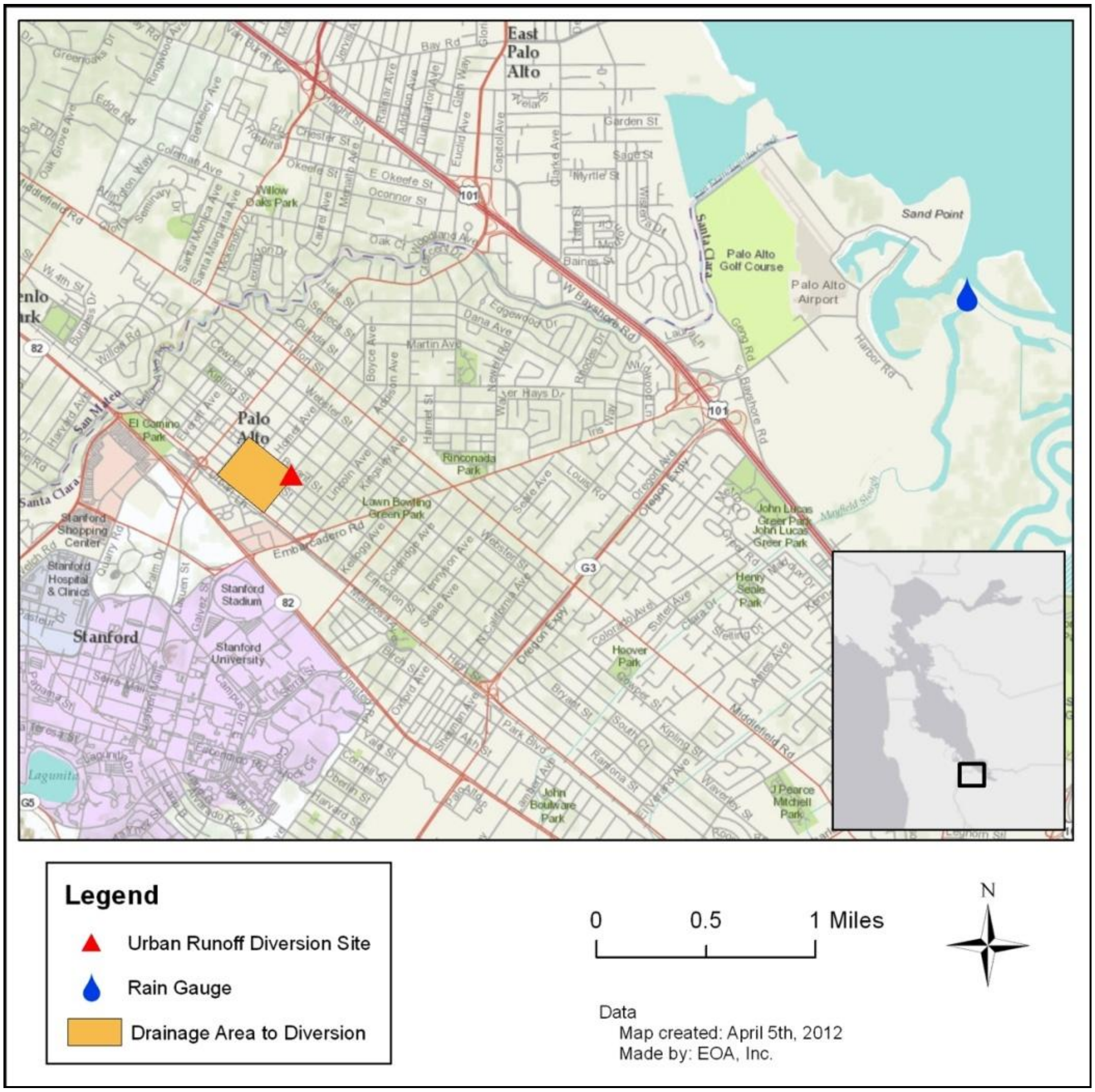

Figure A-4. Location of the City of Palo Alto Urban Runoff Diversion Structure, Santa Clara County, CA.

The overall goal of this pilot project is to comply with provision C.11/12.f of the MRP by better understanding the applicability, costs and benefits associated with the existing Palo Alto urban runoff diversion structure. The results from this and other parallel studies will inform planning for focused implementation of urban runoff control measures during subsequent Permit terms in order to achieve maximum benefit and continue to make progress towards achieving load reductions called for in mercury and PCB reduction strategies (i.e., Total Maximum Daily Loads).

The Palo Alto pilot diversion project was designed to address the following three objectives:

1. Evaluate pollutant loads to the Bay that are reduced due to current operation of the existing diversion structure.
2. Estimate projected benefits, challenges and costs of constructing and operating a similar diversion structure in other watersheds (e.g., a larger drainage area and/or an area known to have elevated concentrations of PCBs or mercury).
3. Document the knowledge and experience gained from evaluation of the diversion structure to inform planning of urban runoff diversions in the next permit term.

Current Status

An internal work plan was developed which describes the methods that will be used to evaluate the effectiveness of the Palo Alto diversion structure and fulfill the objectives of the project. This internal work plan was provided to the Water Board in May 2012. The work plan is intended to guide monitoring and data collection activities over Fiscal Year 2012-13. Work plan tasks include: (1) project planning; (2) water quality monitoring; (3) evaluation of diversion costs and operational challenges; (4) cost and benefit analysis; and (5) reporting. Project planning activities have been ongoing during 2011-12.

Preparations for monitoring have begun, and monitoring is expected to start in August or early September 2012. Monitoring activities will continue through the winter of 2012-13. The volume and turbidity of urban runoff flowing into and through the diversion structure will be monitored continuously during this timeframe. Water quality parameters, including suspended sediment concentrations, particle size distribution, and Hg and PCB concentrations will be monitored during a minimum of two dry weather and four wet weather events. These data will be used to calculate loads removed from urban runoff due to the diversion structure.

In addition, the internal work plan defined a framework to evaluate the construction, operation and costs associated with the diversion structure. This framework is being used to guide information gathering activities associated with work plan Task 3 (evaluation of diversion costs and operational challenges). Activities that have been initiated during the year under this task include gathering and reviewing construction documents, and mapping and documentation of the site and the diversion structure. Additional information gathering, including investigation into construction and maintenance costs and operational challenges and constraints to the POTW receiving the diversion will continue during 2012-13.

Solano County

Project Overview and Objectives

The Solano County pilot diversion project is being implemented by the Fairfield Suisun Urban Runoff Program (FSURMP) and Fairfield-Suisun Sewer District (FSSD). The project involves changes to the operation of an existing pump station so as to divert stormwater from the station to the FSSD wastewater treatment plant. The State Street pump station is located in the City of Fairfield just upstream of Suisun City. It serves a watershed area of approximately 6 acres. The contributing area is commercial, of which a significant portion is automotive repair. (See Figures A-5 and A-6).

The pump station changes to be evaluated for this project include:

- Shutting off the stormwater pump station during dry weather
- Removing standing water in the pump station wet well throughout the dry season and before the first flush
- Monitoring concentrations of pollutants and pollutant indicators in the diverted water

The goal of this pilot project is to comply with provision C.11/12.f of the MRP by better understanding the applicability, costs, and benefits associated with this and similar projects. The results from this and parallel studies by other agencies will inform planning for focused implementation of urban runoff control measures during subsequent Permit terms, in order to achieve maximum benefit and continue to make progress towards achieving load reductions called for in the mercury and PCB TMDLs.

The following three objectives have been developed for the project:

1. Evaluate pollutant loads to the Bay that are reduced due to stormwater diversion.
2. Estimate projected benefits, challenges and costs of operating a similar diversion in a similar drainage area and/or an area known to have elevated concentrations of PCBs or mercury.
3. Document the knowledge and experience gained from evaluation of the diversion project.

Current Status

Normal discharges from the State Street Pump Station were terminated in mid-June. The contents of the pump station's wet well (approximately 825 gallons) were subsequently removed by FSSD staff using a Vactor truck. Prior to removal, the discharge pumps were operated to mix the contents and to collect a representative sample. The sample was analyzed for PCBs (EPA 1668 and USEPA 608), mercury (EPA 1631), total organic carbon (SM 5310B), total metals (EPA 245.1), and suspended sediment concentration (ASTM 3977C). The contents were trucked and discharged to the FSSD treatment plant. As an "in-house" pilot project, there were no formal agreements established for treatment plant's acceptance of the discharge.

As dry weather runoff accumulates in the pump station, FSURMP and FSSD will repeat the removal and sampling process several times more during the summer of 2012. In the fall, the pump station will resume normal operation.

Figure A-5. Solano County Diversion Project Location

Figure A-6. State Street Pump Station Location and Contributing Area

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 Part B, Monitoring Status Report) 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.

Additionally, a BASMAA regional project was initiated in FY 2009-10 to develop methods to assess Permittee progress towards TMDL milestones and attainment of WLAs. The project is ongoing and entails the review of existing information on loads reduced methodologies developed through other recent efforts (such as the Proposition 13

Urban Runoff BMP Project[23]) and development of draft loads reduced formulas for specific stormwater management measures. These methods will 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 being addressed through on-going development of revised methods.

In FY 2011-12, Permittees continued to develop load reduction quantification methods for PCBs and mercury. Efforts were made to align methods for PCBs/Hg with those currently under development for trash (see Trash Section). 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, methods will also be revised. Discussions regarding revisions to these methods are planned in FY 2012-13 via the BASMAA Monitoring and Pollutant of Concern Committee (MPC). Revised methods are planned for submittal with the FY 2012-13 Annual Report. Loads reduced reporting for PCBs and mercury will begin with the Integrated Monitoring Report due on March 15, 2014 in compliance with the MRP.

MERCURY CONTROLS

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 began in FY 2011-12 and the results will be reported in B urban creeks monitoring report to be submitted in March 2013.

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 Multi-year Plan (see Appendix A9) describes several strategies to address pollutant-specific information needs and support management decisions through investigation of prioritized Management Questions.

During FY 2011-12, the RMP submitted a journal manuscript for a synthesis of results from recently completed studies on food web uptake and methods to identify high leverage pathways that introduce mercury to Bay food webs. A more extended Mercury Synthesis report for the RMP will be produced to include additional data from a study of

[23] Conducted by SFEI; project deliverables and data are at http://www.sfei.org/urbanstormwaterBMPS

mercury food web uptake in small fish, and more detailed recommendations on filling information needs for San Francisco Bay, which include:

- Data for additional popular sport fish species;
- Improved spatial understanding of exposure to mercury uptake, particularly in tidal marshes, managed ponds, reservoirs, and streams;
- Information to promote understanding of the potential benefits of management actions at local and regional scales;
- Evaluation of the effectiveness of management actions at local and regional scales; and
- The overall potential for reduction of net methylmercury production at a regional scale is

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 Mercury Wasteload Allocation Sharing 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 this 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. A follow-up meeting was held by teleconference on Nov. 3, 2011. 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. These initial meetings with Caltrans District 4 have been useful in getting discussions started, and in establishing a willingness of all parties to collaborate on this issue.

In these discussions the parties have tentatively agreed that there may not currently be adequate data to perform the loadings analysis in a way that allows for accurately assigning relative loadings (allocations) to BASMAA vs. Caltrans. Additional monitoring data would be helpful. Caltrans is willing to consider how they can help develop additional data via monitoring beginning under their new permit, either independently or in collaboration with BASMAA.

Stormwater runoff from Caltrans facilities is regulated under a separate, statewide stormwater NPDES permit. 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. Currently, the Caltrans statewide stormwater permit has not yet been adopted by the State Water Resources Control Board. This has left Caltrans HQ and the District 4 uncertain as to their monitoring and other requirements (incl. TMDL compliance actions). A Second Revised Draft Tentative Order was circulated on April 27, 2012. The public comment period closed on June 26, 2012. A public hearing on the second revised draft order will be held on August 7, 2012.

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.

Meanwhile the Permittees also will be proceeding with the study as described above, with next steps to include preparation by BASMAA of a preliminary estimate of relative loadings. This will be followed by additional meetings involving BASMAA and Caltrans representatives to discuss the BASMAA calculations vs. the Caltrans calculations. At those meetings the parties will negotiate reconciliation of differences in the initial loadings estimations and attempt to agree on an allocation. An initial allocation sharing scheme may be developed on a preliminary basis, subject to refinement with additional data to provide for better loadings estimates. Discussions of the additional data needs and possible future monitoring collaboration will be considered as negotiations proceed.

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 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 continued to work with the regional PCBs in Caulk Project managed by the San Francisco Estuary Partnership (SFEP) and funded by federal stimulus funds (ARRA). The objective was to evaluate the effectiveness of management practices that address legacy caulks containing PCBs as measures to reduce PCB loadings to the Bay. The project:

- Evaluated PCB levels in caulk sampled from 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.
- Developed potential Best Management Practices (BMPs)and a Model Implementation Process (MIP) 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.

The project concluded at the end of 2011. Final products available on the SFEP web site include:[24]

- Final Report on PCBs in Bay Area Buildings - Sampling Results and Estimate of Loadings to SF Bay
- Excel spreadsheets documenting the basis of the estimated PCB inventory in Bay Area buildings and estimated releases during demolition/renovation
- Best Management Practices
- Model Implementation Process
- Training Strategy
- Technical memorandum on existing regulatory controls and policies related to managing wastes and hazardous materials during building demolition and/or remodeling programs

During FY 2011/12, BASMAA staff continued working with the Project team on implementing the project. The BASMAA staff reported to and received feedback and guidance from the BASMAA Monitoring and POCs Committee. The staff fully participated in all facets of the project, including frequent project teleconferences, development of project work plans, review and commenting on all project

[24] http://www.sfestuary.org/projects/detail.php?projectID=29

deliverables, 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.

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 Multi-year Plan (see Appendix A9) describes several Strategies to address pollutant-specific information needs and support management decisions through investigation of prioritized Management Questions. During FY 2011-12 the RMP's PCB strategy activities included:

- Revisions to 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).
- Preparation of draft reports on conceptual models of general PCB fate and transport in San Francisco Bay and food web bioaccumulation.

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 originally initiated by the Brake Pad Partnership (BPP). Through their participation in CASQA, Permittees have tracked progress in implementing Senate Bill 346 which restricts the use of several heavy metals and asbestos, and provides for a phase out of copper through

2025 (full text of Chapter 307, Statutes of 2010 was submitted with the FY2010-11 Regional POC Report).

CASQA representatives participated in a January 2012 kick-off meeting held by The Department of Toxic Substances Control (DTSC) to provide an opportunity for initial discussion of needs related to implementation of this new law. Through CASQA, Permittees also commented on preliminary draft regulations prepared to implement similar legislation in Washington State[25]. CASQA representatives' active involvement was essential to ensure that precedents set by Washington will meet California municipalities' needs with regard to:

- Marking and packaging standards for brake pads (manufactured after 2014) to identify which products contain <0.5% copper,
- A compliance verification system for third party testing of brake pads to certify their content.

A CASQA comment letter (Appendix A10) summarizes key outcomes of the discussions regarding Washington State regulations.

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. Compliance will be achieved through continued participation in the RMP, whose Multi-year planning process addresses these gaps through two elements guided by the Exposure Effects Work Group (EEWG):

- A workshop focusing on causes of moderate sediment toxicity in San Francisco Bay will be held in fall 2012. This will be the second in a series of workshops on stressor identification that were recommended by EEWG advisers after review of the limitations of conventional approaches to Toxicity Identification Evaluation. A presentation to the May 2012 EEWG meeting that covers the background and objectives for the workshop is at http://www.sfei.org/sites/default/files/Day1_Item5_Bay_ToxWorkshop.pdf
- A study of the olfactory effects of copper on salmonids in salt water. This study is being completed in 2012. As described in the update in Appendix A11, preliminary tests suggest that copper is less toxic to olfactory physiology in seawater-phase juvenile salmonids than in freshwater. NOAA will confirm these results in an RMP project report for EEWG review in late 2012; additional work on the effects of varying salinity will be conducted in 2013 with non-RMP funding.

[25] SB 346 includes a requirement that California regulations must be consistent with those of other states concerning compliance markings and certification. Washington's brake pad law requires adoption of implementing regulations by December 2012, which is ahead of DTSC's timeline for preparing regulations for SB 346. in June 2012 Washington Department of Ecology issued its proposed Better Brakes rules for public comment, available at http://www.ecy.wa.gov/laws-rules/better_brakes/1017.html

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 2012 is to report on the results of the following MRP implementation objective:

> 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 Permittees' approach to filling these information needs is primarily through BASMAA's participation in the Small Tributaries Loading Strategy (STLS) described in the POC Loads Monitoring section of the Monitoring Status Report (Part B of this Document). The STLS is a collaborative effort between MRP Permittees and the RMP that serves as a framework for monitoring of representative Bay Area watersheds and estimation of regional pollutant loads. Elements of the STLS addressing PBDEs, legacy pesticides, and selenium are described in the work plans for watershed monitoring and the Regional Watershed Spreadsheet Model, contained in Appendices B4 and B4a of the Monitoring Status Report (Part B of this document). The schedule in these work plans reflects the October 2011 start date for monitoring conducted through a regional collaborative, and the initial characterization results will be reported along with the Urban Creeks Monitoring Report to be submitted in March 2013. If RMP funds are approved to update a previous Conceptual Model Impairment Assessment Report for PBDEs (Appendix A12), the updates will also be incorporated in characterization and source identification results.

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PART B

REGIONAL MONITORING COALITION MONITORING STATUS REPORT FOR FEBRUARY-JUNE 2012

INTRODUCTION AND PURPOSE

This status report was prepared on behalf of all towns, cities, counties and flood control agencies (i.e., 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 permit term. In a November 2, 2010 letter to the Permittees, the Water Board's Assistant Executive Officer (Thomas Mumley) acknowledged that all Permittees have opted to conduct monitoring required by the MRP through a regional monitoring collaborative, the Bay Area Stormwater Management Agencies (BASMAA) Regional Monitoring Coalition (RMC). The letter noted that MRP Provision C.8.a.ii allows Permittees participating in the RMC to commence data collection by October 2011 instead of October 2010. The letter also asked that Permittees provide 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, to be submitted no later than March 15, 2011.

Monitoring Status Reports were previously forwarded to Water Board staff on March 15, 2011; September 15, 2011; and March 15, 2012. Additionally, a status report describing alternative sampling design(s) and associated multi-year monitoring plan(s) to address Pollutants of Concern and Long-Term Trends Monitoring requirements was forwarded to Water Board staff on March 15, 2011. This Status Report serves as the final report to the Water Board on RMC projects and activities prior to submittal of electronic monitoring data on January 15, 2013 in compliance with provision C.8.g(ii), and submittal of the *Urban Creeks Monitoring Report* on March 15, 2013 in compliance with provision C.8.g(iii).

BACKGROUND

Regionally-implemented activities in the RMC Work Plan 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. 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 MRP[26].

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 BOD. 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. 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.8[27]. The regional monitoring collaborative is referred to as the BASMAA Regional Monitoring Coalition (RMC). With notification of participation in the RMC, participating Permittees commenced water quality data collection during the fall/winter 2011. Summaries of monitoring conducted between February 2012 and July 2012 are included in this status report.

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 the second part of

[26] 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.

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

FY 2011-12, 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 during this reporting period.

Regional Monitoring Program (RMP)

The RMP is a long-term monitoring program that is discharger funded and shares direction and participation by regulatory agencies and the regulated community with the goal of 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 2011 & 2012.

Stormwater Program/Agency	2011	2012
Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)	$173,934	$174,994
Alameda Countywide Clean Water Program (ACCWP)	$168,592	$167,975
Contra Costa Clean Water Program (CCCWP)	$136,623	$137,317
San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)	$83,602	$83,086
Marin Countywide Stormwater Pollution Prevention Program	$55,507	$55,572
Vallejo Sanitation and Flood Control District	$12,809	$12,717
Fairfield-Suisun Urban Runoff Management Program	$14,697	$14,798
City and County of San Francisco[a]	$38,805	$38,111
California Department of Transportation (CalTrans)[a]	$76,063	$76,063

[a] Although contributors to the RMP under the umbrella of "stormwater", during FY 2011-12, 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 2011 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

In fall 2011 the RMP Steering Committee, as part of a 5-year Master Planning process reviewed the S&T Program and agreed to reduce the frequency of some of data collection activities or elements in future years so that more funding will be available for pilot and special studies. 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 the first part of 2012, a considerable amount of RMP and Stormwater Program staff time was spent in overseeing and implementing special studies associated with the RMP's Small Tributary Loading Strategy (STLS) and 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 the first portion of 2012 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)
- Strategy Teams (e.g., PCBs, Mercury, Dioxins, Small Tributaries, Nutrients)

Committee and workgroup representation was provided by Permittee, stormwater program staff and/or individuals designated by RMC participants and the BASMAA BOD. Representation included participating in meetings, providing direction to the RMP Multi-Year Plan (see Appendix A9 to Part A of this Report), reviewing technical reports and work products, co-authoring or reviewing 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

Creek status monitoring requirements are described in provision C.8.c, and monitoring parameters, methods, occurrences, durations and minimum number of sampling sites for each stormwater program are listed in Table 8.1 of the MRP. The RMC's regional monitoring strategy for complying with MRP provision C.8.c - creek status monitoring, was completed in FY 2011-12. The strategy, which is described in *Creek Status and Long-Term Trends Monitoring Plan*, includes ambient/probabilistic and targeted monitoring designs. 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:

1. What is the condition of aquatic life in creeks in the San Francisco Bay Area; are water quality objectives met and are beneficial uses supported?
2. What are the major stressors to aquatic life?
3. What are the long-term trends in water quality in creeks over time?

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.

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)	Local (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 and Targeted Designs

In FY 2011-12, RMC participants began implementing a regionally designed receiving water condition assessment to address the first core monitoring question. Two biological response indicators, benthic macroinvertebrates and algae, are primarily used to assess the condition of aquatic life in creeks. These indicators are monitored via 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. The number of monitoring sites sampled annually by RMC participants for these parameters (>60) 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. Region 2 SWAMP is also participating in the regional condition assessment by sampling roughly 10 nonurban sites annually.

In addition to condition assessments described above, 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).

As a complement to the regional probabilistic design, RMC participants are also collecting data consistent with provision C.8.c using a targeted design. Parameters collected using this approach are identified in Table B.2. Using this approach, monitoring sites are selected (targeted) by RMC participants based on locally derived management questions.

Current Status

Based on the implementation schedule described in MRP Provision C.8.a.(ii), creek status monitoring coordinated through the RMC was scheduled to begin in the Fall/Winter of 2011 with water toxicity testing during one storm event. Due to the limited number of storms between October and December 2011, storm event monitoring was completed in early 2012. Bioassessment monitoring to support condition assessments, and physical habitat, chlorine, and nutrient monitoring to support stressor assessments were completed during late spring and early summer 2012 by all participants and SWAMP. RMC participating programs also successfully completed dry weather water and sediment toxicity, sediment chemistry, and pathogen indicator (bacteria) monitoring in July 2012. Continuous temperature and water quality monitoring were also completed consistent the time schedules in MRP table 8.1. Stream surveys are currently beginning or underway by RMC participants. A full implementation schedule for RMC creek status monitoring is included as Table 7 in Appendix B1.

Standard Operating and Data Quality Assurance Procedures

In parallel with the RMC creek status monitoring plan development, the RMC also developed 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. Draft final versions of the RMC's QAPP and SOPs have been completed. These documents have been developed in coordination with Region 2 SWAMP staff to allow standardization among RMC participants and related regional SWAMP activities.

Creek Status and Trends Information Management System Development

RMC participants are currently developing a regional RMC creek status and trends information management system (i.e., database) as a BASMAA regional project. A draft Information Management System Work Plan was created in 2011 to guide database development and information sharing and management roles and options for database platforms are currently being reviewed by RMC participants. Database development will begin in the spring 2012 and an initial version of the RMC database will be completed by fall 2012. The database will be used individually by each RMC participating program to house, query and export their own creek status monitoring data. Exporting capabilities will assist each program in generating electronic data submittals in SWAMP comparable formats.

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 MRP compliance schedules for these Provisions, the Permittees' focus during the second part of FY 2011-12 was on scoping future collaborative RMC projects for Stressor/Source Identification. To ensure consistency in interpretation of the Stressor/Source ID requirements (C.8.d.i) and a coordinated approach to compliance with that provision, the RMC initiated a regional project to develop Stressor/Source Identification Guidance, planned for completion in 2012. The guidance is being organized to respond to the triggers listed in MRP Table 8.1 and will focus on the initial follow-up actions required by provision C.8.d.i. Components of the Guidance include identifying the geographical and temporal extent of the trigger exceedance, compiling all available data and information on the trigger that was exceeded, investigating whether a known source or stressor is implicated, and determining whether a Toxicity Identification Evaluation, Toxicity Reduction Evaluation or other follow-up investigation is warranted.

Three stressor/source ID projects have been initiated by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP). SCVURPPP completed data analyses for stressor/source identification in Coyote Creek and Stevens Creek, and conducted an additional monitoring study in Guadalupe River and Alviso Slough in FY 2011-12. Monitoring and analyses for these projects were conducted in compliance with provision C.8.d(i). Interim reports for the Coyote Creek and Guadalupe River stressor/source ID studies are included in SCVURPPP's FY 2011-12 Annual Report. A summary of monitoring completed to-date in Stevens Creek was included in the FY 2010-11 SCVURPPP 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 though 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?

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 Work Group, which includes representatives from BASMAA, Water Board staff, RMP/SFEI staff 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. This framework and a summary of activities and products to date are provided in the STLS Multi-Year Plan (STLS MYP). With concurrence of participating Water Board Staff, the STLS MYP presents an alternative approach to the POC loads monitoring requirements described in MRP Provision C.8.e.i, as allowed by Provision C.8.e. The initial Version 2011 of the STLS MYP, along with several of its appendices, was appended to the RMC's September 2011 Monitoring Status Report. Major elements of the STLS MYP are summarized below and the updated Version 2012B is included as Appendix B4 of this Status Report

RMC participant activities associated with POC loads monitoring during the second part of FY 2011-12 focused on monitoring implementation, coordinated through the STLS Work Group and the associated RMP Sources Pathways Loadings Work Group (SPLWG).

STLS Multi-Year Plan activities

Based on the consensus of the STLS Work Group, The STLS MYP 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 loads monitoring management questions, while integrating activities funded by Permittees, via the BASMAA RMC, with those funded by the RMP. The STLS MYP provides a more comprehensive description and workplan for STLS activities over the next 5 to10 years, including a detailed rationale for the methods and locations of proposed activities (e.g., POC loads monitoring in small tributaries).

The MYP includes four main elements that work together to address the four management questions:

- Watershed modeling of runoff, pollutants and sediment discharged to San Francisco Bay, using the Regional Watershed Spreadsheet Model (RWSM);
- Bay Margins Modeling;
- Source Area Runoff Monitoring; and,
- Small Tributaries Monitoring in local watersheds

The following paragraphs provide brief summaries of each of these elements and activities conducted during the period from February through June 2012:

Watershed Modeling –With oversight by the STLS and Sources Pathways Loadings Work Group, RMP staff produced reports documenting the initial construction and testing of the RWSM, which will be the primary tool for estimation of overall POC loads to San Francisco Bay[28]. In March 2012 the STLS Work Group agreed on a five-year work plan (see Appendix B4b) for developing and completing the RWSM for the following attributes or pollutants:

- Hydrology
- Suspended Sediment
- PCBs, mercury and copper
- Selenium, PBDEs and organochlorine pesticides.
- Dioxins and Nutrients

While a similar process is used to develop the model for each of the above, there will be differences in the model structures to reflect differing conceptual models of spatial occurrence and transport in runoff. In FY 2011-12, RWSM efforts focused on refinements to the basic runoff model coefficients and calibration of the hydrological performance of the model.

Bay Margins Modeling – The RMP is 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 goals of the modeling strategy with regard to PCBs and mercury include identification of high-leverage watersheds whose POC loadings contribute disproportionately to Bay impacts. Further development of the Bay Modeling Strategy is planned to occur in FY 2012-13, subject to modifications to the RMP's Multi-Year Plan (Appendix A9) directed by the RMP Steering Committee.

Source Area Runoff Monitoring – This element of the STLS is intended as a placeholder for studies to develop Event Mean Concentrations (EMCs) of POCs to parameterize the RWSM. On the advice of the SPLWG, current RMP studies are exploring alternative approaches to back-calculating EMCs from available sediment, as a cost-effective way to support initial testing of the RWSM and help determine priorities for field-data collection (see Appendix B4b).

Small Tributaries Watershed Monitoring – Monitoring for Water Year 2012[29] was conducted at four stations that were set up and mobilized at the bottom of selected watersheds for small tributary loads monitoring beginning in October 2011. Responsibilities for station setup and field operations were divided between the RMP and contractors for BASMAA programs, provided as in-kind contributions to a RMC regional project for cost-sharing purposes (see Table B.3). Monitoring methods and

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[28] RWSM Year 1 and Year 2 reports are respectively at http://www.sfei.org/sites/default/files/RWSM_EMC_Year1_report_FINAL.pdf and http://www.sfei.org/sites/default/files/RWSM_EMC_Year2_report_FINAL.pdf

[29] Each Water Year runs from October 1 through September 30 of the following year, corresponding to the time period for one year of monitoring reporting as specified in MRP C.8.h.

laboratory analyses according to the descriptions in the STLS MYP are being documented through a BASMAA regional project that has drafted a Field Manual and Quality Assurance Project Plan, while another regional project contracted with SFEI to provide laboratory analyses, data management and data quality assurance to ensure data consistency among all watershed monitoring stations.

Table B.3. Existing or planned Watershed Monitoring Stations for the Small Tributaries Loading Strategy.

Station Name (County)	Funding source WY2012 [a]	Funding source WY2013 [a]
Lower Marsh Creek (Contra Costa County)	CCCWP in-kind	CCCWP in-kind
San Leandro Creek (Alameda County)	RMP [b]	ACCWP in kind
Guadalupe River - (Santa Clara County)	SCVURPPP in-kind (SFEI contract)	SCVURPPP in-kind
Sunnyvale East Channel (Santa Clara County)	RMP	RMP
North Richmond Pump Station (Contra Costa County)	N/A	RMP
Pulgas Creek Pump Station [c] (San Mateo County)	N/A	SMCWPPP in-kind

[a] BASMAA funding is provided on a FY basis beginning July 1 prior to start of the WY, while RMP funds are allocated on a calendar year basis beginning the January 1 after start of the WY.
[b] Funding for equipment purchase and station set-up by ACCWP.
[c] One of two incoming channels - see text.

Due to a very dry WY 2012, fewer than the planned number of storm events were sampled at 3 of the first 4 stations. With concurrence of Water Board staff, the STLS Work Group agreed that additional samples would be added to WY 2012-13 sampling plans so that over a 3-year period, a total of 12 representative storm events will be sampled at stations that were established in WY 2012. A lessons-learned document, with suggested recommendations for improvements in future monitoring procedures, will be developed during fall 2012 and applied to WY 2013 sampling. Data collected at monitoring sites in WY 2012 will be submitted electronically the Water Board by January 15, 2013. A POC Monitoring Field Manual and Quality Assurance Project Plan will be finalized in FY 2012-13 and submitted with the Urban Creeks Monitoring Report in March 2013.

Table B.3 also shows two additional stations where monitoring will be initiated in WY2012-13. Both are at stormwater pump stations in older urban areas where future management actions are likely, as described under Joint Mercury and PCBs Controls in the Regional POC Report (Part A of this document). At the Pulgas Creek Pump Station, one of two main incoming drainage lines will be monitored by SMCWPPP as an STLS effort, while the other will be sampled for one season using a similar monitoring approach as part of SMCWPPP's diversion pilot project to address MRP requirements in C.11/12.f.

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 as Category 3 parameters 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 was scheduled to begin October 2011 for RMC participants.

As described in the *RMC Creek Status and Trends Monitoring Plan* (Appendix B1), the State of California's Surface Water Ambient Monitoring Program (SWAMP) through its Statewide Stream Pollutant Trend Monitoring (SPoT) Program 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 are currently complying with MRP provision C.8.e 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 coordinated with the SPoT program on long-term monitoring to ensure MRP monitoring and reporting requirements were addressed[30]. Recent discussions with SPoT program managers indicate that they are developing an interpretative monitoring report. Permittees will continue to track the timeline for SWAMP reporting of SPoT results.

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, most of which are closely associated with sediment. To determine a strategy for a robust sediment estimate/budget, RMC representatives reviewed recent sediment

[30] MRP Provision C.8.a.iv "Third Party Monitoring" states that where an existing third-party organization has initiated plans to conduct monitoring that would fulfill one or more requirements of Provision C.8 but the monitoring would not meet MRP due date(s) by a year or less, the Permittees may request that the Executive Officer adjust the due date(s) to synchronize with such efforts.

delivery estimates developed by the RMP, and determined that these objectives will be met through sediment-specific modeling with the RWSM. Therefore, the implementation of the sediment delivery/budget study will occur in coordination with other RWSM activities as described in Appendix B4b, where the BASMAA-funded sediment work will also enhance the model development for PCBs and other sediment-bound POCs.

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 in the future, only initial discussions of the scope of this project were conducted by the RMC participants during this reporting period. BASMAA representatives to the RMP will coordinate efforts with the Emerging Contaminants Strategy being developed under the oversight of the Emerging Contaminant Work Group. As described in Appendix B5, consideration of recent studies and data may lead to recommendations for updates to the strategy's prioritization of various emerging contaminants and recommendations for future monitoring in San Francisco Bay.

C.8.F CITIZEN MONITORING AND PARTICIPATION

Participants of the RMC, to varying degrees, currently coordinate with or support citizen monitors and watershed groups within their geographical areas. As a result, relationships have been developed between RMC participants and citizen monitors. In FY 2011-12, RMC participants began sharing information and ideas about varying approaches to encourage citizen monitoring and seek out stakeholder participation and comment at MPC meetings. The variety of potential or planned activities discussed by various Programs and Permittees include:

- encourage citizen input via interactive website
- fund volunteer monitoring through grants to groups
- provide direct assistance to citizen monitoring efforts
- compile information on various citizen monitoring efforts for incorporation in annual reports

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 in January 2013 for electronic data submittals and March 2013 for interpretive reporting (i.e., Urban Creeks Monitoring Reports), for monitoring conducted from October 2011 through September 2012. Therefore, reporting of water quality monitoring data collected in compliance with Provision C.8 is not required in this Status Report.

In the second half of FY 2011-12, RMC participants began outlining the Urban Creeks Monitoring Report due to the Water Board by March 15, 2012. Consistent with RMC monitoring designs (see Table B.2), participants will be collectively developing a single *Regional Urban Creek Urban Creeks Monitoring Report* that will report on parameters collected via the regional probabilistic design. Additionally, each RMC participating program will develop a *Local Urban Creeks Monitoring Report* that will include interpretations of targeted monitoring.

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 made significant progress on the following regional projects during this reporting period:

- 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 and continued through FY 2011-12. The first entails the development of a new field manual and quality assurance project plan (QAPP) for POC loads monitoring coordinated through the STLS Work Group and described in the MYP (Appendix B4). Version 1 of the Field Manual and QAPP will be completed in FY 2012-13 after incorporating revisions in field procedures based on STLS Work Group review of the experiences and lessons learned in FY 2011-12. The second project adapted the existing creek status monitoring SOPs and QAPP developed by SWAMP to document the field procedures necessary to maintain comparable, high quality data among RMC participants. Final draft deliverables (Appendices B2 and B3) are complete for purposes of field data collection and will be updated later in FY 2011-12 after final coordination with the Creek Status Monitoring Information Management System described below.

- 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 provides data users easy access. In the second half of FY 2011-12 the RMC continued 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.

Appendix A

A1

TECHNICAL MEMORANDUM

TO: BASMAA Monitoring and Pollutant of Concern Committee (MPC)

FROM: Chris Sommers (EOA), Peter Mangarella and Lisa Austin (GeoSyntec)

DATE: July 9, 2012

SUBJECT: Draft Management Questions and Objectives for the Integrated Monitoring Report – Part B (Mercury and PCB Loads and Load Reduction Alternatives)

The Municipal Regional Permit (MRP) requires Permittees to submit an Integrated Monitoring Report (IMR) by March 14, 2014 that summarizes water quality monitoring activities and provides conclusions with regard to provisions C.8 and most of C.11 and C12. The Bay Area Stormwater Management Agencies Association (BASMAA) will assist Permittees in developing and submitting the IMR via a regional project(s). The IMR will be separated into two parts: Part A will focus on water quality monitoring conducted per Provision C.8[1]. Part A will be described in a separate document. Part B is the focus of this memorandum and will provide a synthesis of data and information developed through the implementation of PCB and mercury control pilot studies (MRP provisions C.11 and C.12) and PCB and mercury specific monitoring studies conducted via the RMP. Part B will also incorporate information gained through pollutant loading station monitoring conducted per provision C.8.e.

IMR Reporting Requirements:

The final reporting requirements for the MRP provisions listed in the table below will be satisfied via IMR-Part B:

MRP Provision #	MRP Provision Name	Oversight & Collaborating Program/Entity
C.12.b	PCB-containing Building Materials	BASMAA
C.11/12.c	Source Investigation & Property Referrals	BASMAA (via CW4CB)
C.11/12.d	Enhanced Municipal Sediment Removal	BASMAA (via CW4CB)
C.11/12.e	On-site Stormwater Treatment Retrofits	BASMAA (via CW4CB)
C.11/12.f	Pilot Diversions to POTWs	BASMAA
C.11/12.g	Stormwater Loads and Loads Reduced	BASMAA (in collaboration w/RMP via STLS)
C.11/12.h	Fate and Transport Studies	BASMAA (via RMP)
C.11/12.i	Risk Reduction Program	BASMAA (via CW4CB)
C.11.j	Mercury Allocation Sharing	BASMAA (in coordination with CalTrans)

[1] Part A will address reporting requirements for C.8.

In summary, the reporting requirements described in provisions C.11 and C.12 of the MRP are:

- Report on the effectiveness of enhanced practices pilot implementation, including estimates of loads reduced, and present a plan and schedule for possible expanded implementation for subsequent permit terms.
- Report the results of chosen monitoring/measurement approach concerning loads assessment and estimation of loads reduced.
- Report the findings and results of the (fate and transport) studies completed, planned, or in progress as well as implications of studies on potential control measures to be investigated, piloted or implemented in future permit cycles.
- Submit the manner in which the urban runoff mercury TMDL allocation will be shared between the Permittees and California Department of Transportation (CalTrans).

IMR Objectives:

1. Fully comply with the March 15, 2014 MRP reporting requirements associated with the C.11 and C.12 provisions listed above (all of C.11/12).
2. Satisfy USEPA Clean Watershed for Clean Bay (CW4CB) reporting requirements (Provisions C.11/12.c,d,e,i).
3. Develop a framework and approach that will assist in the potential recalculation of PCB and mercury stormater loads to the Bay , and allotting these loads among appropriate MS4s and other stormwater dischargers (Provision C.11/12.g).
4. Document lessons learned via pilot Best Management Practice (BMP) implementation (e.g., comparisons among BMPs in terms of feasibility, cost-benefit, and load reduction opportunity) to guide future cost-effective implementation, possibly at a broader scale (Provisions C.11/12.b,c,d,e,f,i).
5. Document the combined knowledge gained from the implementation of the MRP provisions C.11 and C.12 to assist in the development of provisions in the next MS4 permit related to PCB and mercury TMDL implementation (all of C.11/12).
6. Guide the implementation of actions by the Co-Permittees to reduce PCB and mercury loads from stormwater runoff, make progress towards achieving the TMDL waste load allocations assigned to the Bay Area MS4s, and continue assessing the feasibility of fully addressing the allocations (all of C.11/12).

IMR Management Questions:

The following high priority management questions were developed to guide Part B of the IMR. The questions were formed through an evaluation of the MRP and the MRP fact sheet and discussions to-date with Water Board staff during the development and implementation of the MRP regarding the intent of the IMR. The specific projects that are intended to assist in addressing each question are identified. The linkages between the objectives described above and the management questions are also described. As illustrated, some questions are intended to achieve multiple objectives.

1. Stormwater Loads, Fate and Transport (Objectives 3, 5 and 6)

A. **What is the current annual mass of PCBs and mercury entering the Bay from small tributaries?** – This question will be addressed through information developed via the STLS and summarized in IMR – Part B. A full description of methods and results will be provided in IMR – Part A.

B. **What portion of the mass from small tributaries is attributable to MS4s versus other transport pathways? -** This question will be addressed through information developed via the STLS and the Allocation Sharing Project conducted in response to provision C.11.j.

C. **Which small tributaries are contributing the largest PCB and mercury mass per unit catchment area? -** This question will be addressed through information developed via the STLS and summarized in IMR – Part B.

D. **Which Bay tributaries are contributing most to mercury and PCB impairment in the Bay? -** The contribution to impairment is dependent on both pollutant loading and fate and transport factors such as geographic location of input to the Bay and mercury methylation potential. Therefore, this question is best addressed through information developed via the STLS and fate/transport studies and modeling studies conducted the RMP (e.g., small fish bioaccumulation, near-shore sediment concentrations, etc.).

2. Stormwater Loads Reduced/Avoided Methods (Objectives 1, 3, 5 and 6)

A. **What are the approaches selected to assess progress towards TMDL WLAs?** – This question will be addressed through the BASMAA regional project designed to develop mercury and PCBs load reduction quantification methods, and pilot implementation project results.

B. **What mass of PCBs and mercury to the Bay were reduced or avoided by MS4s: 1) prior to the adoption of the TMDLs (e.g., baseline), and 2) during implementation of the MRP? -** This question will be addressed through the BASMAA regional project designed to develop mercury and PCBs load reduction quantification methods, and pilot implementation project results.

3. Pilot Implementation Projects (Objectives 1, 2, 4, 5, and 6)

A. Feasibility of Pilot Projects

i. **What are the lessons learned via the implementation of MRP pilot projects with regard to feasibility?** – This question will be addressed through the implementation of pilot projects and information gathered through the implementation and monitoring process.

ii. **Which types of BMPs appear to be the most technically feasible (i.e., capable of being put into practice)?** – This question will be addressed through the implementation of pilot projects and information gathered through the implementation and monitoring process.

B. Cost-Benefit of Pilot Projects

i. **What mass of PCBs and mercury to the Bay were reduced or avoided via the implementation of MRP required pilot projects? -** This question will be addressed via pilot implementation project data collection and analyses.

ii. **What are the capital and annual operational costs for each pilot project implemented via the MRP? -** This question will be addressed via pilot implementation project data collection and analyses.

iii. **What are the load reduction benefits per unit cost for each type of pilot BMP implemented during the MRP term? -** This question will be addressed via pilot implementation project data collection and analyses.

iv. **Which BMPs appear to be the most cost effective for reducing/avoiding PCBs and mercury from MS4s? -** This question will be addressed via pilot implementation project data collection and analyses, and supplementing with information in the literature on BMP effectiveness and costs.

C. Opportunity (for Expanded Implementation and Load Reduction)

i. **What mass of PCBs and mercury is available for load reduction or avoidance by each type of BMP pilot tested?** - This question will be addressed via analyses conducted as part of the IMR project. Information available through STLS development of the Regional Watershed Spreadsheet Model, pilot implementation project data collection, and other existing information will be used to address this question.

ii. **What feasible BMP implementation scenarios provide the best opportunities (costs & benefits) for PCB and mercury load reduction from MS4s and addressing impairment in the Bay?** - This question will be addressed via analyses conducted as part of the IMR project. Information available through STLS development of the Regional Watershed Spreadsheet Model, pilot implementation project data collection, and other existing information will be used to address this question, including any available RMP fate/transport studies applicable to reducing impairment in the Bay.

iii. **In what drainages should feasible BMPs be implemented to have the best opportunities for PCB and mercury load reduction from MS4s and addressing impairment in the Bay in the future?** - This question will be addressed via analyses conducted as part of the IMR project. Information available through STLS development of the Regional Watershed Spreadsheet Model, pilot implementation project data collection, and other existing information will be used to address this question, including any available RMP fate/transport studies applicable to reducing impairment in the Bay. Addressing this question will assist Permittees in identify drainages for consideration of future BMP implementation.

A2

CW4CB Task 5 - Selected 10 Retrofit Projects

					Range of Treatment Types							Land Use						Design/ Construction Status					
					LID				Other														
	Stormwater Program	Project Number	Project Name	Owner/ Municipality	Bioretention (w/underdrain)	Permeable Pavement	Flow through Biotreatment (Swale)	Tree Well	Catch Basin Media Insert	Sand Filter	Hydrodynamic Separators	Industrial	Commercial/ Mixed Use	Roads/Rail	Institutional	Residential	Recreational	Conceptual	Design	Constructed	Vicinity PCB Concen-tration[1]	Vicinity Mercury Concen-tration[2]	Comments
Selected 10 Retrofit Projects	ACWP	1	Ettie St. Pump Station	ACFCWCD						X		X	X	X		X			X		Very High	High	• Includes industrial land uses • Amended sand filter BMP
	ACWP	2	Alameda and High St. HDS	Oakland							X	X	X	X		X			X		Medium	High	• Includes industrial land uses • Trash HDS unit
	ACWP	3	West Oakland Industrial Area	Oakland				X				X		X					X		Very High	High	• Industrial land uses
	CCCWP	4	Nevin Avenue Improvements (Green Streets)	Richmond	X	X	X	X					X	X	X	X			X		High	High	• Variety of BMPs including permeable pavement
	CCCWP	5	PG&E Substation 1st and Cutting	Richmond	X							X		X					X		High	High	• Includes industrial land uses • PG&E substation • In public right-of-way
	CCCWP	6	El Cerrito Green Streets	El Cerrito	X								X	X						X	Medium	High	• High traffic arterial • Monitoring by SFEI in 2011/12 wet season • Additional monitoring by CW4CB
	SCVU-RPPP	7	Leo Avenue HDS	San Jose							X	X		X					X		Very High	Very High	• Industrial land uses • Trash HDS unit • Railroad tracks
	SMC-WPPP	8	Bransten Road Green Streets	San Carlos	X		X					X	X	X					X		Very High	High	• Primarily industrial land uses • Current and former railroad tracks
	FSURMP/VSFCD	9	Broadway and Redwood	Vallejo			X					X	X	X		X			X		High	Medium	• Includes industrial land uses • Next to railroad tracks • In flood control easement
	FSURMP/VSFCD	10	PG&E Substation	Vallejo					X				X	X					X		High	High	• PG&E substation • In public right-of-way

Footnotes:

1 Data was provided using the San Francisco Estuary Institute database. PCB ranking (mg/kg sediment): Very Low (<0.01), Low (0.01-0.1); Medium (0.1-1.0); High (1.0-10); and Very high (>10)

2 Data was provided using the San Francisco Estuary Institute database. Mercury ranking (mg/kg sediment): Very Low (<0.1), Low (0.1-0.25); Medium (0.25-0.75); High (0.75-2.0); and Very high (>2.0)

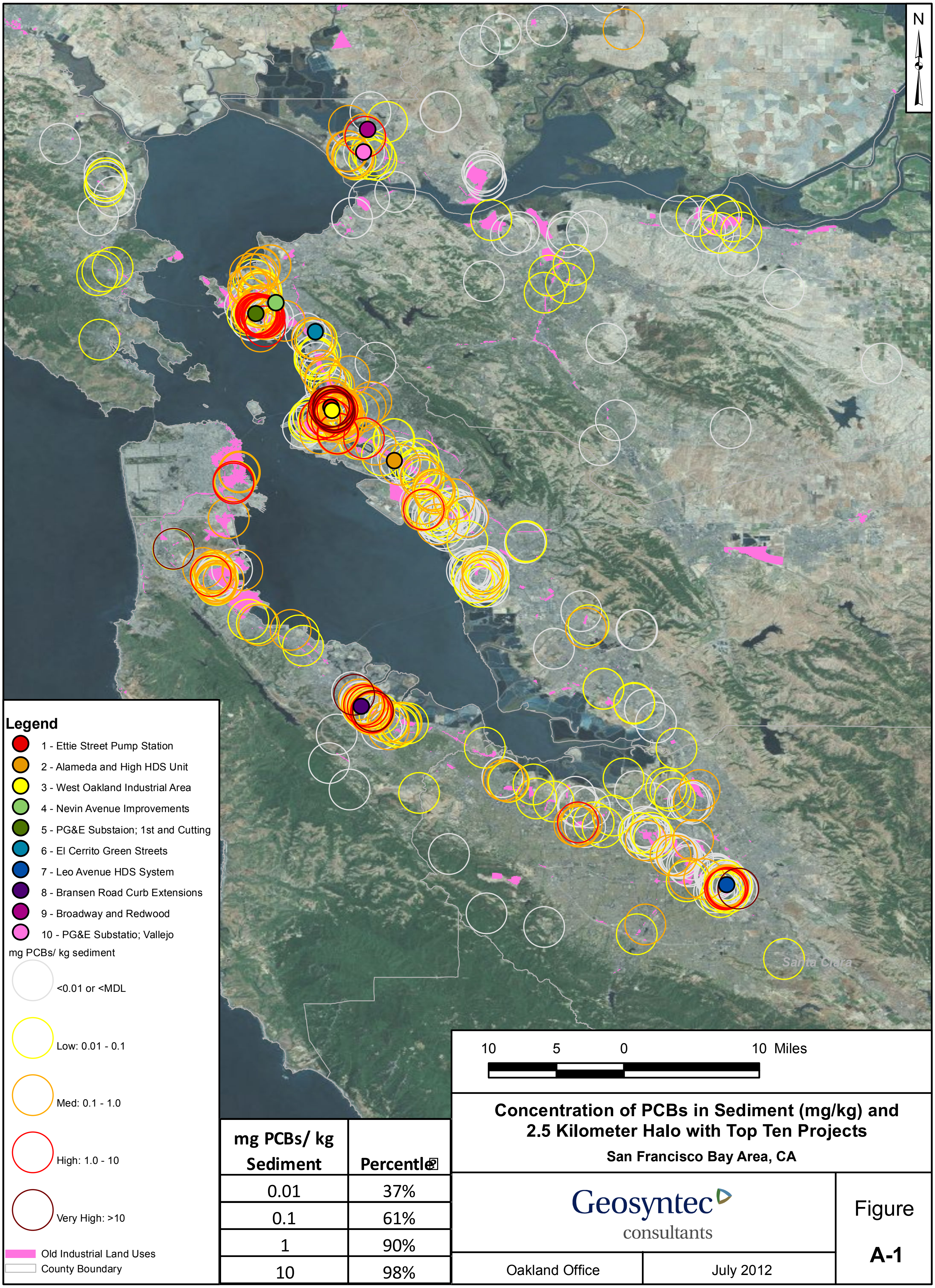
A3

CW4CB Task 5 – Project Tracking with Schedule

	Pro-gram	No	Project Name	Project Sponsor	Project Contact	Designer	Schedule											Notes
							10% Designer under BASMAA Contract	100% Designer under BASMAA Contract	Project Sponsor under BASMAA Contract	100% Design Finished	Board or City Council Approves Project	Construction Project Out to Bid	Board or City Council Approves Construction Contractor Selection	CEQA and Building Permits	Construction Begins	Construction Ends	Monitoring Year	
Selected Projects	ACWP	1	Ettie St. Pump Station	ACFCWCD	Arleen Feng	WRECO	N/A	Pending	Late 5/12	Mid-Late 6/12	N/A	7/12	8/12		By late 8/12	By late 9/12	12/13	
	ACWP	2	Alameda and High St HDS Unit	Oakland	Becky Tuden	Oakland	N/A	N/A	5/1/12	12/11	N/A	3/12	5/12		6/12	7/12	12/13	
	ACWP	3	West Oakland Industrial Area	Oakland	Becky Tuden	WRECO	N/A	3/16/12	5/1/12	8/30/12	N/A	10/12	12/12		1/13	Unknown?	13/14	lisa checking on expediting schedule
	CCCWP	4	Nevin Avenue Improvements (Green Streets)	Richmond	Lynn Scarpa	Richmond /BKF	N/A	N/A	5/15/12	5/12	N/A	10/12	12/12		1/13	10/13	13/14	
	CCCWP	5	PG&E Substation; 1st and Cutting	Richmond	Lynn Scarpa	WRECO	12/23/11	4/9/12	5/15/12	10/24/12	N/A	12/31/12	1/13		4/1/13	6/30/13	13/14	
	CCCWP	6	El Cerrito Green Streets	El Cerrito	Khalil Abusaba	Construc-ted	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12/13	
	SCVURPPP	7	Leo Avenue HDS System	San Jose	James Downing	San Jose	N/A	N/A	Prior to 5/24/12	1/31/12	N/A	3/7/12	?		6/1/12	10/1/12	12/13	
	SM CWPPP	8	Bransten Road Curb Extensions	San Carlos	Laura Prickett	WRECO	1/19/12	4/17/12	?	9/30/12	10/31/12	11/30/12	1/31/12		4/1/13	6/30/13	13/14	
	SC	9	Broadway and Redwood	Vallejo	Sam Kumar	WRECO	?	2/13/12	?	6/22/12	8/12	9/12	N/A		10/12	11/12	12/13	
	SC	10	PG&E Substation	Vallejo	Sam Kumar	WRECO	?	2/13/12	?	5/18/12	8/12	9/12	N/A		10/12	11/12	12/13	

Notes:
White – Completed Activity
Red – To be Completed (Short-term)
Green – To be completed (Long-Term)

A4



mg PCBs/ kg Sediment	Percentile
0.01	37%
0.1	61%
1	90%
10	98%

Concentration of PCBs in Sediment (mg/kg) and 2.5 Kilometer Halo with Top Ten Projects

San Francisco Bay Area, CA

Geosyntec consultants

Figure **A-1**

Oakland Office | July 2012

P:\GIS\BASMAA_CW4CB\Projects\Yee_McKee_Top10_PCB_Conc_081511_MF.mxd, KLH, Jul 13, 2012

A5

Clean Watersheds for a Clean Bay (CW4CB) Task 5

Pilot Retrofit Projects

1. Project Concepts

The project concepts include a discussion of the CW4CB Task 5 retrofit project background, the proposed treatment measure, catchment information, and project design/construction status. The selected projects are in varying stages of design. For those projects with complete designs (i.e., the Nevin Avenue Improvement project and Alameda and High Streets HDS Unit), project design drawings or example specifications are referenced. For projects in the design stage (i.e., the Ettie Street Pump Station project, both PG&E Substation projects, the Bransten Road Green Street project, and the West Oakland Industrial Area project), treatment measure concepts are provided.

1.1 Ettie Street Pump Station

The Ettie Street Pump Station Project is located in West Oakland at 3465 Ettie Street, adjacent to MacArthur Freeway to the north and Nimitz Freeway to the west. The Ettie Street Pump Station is an Alameda County Flood Control and Water Conservation District (ACFCWCD) facility that collects and pumps stormwater runoff to San Francisco Bay. The Ettie Street Pump Station drainage catchment is comprised of approximately 1,200 acres in West Oakland and includes residential, commercial, and industrial areas. The proposed stormwater treatment measure for the Project is a media filter system with two separate filter beds containing different media. The stormwater program and Alameda County representative for the Project is Arleen Feng.

Project Catchment

The site is located in a highly industrial area, located adjacent to MacArthur Freeway to the north, Nimitz Freeway to the west, and industrial and residential areas to the south and east. The Ettie Street Pump Station receives rainfall and other flows from an approximately 1,200 acre watershed. The watershed contains mixed land uses currently comprised of approximately 42% residential, 38% industrial, and 20% commercial land uses.

PCBs have been previously found in sediments collecting at both the Ettie Street Pump Station and in the surrounding catchment. A 2010 report by East Bay Municipal Utility District (EBMUD) presents data from water samples collected between April 2008 and February 2010, during dry weather, first flush, and wet weather events at the Ettie Street Pump Station wet well inlet and diversion outlet. The EBMUD report states that average concentrations for PCB congeners for the pump station effluent were 2,930 pg/L, 19,900 pg/L, and 34,500 pg/L, for dry weather, first flush and wet weather flows respectively. Additionally from 2004 to 2006, the City of Oakland performed an evaluation of potential source properties and collection of sediment samples from right-of-way areas and private properties, which found elevated PCB concentrations (http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/ID/OAK024739).

Treatment Measure Concept

The Ettie Street Pump Station Project will install two parallel media filter beds to treat PCBs and mercury (Hg) that enter the Ettie Street Pump Station from the drainage catchment. The media filter will be located at grade outside the pump station building and will include a pump and pretreatment storage tank. The pump (nominally 1-2 gpm) will draw water up from one of the two wet wells into the pretreatment storage tank, designed to settle out the fine and coarse sand sizes (>63 µm).

Water from the pretreatment storage tank will then be split and conveyed to each tank containing the filter media. Water will be directed over a weir onto the surface of the media filter bed where it will infiltrate through the 2-foot-thick filter media to a 4-inch gravel drainage layer. One filter bed will contain sand and the second bed will contain a mix of media types, including sand, zeolite and granulated active carbon (GAC). The residence time in the pretreatment settling tank will be approximately 1.5 hours and the residence time in the sand filter bed will be approximately 12 hours.

To separate the filter media from the drainage layer, a geotextile filter fabric (or alternatively a choking stone layer) will be placed between the media and the drainage layer. Perforated PVC pipes (2 in diameter) will be located in the drainage layer to carry the water to a line to be discharged into the other wet well. The bottom of the filter bed will be sloped for drainage. The total depth of the media filter will be approximately 2 feet with an additional 6 inches for the underdrain layer.

The area of the pretreatment tank will be approximately 10 square feet and the total area of each filter bed will be approximately 50 square feet. These dimensions are well within the available Project area identified as 14 feet by 14 feet and will allow space for access and testing (specific clearances to existing fence and structures will be provided at the start of the design phase).

Figure 1 below summarizes the proposed retrofit Project configuration with respect to the primary components and monitoring locations. As shown in Figure 1, flows will be pumped from the Ettie Street Pump Station wet well through the settling tank, and then will be evenly split to each media bed using flow control valves. Discharge from the media beds will be combined prior to returning to the storm drain system. Flows will be continuously monitored and water quality grab samples will be collected at influent and effluent locations. Additional solids monitoring locations could be added at the inflow from the wet well.

The primary components for the retrofit Project include the inlet works, media beds, underdrains, outlet works, tanks, flow control valves, in-line strainer, PVC piping and connections, sampling ports, flow meter, filtration media, geotextile, and the slotted underdrain.

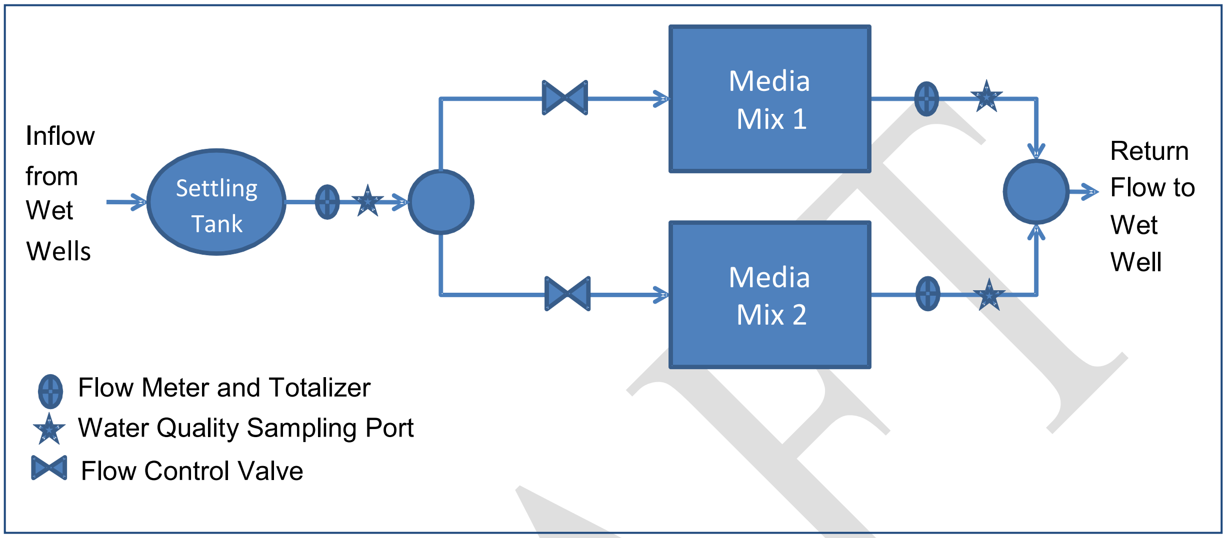


Figure 1. Overall Ettie Street Pump Station Pilot Project Components and Monitoring Locations

Project Design and Construction Schedule

The Ettie Street Pump Station Retrofit Project is currently in the design phase. Design of the Project began in November 2011 and construction will occur in the Fall of 2012.

1.2 Alameda and High Street HDS Unit

The City of Oakland Alameda and High Street Hydrodynamic Separator (HDS) Unit Project is located at the intersection of Alameda Avenue and High Street in Oakland. Another planned HDS project, at International Boulevard and 73rd Street, serves as an alternate site for this Project. These HDS units are planned for installation as part of Oakland's Trash Load Reduction Plan. The stormwater program representative for the Project is Arleen Feng of the Clean Water Program and the City of Oakland representative is Rebecca Tuden.

Project Catchment

The Alameda and High Street CDS unit is located in a watershed with a high concentration of old industrial land uses, including historic rail lines. The current watershed is a mix of industrial and commercial land uses.

Both HDS unit locations are located within 2.5 kilometers of medium (0.1 – 1.0 mg PCBs/ kg sediment) PCB concentrations.

Project Concept
The HDS unit proposed for the Project is the Contech CDS unit. The unit combines hydrodynamic forces and treatment screens to remove solids from stormwater.

Project Design and Construction Schedule
The Project went out to bid in March 2012. Construction is expected to begin in the summer of 2012.

1.3 West Oakland Industrial Area

The West Oakland Project consists of six proposed storm drain catchment retrofits in the West Oakland neighborhoods. The proposed catchment retrofits are located within a three block by four block area, bounded by 32nd Street to the north, 24th Street to the south, Wood Street to the West, and Poplar Street to the east. PCBs have been detected in sediment at the site as well as in the greater site vicinity. Biofilter treatment measures (Filterra® devices) are proposed in six possible locations in the area. The stormwater program representative for the Project is Arleen Feng with the Clean Water Program and the municipal representative is Rebecca Tuden with the City of Oakland.

Project Catchment
The Project is located in the Ettie Street Pump Station Watershed. The blocks adjacent to the six proposed treatment facility options are highly industrial, and include a metal recycling facility, a concrete batch plant, various mixed light industrial and commercial properties, and some residential land use.

Sediment samples taken at the catch basins adjacent to the proposed facilities yielded medium to very high PCB concentrations. The drainage areas for the proposed facilities range from approximately 0.2 acres and 0.6 acres, and largely consist of road land uses.

Project Concept
Filterra units are proposed for the six possible catchment retrofit locations. Filterra® units are proprietary biofilter devices which consist of specialized media and vegetation (trees would be used for this Project). Runoff is filtered through the media and treated runoff is discharged through the facility underdrain.

The proposed BMP locations were selected based on a GIS desktop screening analysis as well as field observations. Field observations were conducted to determine which locations would be feasible for BMP installation, and included measuring distances to utility poles, visible underground utilities, and trees, as well as sidewalk widths. Other impediments to installation and/or monitoring were also observed, such as proximity to business entrances, traffic density, and other factors. Approximately 30 possible catch basins were considered for retrofit. Additionally, the approximate drainage boundary and flow direction was noted. Based on these observations, GIS was used to approximate the right-of-way drainage areas tributary to the selected locations.

Project Design and Construction Schedule

The conceptual design for the West Oakland Industrial Area Project is complete. The design firm is WRECO and 100% design is expected to be completed in August 2012. The Project is expected to go out to bid in October 2012 and construction is anticipated to begin in January 2013.

1.4 Nevin Avenue Improvements

The Nevin Avenue Improvement Project is a planned streetscape project along Nevin Avenue between 19^{th} Street and 27^{th} Street in the City of Richmond. This Project includes stormwater treatment measures integrated into the streetscape. Planned streetscape features include standard street trees and curb extensions to make the street more bicyclist and pedestrian friendly. The City's base contract for the Project includes rain garden curb extensions as the primary stormwater treatment measure. Additional treatment measures proposed under the CW4CB Task 5 Project include permeable pavers with subterranean drainage, porous asphalt concrete pavement, and tree well filters. The stormwater program representative for the Project is Khalil Abusaba, with the Contra Costa Clean Water Program, and the municipal representative is Lynne Scarpa, Environmental Manager for the City of Richmond Stormwater Program.

Project Catchment

The site is located in a mixed civic, residential, and commercial area. Light industrial and historical industrial land uses are within close proximity to the Nevin Avenue Improvement Project location. The Project catchment contains mixed land uses. The area is largely residential in the lower blocks (19^{th} through 23^{rd} Streets), and is adjacent to the Richmond BART station. From 23^{rd} to 25^{th} Streets, the land use is largely commercial, and from 25^{th} to 27^{th} Streets, the City Hall buildings are the dominant land use (civic), with some commercial buildings interspersed.

The drainage to the treatment measures will be largely street drainage with possible drainage from adjacent parcels. Flow direction varies along the extent of the Project. According to a survey obtained from City of Richmond, flow direction is to the west for the blocks between 19^{th} Street and 23^{rd} Street, and again for the blocks between 24^{th} Street and 27^{th} Street. Flow is to the east for the block between 23^{rd} Street and 24^{th} Street.

The site is adjacent to old industrial land uses and is within a 2.5 kilometer halo of high PCB concentrations.

Project Concept

The Nevin Avenue Improvement Project is a streetscape project along eight blocks of Nevin Avenue, from the Richmond BART station to Richmond City Hall. The primary stormwater treatment measure proposed along Nevin is rain garden (bioretention) curb extensions. A total of 4,200 square feet of the bioretention curb extensions are proposed for as part of the improvements.

Additional stormwater treatment features proposed for the Project include a pilot treatment train. The treatment train would include permeable pavers with subterranean drainage, porous asphalt concrete pavement, and tree well filters, along with the bioretention curb extensions, and would be installed on two blocks of the Project (from 24th to Civic Center along Nevin Avenue). The treatment train concept would allow for added treatment benefit in this space-constrained location.

Project Design and Construction Schedule

The Nevin Avenue Improvement Project is currently at 95% design. The design firm is BKF and 100% design is expected to be completed in the summer of 2012. The Project is expected to go out to bid in October 2012 and construction is anticipated to begin in January 2013. Schedule may change pending authorization from grant funding organizations.

1.5 Richmond PG&E Substation

The PG&E Substation Project is located at South 1st Street and Cutting Boulevard in the City of Richmond. PCBs have been detected in storm drains directly adjacent to the site as well as in the greater site vicinity. Bioretention facilities are the proposed stormwater treatment measure for the Project. The stormwater program representative for the Project is Khalil Abusaba, with the Contra Costa Clean Water Program, and the municipal representative is Lynne Scarpa, Environmental Manager for the City of Richmond Stormwater Program.

Project Catchment

The PG&E substation is bounded by rail and Interstate 580 to the north, a recreational vehicle parking lot to the west, Cutting Boulevard to the south and South 1st Street to the east. The substation is surrounded by a concrete berm which retains most stormwater runoff on the site. Ground cover is largely gravel, along with a parking lot which consists partially of concrete. There is no landscaping on site. There is landscaping (trees and mulch) and sidewalk to the south of the substation parcel, which runs along the public right-of-way of Cutting Blvd. There are also utilities (power line pole and a utility box) located along the landscaped strip. Along the eastern site boundary, there is bare compacted dirt and no sidewalk between the substation parcel boundary and South 1st Street.

There are two catch basins that the proposed Project would connect to. The first catch basin is located to the south of the substation directly adjacent to the driveway. This catch basin has an inlet depth of 3 to 4 feet based on visual inspection. The second is located at the southeast corner of the site and has a drop inlet depth below storm grate of about one foot based on visual observation.

Sediment samples taken at the catch basins proposed for retrofit yielded high PCB concentrations.

Treatment Measure Design Concept
The proposed treatment measures for the Project include two alternatives. Alternative #1 would consist of a bioretention facility installed in the parkway adjacent to the PG&E substation along Cutting Boulevard and South 1st Street. Bioretention Facility #1 would collect approximately 0.49 acres along Cutting Boulevard drainage and a small portion of the PG&E substation entrance driveway.

Alternative #2 would consist of two bioretention facilities. Bioretention Facility #1 would collect approximately 0.49 acres, as stated previously. Bioretention Facility #2 would collect drainage from approximately 1.17 acres of South 1st Street and the substation.

Project Design and Construction Schedule
The City of Richmond PG&E Substation Project is currently in the design phase. The design firm is WRECO and 100% design is expected to be completed in October 2012. The Project is expected to go out to bid in December 2012 and construction is anticipated to begin in April 2013.

1.6 El Cerrito Green Streets

The El Cerrito Green Streets Project includes two already constructed flow-through biotreatment facilities. One is located at San Pablo and Madison Avenues and the second is located at San Pablo and Eureka Avenues, both in the City of El Cerrito. Details about this project can be found at (http://www.el-cerrito.org/esd/ landscapeandwater.html) and at San Francisco Estuary Partnership (http://www.sfestuary.org/projects/detail.php?projectID=41). The stormwater program representative for the Project is Khalil Abusaba, with the Contra Costa Clean Water Program.

This Project was monitored by the SFEI during the 2011/ 2012 wet season, but the results are not yet available. CW4CB will perform additional monitoring during the 2012/13 wet season.

1.7 Leo Avenue HDS System

The Leo Avenue Hydrodynamic Separator (HDS) Unit Project is located on 7th Avenue just southeast of Phelan Avenue in southeast San Jose. This HDS unit is planned for installation as part of San Jose's Trash Load Reduction Plan, but a modified unit has been selected for enhanced sediment removal. The stormwater program representative for the Project is Chris Sommers of the Santa Clara Valley Urban Runoff Pollution Prevention Program and the City of San Jose representative is James Downing with the City of San Jose's Environmental Service Department.

Project Catchment
The Leo Avenue HDS unit is expected to receive runoff from approximately 214 acres of commercial and industrial land uses.

Sediment samples taken on Leo Avenue, which is located within the Project's drainage catchment have detected high levels of PCBs.

Project Concept
The City of San Jose proposes to implement a modified prefabricated HDS unit which incorporates a larger sump for enhanced sediment collection.

Project Design and Construction Schedule
The design for the Leo Avenue HDS Unit Project is complete. The Project went out to bid in March 2012 and construction is anticipated to begin in the summer of 2012.

1.8 Bransten Road Curb Extensions

The Bransten Road Curb Extensions Project is located along Bransten Road, between Old County Road to the southwest and Industrial Road to the northeast, in the City of San Carlos. Curb extension bioretention facilities are the proposed stormwater treatment measure for the Project. The countywide stormwater program representative for the Project is Laura Prickett, with the San Mateo Countywide Water Pollution Prevention Program. The City of San Carlos representative for the Project is Ray Chan, Acting City Engineer.

Project Catchment
The site is located in a highly industrial area, located adjacent to Caltrain tracks and El Camino Real to the southwest, and the 101 Freeway to the northwest. The combined acreage of the estimated catchment, which consists of Bransten Road and adjacent commercial and light industrial land uses, is approximately 25 acres. The approximate area of the roadway right-of-way (sidewalks, parkways, and street width) is two acres. It is unknown if the drainage from the adjacent parcels flows into the street; it is assumed for this concept that parcel drainage would not be treated in the curb extension bioretention facilities.

Industrial land uses within the estimated tributary area include a concrete batch processing plant, a top soil facility, a transfer station and fire station, and other light industrial and commercial land uses, including a school bus yard.

Flow direction on the street is known to be towards the northeast. There are no storm drains along the upstream portion of Bransten Road. Beginning at 977 Bransten Road, there is a storm drain (unknown diameter) which runs along the center of the road towards Industrial Road. Soils underlying the site have low infiltration rates.

Sediment samples taken on Bransten Road have detected high levels of PCBs.

Project Concept
The concept plan is a green street retrofit along Bransten Road. Curb extension bioretention facilities are proposed along Bransten Road between Old County Road and Industrial Road. The curb extension bioretention facilities are proposed to be similar to the stormwater curb extension

illustrated in the Countywide Program's Sustainable Green Streets and Parking Lots Design Guidebook and the City of Portland design schematic. The curb extension bioretention facilities would include an underdrain where the storm drain is present and would not include an underdrain, if allowable, up-gradient of the existing storm drain.

Stormwater will flow into the facilities through a curb cut located at the upstream end of the curb extension. The outlet from the facilities will be an elevated curb cut at the downstream end, which will act like an overflow weir designed to provide for 12 inches of ponding depth across the facility. The facility cross-section will include 1.5 feet of bioretention media underlain by gravel to provide storage and potential infiltration below these facilities, provided it is allowable. Approximately 770 linear feet of curb extension bioretention facility without an underdrain are proposed upstream of the storm drain. Approximately 500 linear feet of curb extension bioretention with an underdrain are proposed. The curb extensions are proposed to be approximately 6.0 feet wide, yielding a proposed total area of curb extension bioretention without an underdrain of 4,620 square feet, and a proposed total area of curb extension bioretention with an underdrain of 3,000 square feet.

Project Design and Construction Schedule

The Bransten Road Green Streets Project is currently in the design phase. The design firm is WRECO and 100% design is expected to be completed in September 2012. The Project is expected to go out to bid in November 2012 and construction is anticipated to begin in April 2013.

1.9 Broadway and Redwood

The Broadway and Redwood Project is located east of Broadway between Redwood and Valle Vista in downtown Vallejo. The project would retrofit a vegetated swale in the area between Broadway and the Southern Pacific Railroad tracks. The land is owned by Southern Pacific but the Vallejo Sanitation and Flood Control District has an easement on the property that would permit construction of a treatment measure within the easement. Kevin Cullen, with the Fairfield-Suisun Sewer District, Lance Barnett, with Vallejo Sanitation & Flood Control District, and Sam Kumar with the City of Vallejo are the municipal leads for the Project.

Project Catchment

The catchment would include (1) that portion of Broadway (between Redwood and Valle Vista) that drains to the east (from the crown in the road) and (2) the area between the railroad tracks and Broadway. The portion draining from Broadway is completely impervious, whereas the area draining between the tracks and Broadway is mostly pervious. The land use can be characterized as transportation.

The site is within a 2.5-kilometer halo of high PCB concentration.

Project Concept
The treatment measure concept is to install a vegetated swale between the railroad tracks and Broadway. The width of the swale will be designed within the VSFCD easement. The length of the swale will ideally extend along the entire block of Broadway between Redwood and Valle Vista, but may be shorter depending on the final design. Curb cuts would be made through the existing curb along Broadway to divert roadway runoff into the swale.

Project Design and Construction Schedule
The Broadway and Redwood Project is currently in the design phase. The design firm is WRECO and 100% design is expected to be completed in the summer of 2012. The Project is expected to go out to bid in the fall of 2012 and construction is anticipated to begin in the fall or winter of 2012.

1.10 Vallejo PG&E Substation

The PG&E Substation Project is located on the corner of Sutter Street and Pennsylvania Avenue. The substation is bounded by an alley named Ford Al to the north, a truck container lot to the east, Pennsylvania Avenue to the south, and Sutter Street to the west. Sutter Street is a crowned, two lane road that runs north-south with a sidewalk on both sides. Approximately 12 ft of dense vegetation separates the PG&E substation and the Sutter Street sidewalk. The substation groundcover is predominantly compact gravel. Kevin Cullen, with the Fairfield-Suisun Sewer District and Sam Kumar with the City of Vallejo are the municipal leads for the Project.

Project Catchment
The catchment includes a portion of the PG&E substation at 500 Sutter Street and a portion of the roadway along Sutter Street. The treated watershed was estimated to be approximately 0.13 acres. The land use is a combination of industrial and commercial.

Project Concept
The PG&E substation drains into two drainage inlets along Sutter Street. Within the substation property, a concrete berm surrounds the substation structure and directs stormwater runoff from the structure area into a concrete lined ditch at the southwest corner of the property. The ditch connects to a 15 inch culvert that flows directly into drainage Inlet #1 on the northeast corner of Sutter Street and Pennsylvania Street. Stormwater runoff from the rest of the substation property sheet flows via driveway towards Sutter Street and into drainage Inlet #2 adjacent to the substation driveway. A curb along the northern and eastern edges of the substation lot prevents substation runoff from draining towards Ford Al alley. The two drainage inlets connect to a 36 inch culvert that flows south under Sutter Street. Information on the existing drainage systems was provided by the Vallejo Sanitation and Flood Control District.

A new drainage inlet would be installed adjacent to the substation driveway to collect sheet flow from the PG&E substation site. The proposed drainage inlet would be a Contech Catchbasin Stormfilter. Contech Stormfilters provide stormwater treatment through a replaceable media filter cartridge. The cartridge media filter is available with a variety of media, including PhosphoSorb, Perlite, Zeolite, CFS Leaf Media, Granular Activated Carbon (GAC), and a Zeolite, Perlite, GAC (ZPG) blend. Stormwater flows into the drainage inlet influent chamber and then into a second chamber with the media filter cartridge. The medium filter cartridge traps pollutants but allows water to flow through the media filter and into the effluent chamber.

Preliminary surveys show a gas line very close to the proposed inlet location. The curb inlet configuration is proposed to avoid utility conflicts. The site watershed would be approximately 0.15 acres. Based on the watershed size, a single cartridge catchbasin would be sufficient to provide treatment for the site. An 18" culvert would connect the StormFilter to the existing inlet along the northbound lanes of Sutter Street.

Project Design and Construction Schedule

The PG&E Substation Project is currently in the design phase. The design firm is WRECO and 100% design is expected to be completed in the summer of 2012. The Project is expected to go out to bid in the fall of 2012 and construction is anticipated to begin in the fall or winter of 2012.

MRP Regional Supplement for POCs and Monitoring
Appendix A

A6

Appendix A6

Excerpt from CLEAN WATERSHEDS FOR A CLEAN BAY (CW4CB) SEMI-ANNUAL PROGRESS REPORT NUMBER THREE
February 13, 2012
Reporting Period: April 1, 2011 through September 30, 2011

Task 6. Risk Communication and Exposure Reduction

This task will 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. The Project Work Plan describes how this effort will be accomplished and includes four general sub-tasks:

- 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.

BASMAA developed the above sub-tasks 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 Regional Water Board and EPA staff. This task is receiving additional funding from other dischargers to the Bay that have similar NPDES permit requirements, including BACWA and industrial dischargers. 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).

<u>A. Description of activities accomplished</u>

- Sub-task 1. Convene a risk reduction stakeholder advisory group.

During a previous reporting period, a Stakeholder Advisory Group (SAG) was formed. 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 among SAG members.

During this reporting period, the SAG met in May 2011 to be introduced to the funded groups (see Sub-task 3) 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 ways of delivering them. CDPH convened a SAG signage subcommittee meeting in August 2011 to discuss the development of a warning sign for San Francisco Bay based on the updated advisory. The group reviewed and provided suggestions for improving some preliminary sign designs that were developed by CDPH. The SAG also met in September 2011 (fourth meeting overall) to discuss the development of the fish consumption warning sign. The goal with the creation of this sign is to help anglers identify the fish that are safe to eat from the SF Bay, as well as which fish to avoid. The SAG also received a presentation about signage and other education strategies of the Fish Contamination Education Collaborative (FCEC). FCEC is a component of the Palos Verdes Shelf Superfund Site remediation effort that is managed by EPA. The agenda, presentations, and meeting summary have been posted on the project website www.sfei.org/sfbfp.

- 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 the last reporting period, CDPH developed a draft framework for review and comment by the SAG, including a project goal and five objectives.

During this reporting period, after review and comment, the framework was finalized.

- Sub-task 3. Award and oversee implementation of mini-grants.

During previous reporting periods, 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 Geoff Brosseau, CW4CB's Principal Investigator, were selected to be on the proposal selection panel. The RFP was released in mid-February 2011 with proposals due back by April 1, 2011.

During this reporting period, nine proposals received back by April 1. The selection panel reviewed and scored the proposals and selected four projects from the following organizations for funding:

1. California Indian Environmental Alliance
2. APA Family Support Services
3. Greenaction for Health and Environmental Justice
4. 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 2011. 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.

CDPH continued to support the funded group projects by conducting additional fish contamination and evaluation training for Greenaction staff, reviewing an educational brochure developed by Greenaction, translating some of the evaluation tools into Spanish for Kids for the Bay, and developing poster-sized versions of the advisory materials for several groups.

- Sub-task 4. Conduct evaluation activities.

Evaluation is a critical sub-task. Evaluation activities will include: evaluation of the SAG, mini-grant evaluation activities by the funded groups, and evaluation of the mini-grants task overall.

During this reporting period, CDPH facilitated real-time, self-evaluations by the SAG of their meetings. During the last reporting period, 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. So, also during this reporting period, the second half of the training CDPH conducted for sub-award recipients 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.

B. Status of Achieving Milestones

- Sub-task 1. Convene a risk reduction stakeholder advisory group:

This sub-task/s milestone was achieved during a previous reporting period. The schedule in the Project Work Plan calls for convening the SAG during the first quarter of the project (July - September 2010). Initial planning was conducted during the first quarter and the SAG held its introductory meeting in December 2010. The SAG has met three more times through this reporting period.

- Sub-task 2. Develop a broad risk communication strategy.

The schedule in the Project Work Plan calls for developing a broad risk communication strategy during the seven-quarter period of Year 1 Q2 through Year 4 Q4 (October 2010 - June 2012). As reported above under Sub-task 2, development of the strategy was initiated and has been completed in the form of a framework.

- Sub-task 3. Award and oversee implementation of mini-grants.

The schedule in the Project Work Plan calls for awarding and overseeing implementation of mini-grants during the ten-quarter period of Year 2 Q1 through Year 4 Q2 (July 2011 – October 2013). The awarding of mini-grants was accomplished ahead of schedule in Year 1 Q4, and overseeing implementation is underway and ongoing.

- Sub-task 4. Conduct evaluation activities.

The schedule in the Project Work Plan calls for conducting evaluation activities near the end of the project during Q2 and Q3 of Year 4 (October 2013 – January 2014), which will be done at that time but evaluation of the SAG occurred during this reporting period.

C. Problems encountered with achieving outputs/outcomes and their resolutions

Problems related to this task were not encountered during this reporting period.

D. Planned activities for the next six months

Activities planned for the next reporting period will be focused on the following:

- Sub-task 1. Convene a risk reduction stakeholder advisory group.

The SAG will continue to help create, inform, and guide the development of a risk communication framework (Sub-task 2). In addition, the SAG meetings will continue to be used to keep members updated on the progress of the mini-grants (Sub-task 3) and related activities (e.g., fish monitoring activities, Bay PCBs TMDL, new San Francisco Bay fish consumption advisory), and encourage new activities and collaborations among the participating groups (e.g., sign posting by fishing location managers).

- Sub-task 2. Develop a broad risk communication strategy.

Sub-task 2 was completed during this reporting period. No activities are planned for the next reporting period, although the framework may be opened for lessons learned comments by the SAG at some point during the remainder of the project.

- Sub-task 3. Award and oversee implementation of mini-grants.

CDPH and the SAG will continue to provide oversight of the four mini-grant funded projects.

- Sub-task 4. Conduct evaluation activities.

The SAG will continue to conduct self-evaluations of their meetings. The mini-grant funded groups will start to implement evaluation processes for their mini-grant project activities.

Excerpt from CLEAN WATERSHEDS FOR A CLEAN BAY (CW4CB) SEMI-ANNUAL PROGRESS REPORT NUMBER FOUR

September ____, 2012

Reporting Period: October 1, 2011 through March 30, 2012

Task 6. Risk Communication and Exposure Reduction

This task will 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. The Project Work Plan describes how this effort will be accomplished and includes four general sub-tasks:

- 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.

BASMAA developed the above sub-tasks 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 Regional Water Board and EPA staff. This task is receiving additional funding from other dischargers to the Bay that have similar NPDES permit requirements, including BACWA and industrial dischargers. CDPH is 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).

<u>A. Description of activities accomplished</u>

- Sub-task 1. Convene a risk reduction stakeholder advisory group.

During a previous reporting period, a Stakeholder Advisory Group (SAG) was formed. 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 among SAG members.

During this reporting period, CDPH continued development of the San Francisco Bay warning sign. A revised sign was presented to the signage subcommittee on November 15. CDPH convened the fifth and sixth meetings of the SAG on December 6, 2011 and March 8, 2012. The main December 6 agenda items were to (1) review and approve the new warning sign for San Francisco Bay and discuss posting, (2) learn about the Regional Monitoring Program sport fish sampling activities and discuss additional sampling activities that would support a more comprehensive advisory, and (3) hear updates from the funded groups on their projects (see Sub-task 3). In January, CDPH convened a conference call with the county health and environmental health agencies (including several who have not been participating on the SAG) to update them about the sign and posting activities. CDPH also convened a call with OEHHA staff and received final approval from them on the sign. CDPH printed 350 copies of the SFB warning sign in a digital high pressure laminate material and will begin distributing the signs to the counties for posting in the next quarter. The main March 8 agenda items were to (1) hear an update on the San Francisco Bay sign and discuss possible media activities around the posting, (2) learn about the Water Board's TMDL activities, (3) discuss possible future activities, should the SFBFP continue beyond the current funding, and (4) hear updates from the funded groups on their projects (see Sub-task 3). The agendas, presentations, and meeting summaries have been posted on the project website www.sfei.org/sfbfp.

- Sub-task 2. Develop a broad risk communication strategy.

The Bay Area risk communication and exposure reduction work group previously agreed that this sub-task focus on developing a broad risk communication framework that serves as the basis for planning future outreach, education, and risk reduction activities. The framework addresses 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 the last reporting period, after review and comment, CDPH finalized the framework but has left open the possibility that it may be revised based on SAG input.

During this reporting period, no additional work on the framework was necessary.

- Sub-task 3. Award and oversee implementation of mini-grants.

During previous reporting periods, 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 Geoff Brosseau, CW4CB's Principal Investigator, were selected to be on the proposal selection panel. The RFP was released in mid-February 2011 with proposals due back by April 1, 2011. Nine proposals were received; the selection panel reviewed and scored the proposals, and selected four projects from the following organizations for funding:

5. California Indian Environmental Alliance
6. APA Family Support Services
7. Greenaction for Health and Environmental Justice
8. Kids for the Bay

During this reporting period, all four funded groups submitted their midterm reports. APA, Greenaction, and Kids for the Bay have made good progress on their projects and CDPH has approved the next payment of their award (40% of the awarded amount). The California Indian Environmental Alliance (CIEA) had some difficulty implementing their project as originally planned. CIEA's project partner, the Native American Health Clinic (NAHC) WIC clinic, was unable to participate fully in the project, due in part to budget and staffing reductions at the clinic. CIEA had to redesign some parts of their project and worked closely with the clinic staff and CDPH to finalize these changes and renegotiate their MOA.

There were two main changes to the CIEA project. First, CIEA reduced the number of people included in their fish consumption survey from 8,000 to 1,000, and added an educational intervention and evaluation after the survey. The reduction in survey participants was necessary because the population served by their project partner, the NAHC-WIC clinic, was smaller than anticipated. CIEA will supplement the survey by conducting interviews at several community events. Second, CIEA will not conduct the community education meetings with WIC participants as described in their original MOA. Instead, in collaboration with the WIC clinic staff, CIEA has designed a fish curriculum called "Making Healthy Fish Choices" that uses a WIC class format and will be offered at the clinic during the spring. CDPH approved the next award payment to CIEA after they completed 100 surveys and the fish curriculum. CDPH collaborated with CIEA in conducting a half-day training for 10 of the WIC clinic staff on February 29. CDPH also conducted a site visit with CIEA staff while they implemented their fish consumption survey at the NAHC-WIC clinic.

In addition to the training on February 29, CDPH has provided significant support to the CIEA project in February and March, which has included:

- providing extensive comments on CIEA's fish consumption survey and fish curriculum.
- developing an educational "pledge" for the fish curriculum participants and translating the pledge into Spanish and Vietnamese. This pledge serves as an educational handout but will also help CIEA track SF Bay fish consumers who attend the fish class.
- translating a CDPH low-literacy brochure ("Safety Tips for Eating Fish") into Spanish so it could be used as part of the fish curriculum
- creating poster versions of the low-literacy brochure in English and Spanish.
- providing a Spanish-speaking interviewer who assisted CIEA in conducting fish consumption interviews at the NAHC-WIC clinic.
- printing of educational materials and providing training tools.

Although $100,000 was originally set aside to support the four funded groups, only $95,000 was requested and awarded to the groups. The remaining $5,000 was made available to the four groups upon request to support their projects. CDPH approved supplemental funding of $1,250 for all of the four groups.

CDPH staff conducted a site visit with Kids for the Bay. CDPH observed a lesson given by Kids staff to a 3rd grade class at the Cox Academy in Oakland.

CDPH assisted Greenaction by reviewing their educational brochure and translating it into Chinese, completing a Vietnamese translation of their educational brochure.

CDPH also provided training on advisories and fish contamination issues to 20 park supervisors from the East Bay Regional Park District at a meeting on November 9, 2011.

CDPH conducted training for 16 staff from APA Family Support Services and APA partner organizations including Nihonmachi Little Friends, Korean Center, Inc., Lao Seri Association (Cambodian and Laotian Services Programs), Vietnamese Family Services, Pilipino Senior Resource Center, and WestBay Multi Services Center. From both the APA and CIEA trainings there was an increase in knowledge from the pre/post test and very positive comments from the written evaluations.

CDPH completed the Chinese translation of the advisory brochure. As with the other brochures, there are two different covers for the brochure. CDPH printed 3,000 copies of the clinic cover brochure (Chinese) and distributed them to the funded groups (printing of 2,000 copies of the shark cover brochure in Chinese is in progress). CDPH also completed the Chinese translation of the kiosk version. These Chinese materials have also been posted on the project website. CDPH also completed the Vietnamese translation of the advisory brochure (including two versions—a clinic cover and a shark cover) and kiosk version. CDPH printed 2,000 copies of the clinic cover Vietnamese brochure and provided these to the funded groups. These materials have been posted on the project website. CDPH is also in the process of printing 150 copies of the advisory kiosk version (English) in a rigid PVC plastic that will be distributed along with the SF Bay sign for posting on kiosk or bulletin boards at fishing sites.

- Sub-task 4. Conduct evaluation activities.

Evaluation is a critical sub-task. Evaluation activities will include: evaluation of the SAG, mini-grant evaluation activities by the funded groups, and evaluation of the mini-grants task overall.

During this reporting period, CDPH continued to facilitate real-time, self-evaluations and modifications by the SAG of their meetings. Training evaluation was described above under Sub-task 3.

<u>B. Status of Achieving Milestones</u>

- Sub-task 1. Convene a risk reduction stakeholder advisory group:

This sub-task/s milestone was achieved during a previous reporting period. The SAG has met two times during this reporting period.

- Sub-task 2. Develop a broad risk communication strategy.

The schedule in the Project Work Plan calls for developing a broad risk communication strategy during the seven-quarter period of Year 1 Q2 through Year 4 Q4 (October 2010 - June 2012). As reported above under Sub-task 2, development of the strategy was initiated and completed in the form of a framework.

- Sub-task 3. Award and oversee implementation of mini-grants.

The schedule in the Project Work Plan calls for awarding and overseeing implementation of mini-grants during the ten-quarter period of Year 2 Q1 through Year 4 Q2 (July 2011 – October 2013).   The awarding of mini-grants was accomplished ahead of schedule in Year 1 Q4, and overseeing implementation is underway and ongoing.

- Sub-task 4. Conduct evaluation activities.

The schedule in the Project Work Plan calls for conducting evaluation activities near the end of the project during Q2 and Q3 of Year 4 (October 2013 – January 2014), which will be done at that time but evaluation of the SAG occurred during this reporting period.

C. Problems encountered with achieving outputs/outcomes and their resolutions

Problems related to this task were not encountered during this reporting period.

D. Planned activities for the next six months

Activities planned for the next reporting period will be focused on the following:

- Sub-task 1. Convene a risk reduction stakeholder advisory group.

The SAG will continue to help create, inform, and guide the development of a risk communication framework (Sub-task 2). In addition, the SAG meetings will continue to be used to keep members updated on the progress of the mini-grants (Sub-task 3) and related activities (e.g., fish monitoring activities, Bay PCBs TMDL, new San Francisco Bay fish consumption advisory), and encourage new activities and collaborations among the participating groups (e.g., sign posting by fishing location managers).

- Sub-task 2. Develop a broad risk communication strategy.

Sub-task 2 was completed during a previous reporting period. No activities are planned for the next reporting period, although the framework may be opened for lessons learned comments by the SAG at some point during the remainder of the project.

- Sub-task 3. Award and oversee implementation of mini-grants.

CDPH and the SAG will continue to provide oversight of the four mini-grant funded projects.

- Sub-task 4. Conduct evaluation activities.

The SAG will continue to conduct self-evaluations of their meetings. The mini-grant funded groups will start to implement evaluation processes for their mini-grant project activities.

A7

San Francisco Bay Fish Project
Quarterly Report
April 1, 2012 – June 30, 2012
Submitted on June 28, 2012, to the Aquatic Science Center by the California Department of Public Health

Task 1: Conduct Needs Assessment
Completed.

Task 2: Create and Convene Stakeholder Advisory Group (SAG)
Percent completion of task: 100%

CDPH convened the seventh (and last) meeting of the SAG on June 14th, 2012. The main agenda items were (1) final presentations from the funded groups, (2) an update on the San Francisco Bay sign posting and forthcoming media activities, (3) results of the survey on possible future activities, and (4) a presentation on Biomonitoring California. Biomonitoring California is a CDPH and Cal-EPA program to develop a biomonitoring program for the State (see http://www.oehha.ca.gov/multimedia/biomon/about.html). There were 21 attendees (including CDPH staff) (see agenda and draft meeting notes in Attachments 2A and 2B). The agenda and presentations have been posted on the project website www.sfei.org/sfbfp. The meeting summary will be posted once it is finalized.

CDPH received the San Francisco Bay "Fish Smart" warning signs that were ordered from the printer. We printed slightly fewer signs (319, not 350) due to the higher costs of producing these signs than expected. CDPH contributed $9,000 toward the printing costs of the sign (total printing cost was $15,103). During early May, the signs were distributed to our partners in 6 counties and other organizations for posting. CDPH has developed a list of fishing locations drawn primarily from the California Recreational Fisheries Survey (Attachment 2C). The organizations posting the signs were asked to fill out a sign tracking form (Attachment 2D). As of June 28th, only about 12% of the sites identified by CDPH have been posted. CDPH will continue to work with the posting agencies to complete posting activities.

CDPH is working with San Francisco Department of Public Health to plan a media event to highlight in the posting of the signs and the funded group projects. The media event would include the issuing of a press release to inform the media about the fish advisory and to invite media to the posting of a sign at a San Francisco pier. SAG members, including SFDPH staff, CDPH and SF-based funded groups, will be available to answer questions relevant to their roles. CDPH is also exploring doing a similar event with the City of Berkeley.

Task 2 Attachments:
2A. SAG meeting June 14th agenda

2B. SAG draft meeting notes (includes list of meeting attendees on the last page)
2C SFB Fishing Site list
2D Sign Tracking Form

Task 3. Conduct Risk Communication and Exposure Reduction Activities
Percent completion of task: 90%

Task 3(a) Risk Communication and Exposure Reduction Framework
Completed.

Task 3(b) Project Subcontracts

The funded projects are close to completion of their projects. CDPH asked the funded groups to submit their final reports by July 2nd using the final report template (Attachments 3A). However, CDPH has already granted two of the groups an extension of this due date. CDPH granted Kids for the Bay an extension until July 27th that they requested in November 2011. Kids anticipated needing extra time to complete their final report because some of their project activities would continue into June 2012.

The California Indian Environmental Alliance (CIEA) reported that they were unable to reach their target of 1000 waiting room interviews at the Native American Health Center, Women, Infants and Children (NAHC-WIC) clinic. While they continued to interview at the clinic, they began to encounter people they had already interviewed. They tried to expand the survey by interviewing at the NAHC Seven Directions clinic (in addition to the WIC clinic) and still could not reach their target. CIEA estimates that they interviewed about 775 people. CIEA also requested and was granted an extension on their final report until July 18th because their project lead was unavailable for several weeks in June due to prior commitments.

CDPH conducted site visits with Greenaction and APA (site visits with Kids for the Bay and CIEA were conducted in Dec. 2011 and March 2012, respectively). CDPH staff observed a workshop given by Greenaction staff for Tongan youth that included presentations and a fish bingo game. CDPH also observed a workshop for Chinese youth given by APA interns who were trained by APA staff. In addition, CDPH staff attended a Kids for the Bay event where students from Cox Academy in Oakland conducted presentations on San Francisco Bay fish contamination to their parents and family members.

CDPH conducted in-person evaluation interviews with staff from the funded groups that included questions about challenges, lessons learned, how to incorporate behavior change into their projects, capacity building, and sustainability. The funded groups were also asked to evaluate CDPH (see list of interview questions in Attachment 3B). The interview questions were reviewed by USEPA, Regional Board, BACWA, and BASMAA, and revised based on their input. The evaluation interview results will be described in CDPH's final report.

CDPH continued to provide technical assistance and support to the funded groups in a variety of ways. This assistance during the past quarter included the following:

1. CIEA

- Translation of the "Making Healthy Fish Choices" curriculum into Spanish.
- Designing a focus group guide for evaluating the "Making Healthy Fish Choices" classes
- Moderating two focus groups, including one focus group in Spanish. CDPH will moderate a third focus group in Vietnamese that is planned for July 9th.
- Providing a Spanish-speaking interviewer for approximately 10 days who assisted CIEA in conducting fish consumption interviews at the waiting rooms of the NAHC- clinics. The interviewer also implemented the CIEA's educational intervention at the end of the interview.
- Printing educational materials, surveys, and evaluation tools.

2. Kids for the Bay

- Translating into Spanish the following materials:
    - An invitation to the Fish Presentation and Cooking Demonstration
    - A take-home interview for student to use to interview their parents/guardians on the Safe Bay Food Consumption Action Project
    - A post-test survey for parents/guardians who attend the Fish Cooking Student Presentations
- Printing educational materials.

3. APA

- Printing educational materials.

Task 3(c) Advisory Brochure and Kiosk Flyer

CDPH completed the translations of the advisory brochure (clinic cover) in six additional languages (see table below and Attachments 3B-3G). These materials have been posted on the project website. The advisory brochure is now available in 9 languages plus English. CDPH printed four of new languages using offset printing (quantities are listed in the table below). CDPH funds ($941.45) paid for the printing of these brochures. (Smaller quantities of the other languages were printed in-house on a color copier and provided to the funded groups). Kiosk versions and shark cover brochures for the new six languages are still under development. One final language (Japanese) is still being developed.

New Advisory Brochure Languages (clinic cover)

Languages	Number of copies produced through offset printing
Cambodian	1000
Samoan	1000

Tagalog	1000
Korean	1000
Tongan	0
Laotian	0

CDPH also produced 200 copies of the kiosk version of the advisory (English only) in a rigid PVC plastic. These printed plastic kiosk versions were distributed to the counties and other groups for posting on kiosks and bulletin boards at fishing sites near where the San Francisco Bay sign is posted.

Task 3(d) Identify Future Activities

CDPH explored possible future activities with the SAG that could be implemented with additional funding. CDPH began by discussing possible future activities with the SAG at the March 8th, 2012, meeting. CDPH presented a list of suggestions for future activities that had been raised at past meetings and recorded SAG comments for additional activities. Due to time constraints at the meeting, CDPH asked all SAG members to respond to an online survey about future activities. This survey included questions about whether there was support for current activities (SAG, small grant program, educational materials, trainings/technical assistance), ideas for new activities, populations and activities that should be targeted in the grant program, and ranking of the level of importance of the list of activities suggested from past meetings. Ten SAG members responded to the online survey. A draft summary of all the responses we received was presented to the SAG at the June 14th meeting and provided in a handout (see Attachment 3H). This handout was also sent out to the SAG after the meeting and we asked for further comments. We will revise and finalize this document after we include these final comments.

This subtask (Task 3(d)) also requires CDPH to explore alternative funding sources and other ways to sustain the program. CDPH and SFEI developed an initial proposal for the USEPA Water Quality Improvement Fund. This proposal requested $949,384 that would have funded the project for four years. We were not selected to submit a full proposal.

CDPH has also been providing periodic updates to the SAG about small grant programs that could fund fish education projects by stakeholder groups. These grants include:

- USEPA (CARE, Environmental Education, Environmental Justice)
- J.W. & H.M. Goodman Foundation
- Center for Environmental Health
- Wells Fargo & Company/National Fish and Wildlife Foundation.

Task 3 Attachments:
3A Final report template for funded groups
3B Advisory brochure in Cambodian
3C Advisory brochure in Samoan
3D Advisory brochure in Tagalog

3E Advisory brochure in Korean
3F Advisory brochure in Tongan
3G Advisory brochure in Laotian
3H Future activities draft summary

Task 4. Program Evaluation and Coordination
Percent completion of task: 85%

CDPH conducted a year-end evaluation at the June 14th SAG meeting. A draft summary is provided in Attachment 4A. This evaluation included questions about the June 14th meeting as well as questions about the SAG over the course of the project. There were 11 respondents. CDPH is still working on having other SAG member fill out the evaluation form and will revise the summary if additional evaluation forms are received.

During June, CDPH met with staff from each of the funded groups to conduct in-person evaluation interviews. A list of questions asked during these evaluation interviews is provided in Attachment 4B. CDPH will provide a summary of these interviews in our final report.

Task 4 Attachments:
4A Year-end SAG meeting (June 14th) evaluation draft
4B Interview questions to evaluation funded group projects

A8

Municipal Regional Permit - Pilot Stormwater Diversion Projects - Provisions C.11f and C.12.f

Project Name & Location	Project Objectives	Project Characterization: Catchment Size (acres)	Primary Land Uses	Diversion Type: Gravity	Pumped	Contin.	Batch	Expected Diversion Flow (gpm): Wet weather	Dry weather	Monitoring: Pollutants	Other	Tasks	2012 Q1	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4
Alameda	1. Evaluate load reductions	1000	residential		X		X	25 max	25 max	Mercury, PCBs	SSC, DOC (potential),	1. Pre-project wet and/or dry season monitoring and analysis		■	■									
Ettie St. Pump Station City of Oakland	2. Pilot turbidity trigger for diversion		industrial mix								partical size, turbidity (forebay),	2. Detailed planning and workplan development	■	■										
	3. Establish particle size-POC concentration relationships		commercial								station pumping volume,	3. Equipment installation/construction and implementation	■	■	■									
	4. Project cost/benefits and challenges of larger-scale project scenarios										pretreatment volume,	3.a Large scale scenario development				■	■	■						
	5. Coordinate with pilot retrofit to leverage data collection										diversion volume, rainfall	4. Post installation/construction monitoring and analysis			■	■	■	■						
												5. Data analysis and interpretation and project reporting			■	■		■	■	■	■			
Contra Costa	1. Evaluate PCB and mercury loads avoided through pump station maintenance conducted in conjunction with diversion to a POTW.	339			X	TBD	TBD	TBD	TBD	PCBs, mercury, metals	Mass sediment removed	1. Pre-project wet and/or dry season monitoring and analysis	■											
North Richmond Pump Station City of Richmond												2. Detailed planning and workplan development		■	■	■	■	■						
	2. Design a diversion pilot project that can be permitted for discharge to West County Wastewater District											3. Equipment installation/construction and implementation							■	■				
			Mixed residential, light industrial; formerly used for nurseries									4. Post installation/construction monitoring and analysis									■			
	3. Evaluate operating techniques that can treat first flush without adversely impacting POTW capacity											5. Data analysis and interpretation and project reporting										■		
Fairfield/Suisun	1. Evaluate pollutant loads to the Bay that are reduced due to stormwater diversion.	6	Commercial				X	NA	10000 gallons	Mercury, PCBs	SSC	1. Pre-project wet and/or dry season monitoring and analysis	■											
State Strret Pump Station	2. Estimate projected benefits, challenges and costs of operating a similar diversion in a similar drainage area and/or an area known to have elevated concentrations of PCBs or mercury.											2. Detailed planning and workplan development	■	■										
	3. Document the knowledge and experience gained from evaluation of the diversion project.											3. Equipment installation/construction and implementation			■									
												4. Post installation/construction monitoring and analysis			■	■	■	■	■					
												5. Data analysis and interpretation and project reporting						■	■	■				
San Mateo	1. Characterize PCB and Hg concentrations in dry & wet weather flows into the pump station and establish relationships as feasible among turbidity, SSC, and pollutant concentrations.	330	Industrial		X		X	25 max	25 max	Mercury, PCBs	SSC, TOC, partical size, turbidity	1. Pre-project wet and/or dry season monitoring and analysis	NA											
	2. Pilot-test the practicability of using a turbidity threshold trigger to selectively divert flows with elevated turbidity and associated particle-bound pollutants and thereby optimize pollutant loads diverted.										diversion and stormwater runoff volumes, rainfall	2. Detailed planning and workplan development	■	■										
Pulgas Creek Pump Station	3. Evaluate costs and benefits (reduction of pollutant loads to the Bay) due to the pilot-scale diversion of urban runoff from the pump station to the sanitary sewer system.											3. Equipment installation/construction and implementation			■	■								
City of San Carlos	4. Estimate costs and benefits of implementing a larger scale and more permanent diversion.											4. Post installation/construction monitoring and analysis			■	■	■	■						
												5. Data analysis and interpretation and project reporting						■	■	■				
Santa Clara	1. Evaluate pollutant loads reduced due to current operation of diversion structure.	50	Light Industrial	X		X				Mercury, PCBs,	SSC, DOC, partical size, turbidity,	1. Pre-project wet and/or dry season monitoring and analysis	NA											
Passive MS4 Diversion Structure City of Palo Alto	2. Estimate projected benefits, challenges and costs of constructing and operating a similar diversion structure in other watersheds		Multi-family Res.							Metals	diversion and stormwater runoff volumes, rainfall	2. Detailed planning and workplan development	■	■										
	3. Document the knowledge and experience gained from evaluation of the diversion structure to inform planning of urban runoff diversions in the next permit term.											3. Equipment installation/construction and implementation		■	■									
												4. Post installation/construction monitoring and analysis			■	■	■	■						
												5. Data analysis and interpretation and project reporting			■	■	■	■	■	■				
Status Reports, Regional Interpretation and Reporting	SEE ATTACHMENT A											Submit Annual Status Reports			■				■					
												Submit Integrated Report									■			

ATTACHMENT A

Municipal Regional Permit – Evaluating PCB/Hg Pilot Project Results thru the Integrated Monitoring Report (IMR) - Provisions C.11 and C.12.

The pilot projects called for in MRP Provisions C.11 and C.12 will increase our understanding of the effectiveness, costs, and applicability of a variety of potential control measures towards the goal of attaining a ninety percent reduction in stormwater loads of PCBs and a fifty percent reduction in stormwater loads of mercury over a twenty year period. These pilot projects include pollutant source property identification and referral to regulatory agencies, enhancements to municipal operation and maintenance (O&M) practices (e.g., street sweeping, storm drain system maintenance), stormwater treatment retrofitting, stormwater diversion to POTW studies, and evaluating prevention of release of PCBs in materials such as caulks and sealants during renovation or demolition of buildings and other structures.

The effectiveness of each type of piloted control measure in reducing stormwater runoff pollutant loadings to the Bay will be qualitatively and quantitatively evaluated and compared based on specific criteria, including the following:

1. Feasibility – is a control measure generally practicable?
2. Efficiency – what is the cost-effectiveness of the control measure (e.g., $/kg pollutant load reduced)?
3. Opportunity – what overall reduction in rate of pollutant mass loading can the control measure achieve?

BASMAA MRP stormwater programs will report the findings of the pilot studies and related evaluations in the Integrated Monitoring Report (IMR), which is due March 2014. A BASMAA Regional Project is underway to scope and develop the IMR. In parallel with development of the IMR, BASMAA representatives will work with Regional Water Board staff to apply the lessons learned during this permit term, identify cost-effective next steps in implementing the mercury and PCB TMDLs, and develop the mercury and PCB provisions for the next iteration of the MRP, with the goal of preparing a first draft of the new permit language by the fall of 2014.

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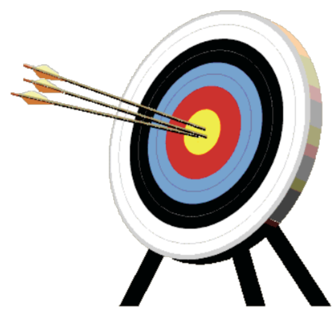
THE RMP MULTI-YEAR PLAN

2012 ANNUAL UPDATE



APPROVED BY STEERING COMMITTEE: 01-24-12

Figure 1. RMP Committees and Workgroups.

RMP ORIGIN AND PURPOSE

In 1992 the San Francisco Bay Regional Water Board passed Resolution No. 92-043 directing the Executive Officer to send a letter to regulated dischargers requiring them to implement a regional multi-media pollutant monitoring program for water quality (RMP) in San Francisco Bay. The Water Board's regulatory authority to require such a program comes from California Water Code Sections 13267, 13383, 13268 and 13385. The Water Board offered to suspend some effluent and local receiving water monitoring requirements for individual discharges to provide cost savings to implement baseline portions of the RMP, although they recognized that additional resources would be necessary. The Resolution also included a provision that the requirement for a RMP be included in discharger permits. The RMP began in 1993, and over the past 19 years has been a successful and effective partnership of regulatory agencies and the regulated community.

The goal of the RMP is to provide the high quality body of knowledge on estuarine contamination needed for managing water quality in this treasured aquatic ecosystem.

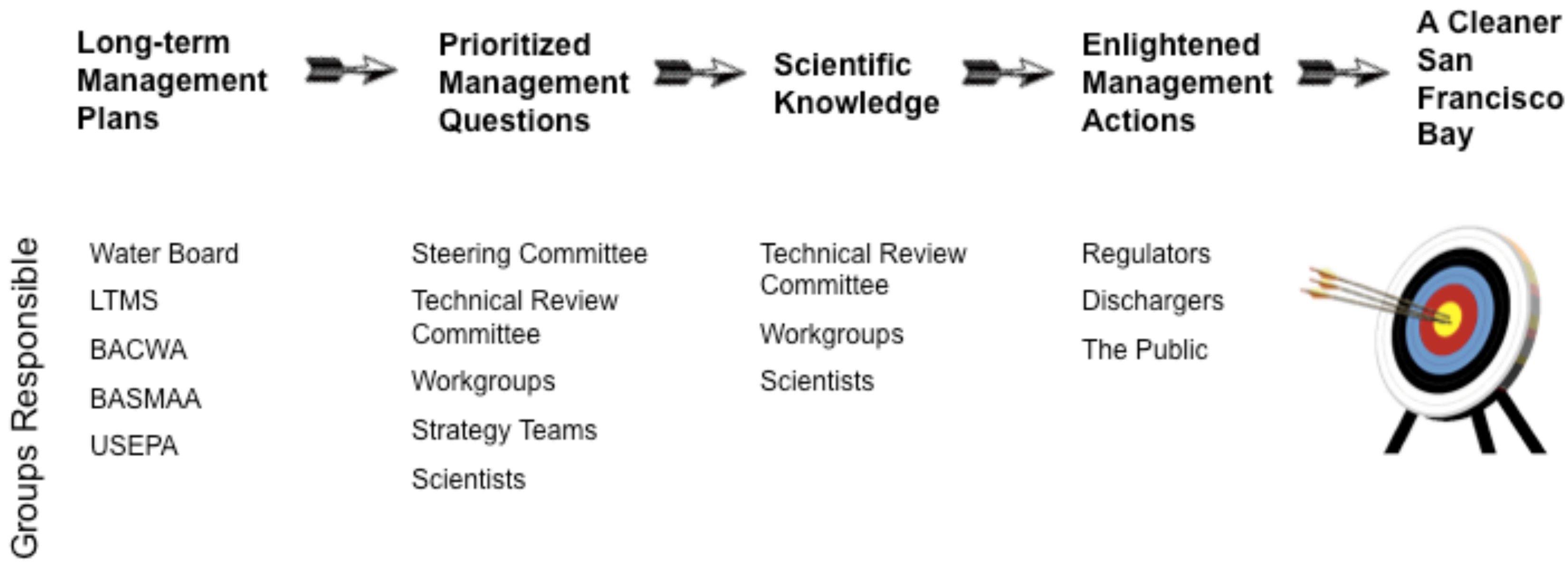
This goal is achieved through a cooperative effort of a wide range of regulators, dischargers, scientists, and environmental advocates. This collaboration has fostered the development of a multifaceted, sophisticated, and efficient program that has demonstrated the capacity for considerable adaptation in response to changing management priorities and advances in scientific understanding.

RMP PLANNING

This collaboration and adaptation is achieved through the participation of stakeholders and scientists in frequent committee and workgroup meetings. The Steering Committee (Figure 1) consists of representatives from discharger groups (wastewater, stormwater, dredging, industrial) and regulatory agencies (Regional Water Board, USEPA, and U.S. Army Corps of Engineers). The Steering Committee determines the overall budget and allocation of program funds, tracks progress, and provides direction to the Program from a manager's perspective. Oversight of the technical content and quality of the RMP is provided by the Technical Review Committee (TRC), which provides recommendations to the Steering Committee. Five workgroups report to the TRC and address the main technical subject areas covered by the RMP: sources, pathways, and loadings; contaminant fate; exposure and effects; emerging contaminants; and sport fish contamination. An additional workgroup will be established in address the topic of nutrients and to guide development of a nutrient strategy by the Regional Water Board. The workgroups consist of regional scientists and regulators and invited scientists recognized as authorities in their field. The workgroups directly guide planning and implementation of pilot and special studies. RMP "strategy teams" comprise one more layer of planning activity. These stakeholder groups meet as needed to develop long-term RMP study plans for addressing high priority topics. Topics addressed to date include mercury, PCBs, dioxins, small tributary loads, and forecasting.

The annual planning cycle begins with a workshop in October in which the Steering Committee articulates general priorities among the information needs on water quality topics of concern. In the second quarter of the following year the workgroups and strategy teams forward recommendations for study plans to the TRC. At their June meeting, the TRC combines all of this input into a study plan for the following year that is submitted to the Steering Committee. The Steering Committee then considers this recommendation and makes the final decision on the annual workplan.

Figure 2. Science in support of water quality management.



The RMP supports management efforts to protect and restore water quality in the Bay. It does this by developing the scientific understanding needed to answer the key questions on priority topics that underpin current and future management policies and actions. RMP stakeholders and scientists work closely together to ensure the linkage of science and management.

In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon, so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each of the workgroups and teams develops five-year plans for studies to address the highest priority management questions for their subject area. Collectively, the efforts of all these groups represent quite a substantial body of deliberation and planning.

PURPOSE AND ORGANIZATION OF THIS DOCUMENT

The purpose of this document is to guide efforts and summarize plans developed within the RMP. The intended audience includes representatives of the many organizations who directly participate in the Program. This document will also be useful for individuals who are not directly involved with the RMP but are interested in an overview of the Program and where it is heading.

The organization of this Multi-Year Plan parallels the RMP planning process (Figure 2). Section 1 presents the long-term management plans of the agencies responsible for managing water quality in the Bay and the overarching management questions that guide the Program. The agencies' long-term management plans provide the foundation for RMP planning (page 6). The first step the RMP takes to support these plans, is to distill prioritized lists of management questions that need to be answered in order to turn the plans into effective actions (page 7). The prioritized management questions then serve as a roadmap for scientists on the Technical Review Committee, the workgroups, and the strategy teams to plan and implement scientific studies to address the most urgent information needs. This information sharpens the focus on management actions that will most effectively and efficiently improve water quality in the Bay.

Section 2 provides an overview of the budget of the RMP, including where the funding comes from and how it is allocated among different elements of the Program. This section provides a summary of the priority topics to be addressed by the Program over the next five years.

Section 3 presents the five-year plans developed by the workgroups and strategy teams for specific priority topics: mercury, PCBs, dioxins, emerging contaminants, small tributary loads, exposure and effects, forecasting, nutrients, and status and trends. Led by the stakeholder representatives that participate in these groups, each workgroup and strategy team has developed a specific list of management questions for each topic that the RMP will strive to answer over the next five years. With guidance from the science advisors on the workgroups, plans have been developed to address these questions. These plans include proposed projects and tasks and projected annual budgets. Information synthesis efforts are underway for several of the strategies that will yield recommendations for a next phase of studies. For now, study plans and budget allocations for these strategies are largely labelled as "to be determined". Other pieces of information are also included to provide context for the multi-year plans. First, for each high priority topic, specific management policies or decisions that are anticipated to occur in the next few years are listed. Second, the latest advances in understanding achieved through the RMP and other programs on Bay water quality topics of greatest concern are summarized. Lastly, additional context is provided by listing studies performed within the last two years and studies that are currently underway.

Section 4 describes five-year plans for other elements that are essential to the mission of the RMP: communications, data management, and quality assurance.

A Living Document

The RMP Multi-Year Plan is updated annually to provide an up-to-date description of the priorities and directions of the Program. An annual Planning Workshop is held in conjunction with the October Steering Committee meeting. A draft Multi-Year Plan is prepared after the workshop, and approved by the Steering Committee at the January meeting.

More detailed descriptions of the elements of the RMP are provided in the annual Program Plan and in the annual Detailed Workplan (both available at **www.sfei.org/rmp/what**).

For additional information on the RMP please visit our website at **www.sfei.org/rmp**.

Please contact Jay Davis, RMP Lead Scientist, at jay@sfei.org with questions or suggestions for improving this document.

Annual Steering Committee Calendar

- January
  - Approval of Multi-Year Plan
- April
  - Multi-year Plan: Focus on selected element(s)
  - Plan for Annual Meeting
  - Additional guidance to workgroups
- August
  - Multi-year Plan: mid-year check-in, workshop planning
  - Decision on special studies recommended by the TRC for next year
  - Plan for Annual Meeting
  - Report on SFEI financial audit
  - Brief discussion of fees for year after next
- October
  - Confirm chair(s)
  - Planning Workshop
  - Decision on fees for the year after next
  - Approve Program Plan and detailed budget for next year
  - Decision on Pulse and Annual Meeting topic for next year

Agendas and meeting summaries available at http://www.sfei.org/rmp/sc

CURRENT AND ANTICIPATED MANAGEMENT DECISIONS, POLICIES, AND ACTIONS BY THE REGULATORY AGENCIES THAT MANAGE BAY WATER QUALITY

Decisions, Policies, and Actions	Timing
ONGOING AND EXISTING	
Determination of Permit Limits	Ongoing
Long-Term Management Strategy for Placement of Dredged Material/Dredged Material Management Office Regional Sediment Management Strategy	Ongoing
Dredging Permits Bioaccumulation testing triggers and in-Bay disposal levels	Annual
Biennial 303(d) List and 305(b) Report	2012-13 2014-15
Copper Compare levels to site specific objectives triggers Reevaluation of the site-specific objectives	Annual Triennial (2012)
Cyanide Antidegradation policy Ambient levels below CTR threshold	Triennial (2012)
Selenium North Bay Selenium TMDL South Bay Selenium TMDL	2013-14 > 2015
Dioxins Review/reissue permit requirements Review 303(d) listings and establish TMDL development plan	2013-14 2013-14
Mercury Review existing TMDL and establish plan to revise Revised mercury TMDL and/or implementation Plan	2013-14 2016-18
PCBs Review existing TMDL and establish plan to revise Revised PCBs TMDL and/or implementation plan	2014-15 2019-20

The RMP contributes to effective management by providing scientific support for current policies and by anticipating and addressing information needs related to future policies and actions.

Decisions, Policies, and Actions	Timing
NEW AND FUTURE	
Nutrients New estuarine numerical endpoints Assessment of ammonia/ammonium	2012-15 2012-14
Legacy Pesticides (DDT, Dieldrin, Chlordane) Delist	2012-13
Pathogens Review Bay beaches 303(d) listings and establish TMDL development plan	2012-13
Sediment Hot Spots Review 303(d) listings and establish TMDL development plan	2012-13
Chemicals of Emerging Concern State Water Board policy? Regional Water Board plan or policy	2012-13 2012-13
Toxicity Adoption of new state policy on effluent and receiving water toxicity	2012
Sediment Quality Objectives 303(d) listings Determination of reasonable potential and permit requirements	2014-15 Annual

RMP stakeholders have articulated an overarching goal and a tiered framework of management questions that organize and guide RMP studies. The management questions are closely linked to existing and planned regulations.

RMP GOAL AND MANAGEMENT QUESTIONS

LEVEL I (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?

General Goal of the RMP

Collect data and communicate information about water quality in the San Francisco Estuary in support of management decisions

	QUESTION 1	QUESTION 2	QUESTION 3	QUESTION 4	QUESTION 5
LEVEL I (CORE) QUESTIONS	Levels of concern and associated impacts	Concentrations and masses (spatial distribution)	Sources, pathways, loadings, and processes	Increased or decreased (trends)	Projected concentrations, masses, and impacts
LEVEL II QUESTIONS	Q1 Which chemicals have potential for impacts? Q2 What is the potential for impacts due to contamination? Q3 What are appropriate guidelines? Q4 What contaminants are responsible for impacts?	Q1 Are there particular regions of concern?	Q1 Which sources, pathways, etc. contribute most to impacts? Q2 Opportunities for management intervention for important pathways? Q3 Effects of management actions on loads?	Q1 Effects of management actions on concentrations and mass? Q2 Effects of management actions on potential for adverse impacts?	Q1 Impacts forecast under various management scenarios? Q2 Which contaminants predicted to increase?

Along with, and consistent with, these general goals, the RMP addresses specific provisions of **NPDES permits** addressing priority information gaps

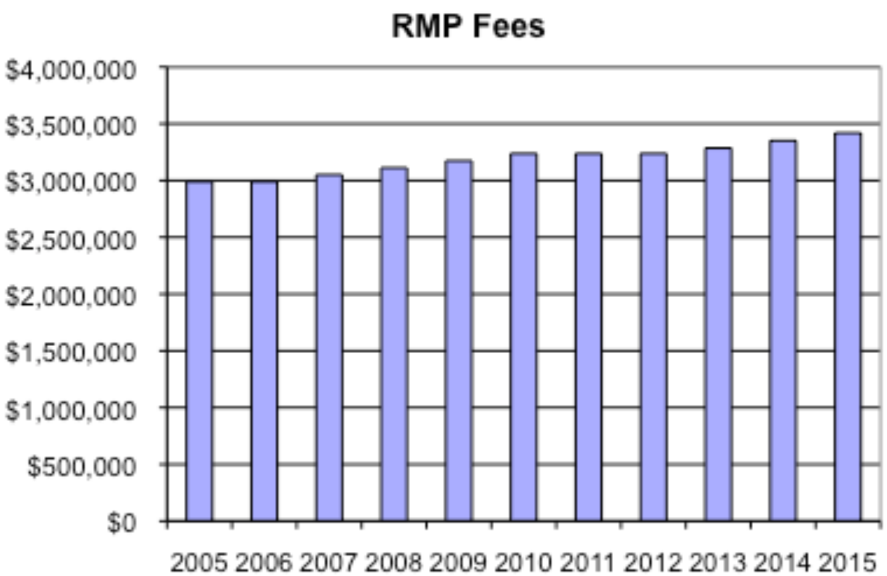
The following **key criteria** are used to evaluate potential RMP elements (in order of priority):

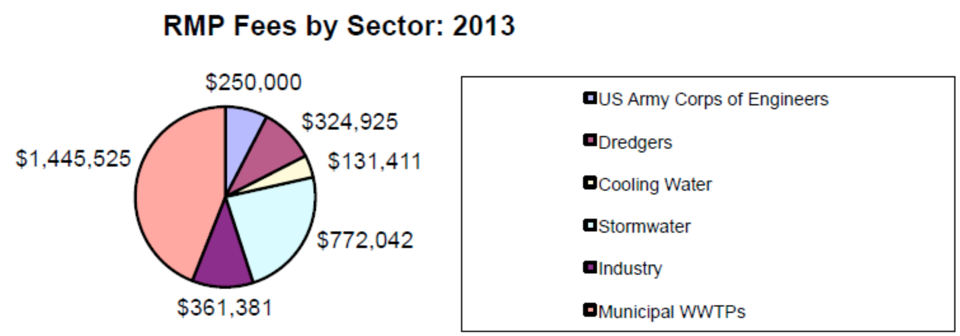
1) addresses NPDES permit requirements
2) supports policies and adaptive implementation
3) addresses scientific information needs

BUDGET: Revenue - 2013

RMP fees were $2.99 million in 2005 and 2006, increased by 2% per year in 2007-2010, and were $3.24 million for 2010, 2011 and 2012. Fees will increase by 1.5% in 2013, 2% in 2014, and 2% in 2015.

RMP fees for 2013 are divided among the discharger groups as indicated. The proportion contributed by the Army Corps has decreased over the years as their contribution has stayed constant at $250,000 per year since 1993.



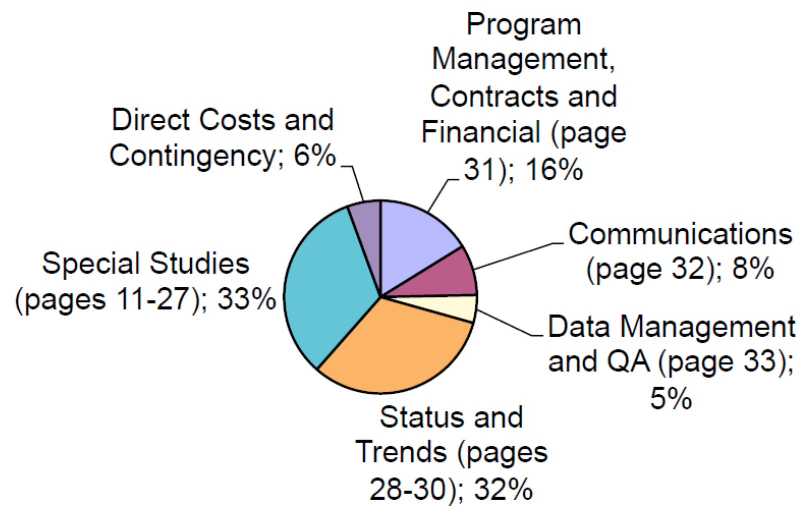


RMP fee increases have not kept pace with Bay Area inflation rates. This has contributed to a decrease in the amount of work done per year by the Program.

Year	Jun Bay Area CPI	% CPI Increase	Actual RMP Fee Increase	Basis	Target Fees
2005	201.2				$ 2,990,242
2006	209.1	3.9%	0.0%	Fixed %	$ 2,990,242
2007	216.1	3.3%	2.0%	Fixed %	$ 3,050,047
2008	225.2	4.2%	2.0%	Fixed %	$ 3,111,048
2009	225.7	0.2%	2.0%	Fixed %	$ 3,173,269
2010	228.1	1.1%	2.0%	Fixed %	$ 3,236,734
2011	233.6	2.4%	0.0%	Fixed %	$ 3,236,734
2012			0.0%	Fixed %	$ 3,236,734
2013			1.5%	Fixed %	$ 3,285,285
2014			2.0%	Fixed %	$ 3,350,991
2015			2.0%	Fixed %	$ 3,418,010
	AVERAGE	2.5%			
	16.1%	% INCREASE 2005-2011			8.2%
Data from ABAG: http://www.abag.ca.gov/planning/research/cpi.html					

BUDGET: Expenses – 2013

Program Management, Contracts and Financial (page 31)	$	538,125
Communications (page 32)	$	281,875
Data Management and QA (page 33)	$	155,000
Status and Trends (pages 28-30)	$	1,067,900
Special Studies (pages 11-27)	$	1,093,540
Direct Costs and Contingency	$	185,845



A table listing all line items for 2012-2017 is provided in Appendix 1

Unencumbered Reserve
An unencumbered reserve of $200,000 is maintained to respond to unanticipated urgent priorities.

Unencumbered Funds
Higher than anticipated revenues and elimination or reduction of lower priority elements sometimes leads to accumulation of unencumbered funds (currently $180,000 in addition to the $200,000 unencumbered reserve) that can be used for high priority topics at the discretion of the Steering Committee.

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RMP SPECIAL STUDIES: 2013-2017

RMP expenditures on special study topics. Figures for 2011 and 2012 are actual amounts. Figures for 2013 and beyond are estimates for planning.

	2011	2012	2013	2014	2015	2016	2017
TOPIC							
Mercury	$95,000	$25,000	$0	TBD	TBD	TBD	TBD
PCBs	$53,000	$0	$0	TBD	TBD	TBD	TBD
Dioxins	$26,000	$95,500	$0	$40,000	TBD	TBD	TBD
Emerging Contaminants	$100,000	$117,000	$100,000	TBD	TBD	TBD	TBD
Small Tributaries	$340,000	$428,000	$450,000	$300,000	$300,000	TBD	TBD
Other SPL	$0	$0	$0	TBD	TBD	TBD	TBD
Exposure and Effects	$97,000	$130,000	$100,000	TBD	TBD	TBD	TBD
Forecasting	$0	$100,000	$100,000	$100,000	TBD	TBD	TBD
Nutrients	$0	$140,000	$230,000	$300,000	TBD	TBD	TBD
ANNUAL TOTALS FOR SPECIAL STUDIES	**$711,000**	**$1,035,500**	**$980,000**	**$740,000**	**$0**	**$0**	**$0**
ANNUAL TOTAL AVAILABLE FOR SPECIAL STUDIES	$706,194	$895,434	$1,093,540	$1,142,106	$1,133,319	$1,171,465	$1,225,486
REMAINING	**-$4,806**	**-$140,066**	**$113,540**	**$402,106**	**$1,133,319**	**$1,171,465**	**$1,225,486**

TBD – To be determined through synthesis efforts and workgroup discussion.

Special Studies to characterize **small tributary loading** are a high priority for the next three years. **Nutrient** synthesis and monitoring, and **forecasting** of future scenarios for nutrients and other contaminants are also priorities. Next steps for mercury, PCBs, dioxins, emerging contaminants, and effects will be outcomes from information synthesis efforts.

SMALL TRIBUTARIES LOADING STRATEGY

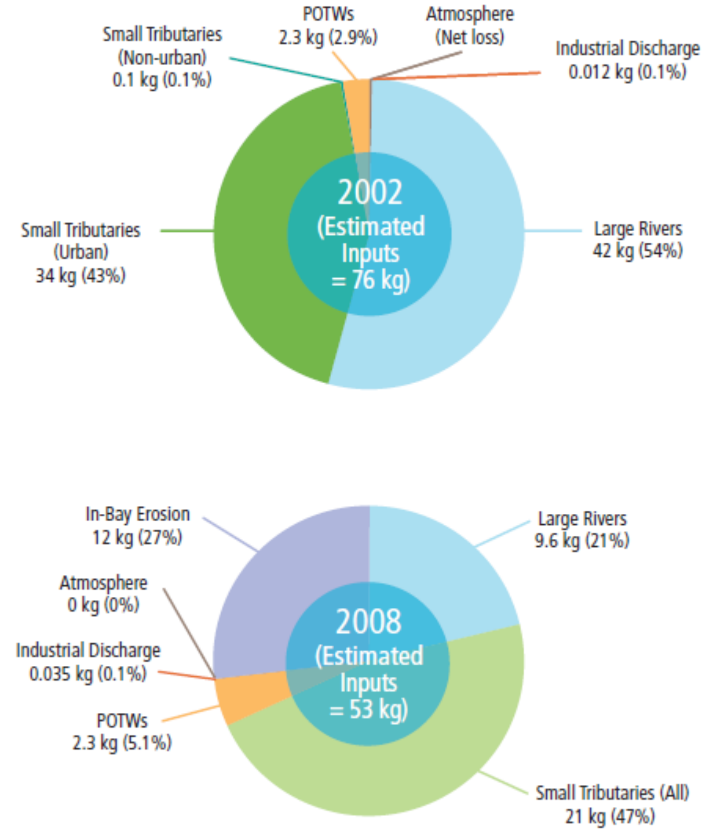
Note: "Small tributary" refers to the rivers, creeks, and storm drains that enter the Bay downstream of Chipps Island.

Relevant Management Policies and Decisions

- Refine pollutant loading estimates for future TMDLs and management decisions, including mercury and PCB TMDL updates
- Provisions of the Municipal Regional Permit (MRP) in 2010 and beyond
- Which small tributaries are the highest priorities for cleanup?
- What management actions are the best options for small tributaries?

Recent Noteworthy Findings

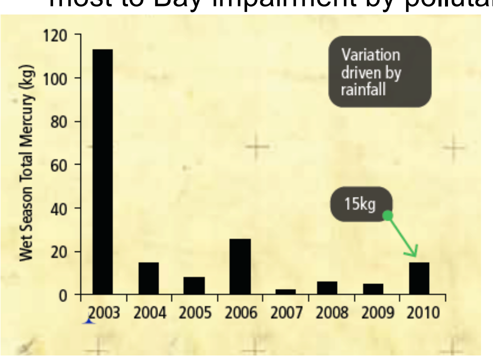
- The proportion of estimated small tributary loads has increased dramatically relative to large river loads for PCBs and mercury as we have obtained more information over the past eight years.
- More intense rainfall in the New Almaden historic mining district mobilizes sediment particles with high mercury concentrations.
- PCBs in the Guadalupe River watershed predominantly originate from urbanized areas in the lower watershed.
- Distinct differences in wet and dry years lead to high variability in mercury loadings to the Bay.
- Area-scaled loadings of many pollutants were similar from the Guadalupe watershed and from a small highly urbanized watershed in Hayward.



Estimates of PCB loads to the Bay in 2002 and 2008.

Priority Questions for the Next Five Years

1. Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by pollutants of concern?
2. What are the loads or concentrations of pollutants of concern from small tributaries to the Bay?
3. How are loads or concentrations of pollutants of concern from small tributaries changing on a decadal scale?
4. What are the projected impacts of management actions on loads or concentrations of pollutants of concern from the high-leverage small tributaries?



Estimates of mercury loads from the Guadalupe River from 2003 to 2010.

SMALL TRIBUTARIES LOADING STRATEGY

Monitoring loads from representative watersheds will be the major emphasis for the next several years. Monitoring of representative source characterization sites in 2012 and beyond will provide data needed for model development in subsequent years. This work will be closely coordinated with and substantially augmented by MRP monitoring.

Small tributaries loading studies in the RMP from 2011 to 2015. Numbers indicate budget allocations in $1000s.

Task ID	Funder	Task Description	2011	2012	2013	2014	2015
1		**Watershed and Associated Bay Modeling**					
1A		Regional Watershed Spreadsheet Model					
1A.1	RMP	Phase I – Water, Sediment, PCBs and Mercury	20	20			
1A.1	BASMAA	Phase I – Sediment		28	15	TBD	
1A. 2	RMP	Phase II – Other Pollutants of Concern			20?		
1A.2	BASMAA	Phase II– PBDE, DDT, chlordane, dieldrin		TBD	TBD	TBD	
1A.3	RMP	Phase III – Periodic Updates				TBD	TBD
1B	RMP	Coordination with Bay Margins Modeling			TBD	TBD	
1C	TBD	HSPF dynamic modeling					TBD
2	RMP	**Source Area Monitoring / EMC Development**	20	80	(80)	TBD	TBD
3		**Small Tributaries Monitoring**					
3.1	BASMAA	Multi-Year Plan Development	15				
3.2	BASMAA	Standard Operating and Quality Assurance Procedures	55				
3A	RMP	Monitor Two Representative Small Tributaries	300	328	300	300	TBD
3AB.1	BASMAA	Monitor Two to Four Representative Small Tributaries or Sites Downstream of Management Actions	255	510	480	(480)	TBD
3AB.2	BASMAA	Lab Analyses, Quality Assurance, Data Management	183	316	(320)	(320)	TBD
4	RMP	**Reporting, Stakeholder Admin, Adaptive Updates**	41		(50 min)	TBD	
	BASMAA	**Data Analysis, Communications, Administration**	45	84	(85 min)	TBD	TBD
RMP Total			**381**	**428**	**TBD**	**TBD**	**TBD**
BASMAA Total		**Task 1**		**28**	**TBD**	**TBD**	**TBD**
		Tasks 2-4	**558**	**910**	**TBD**	**TBD**	**TBD**
Total			**934**	**1,366**	**TBD**	**TBD**	**TBD**

NUTRIENT STRATEGY

Relevant Management Policies and Decisions

Primary

- Nutrient numeric endpoints (draft in 2013)
- Evaluate need for revised objectives for DO and ammonia (2013)
- Water quality assessment – impairment listing – 2014, 2016
- NPDES permits (e.g., POTW, MRP) –ongoing
  Data collection – 2012

Secondary

- Delta Flows
- Regional Sediment Strategy
- Watershed TMDLs
- Recycled Water Policy and POTW projects

Recent Advances in Understanding and Priority Information Needs

- There is a growing body of evidence that suggests the historic resilience of San Francisco Bay to the harmful effects of nutrient enrichment is changing.
- Since the late 1990s, regions of the Bay have experienced significant increases in phytoplankton biomass (30-105% from Suisun to South Bay) and significant declines in DO concentrations (2.0 and 4.0 % in Suisun Bay and South Bay, respectively).
- USGS has found declining suspended sediment in the Bay – however, no data are available for shallow subtidal regions
- There is a need for long-term status and trends monitoring of nutrients and eutrophication
- Bay water quality objectives related to nutrients are limited to un-ionized ammonia and dissolved oxygen
- There are outstanding questions about the role and importance of ammonium with respect to beneficial use impairment

Priority Questions for the Next Five Years

1. Is there a problem or are there signs of a problem?
   a. Are anthropogenic nutrients currently, or trending towards, adversely affecting beneficial uses of the Bay?
   b. Are beneficial uses in segments of San Francisco Bay impaired by any form of nutrients?
   c. Are trends spatially the same or different in San Francisco Bay?
2. What are appropriate guidelines for assessing SF Bay's health with respect to nutrients and eutrophication?
3. Which nutrient sources, pathways, (and transformation processes) contribute most to concern?
   a. What is the relative contribution of each loading pathway (POTW, Delta, NPS, etc.) to the Bay overall and the Bay's key sub-systems, and how do these loads vary seasonally?
   b. What is contribution of nutrient regeneration (benthic fluxes) from sediments and denitrification/nitrogen fixation to SF Bay nutrient budgets?
4. What nutrient loads can the Bay assimilate (without impairment of beneficial uses)?
5. What future impairment is predicted for nutrients in the Bay?

NUTRIENT STRATEGY

Five-Year Goals for Nutrient Strategy

1) Document our current understanding of nutrient dynamics in the Bay, highlighting what is known and the crucial questions that need to be answered
2) Implement a monitoring program that supports regular assessments of the Bay, and characterizes/quantifies key internal processes that exert important influence over the Bay's response to nutrient loading
3) Establish guidelines (water quality objectives; i.e., assessment framework) for eutrophication and other adverse effects of nutrient overenrichment, if needed
4) Quantify nutrient loads to and important processes in the Bay
5) Establish a modeling strategy to support decisions regarding nutrient management for the Bay

The Nutrient Science Strategy for the Bay is a collaborative effort with major contributions from RMP, USGS, the State and Regional Boards, BACWA, and hopefully others. Funding and oversight are provided by these multiple organizations. Multiagency collaboration is essential to address the information needs for nutrients in the Bay.

Nutrient studies in the Bay from 2011 to 2017. Numbers indicate budget allocations in $1000s.

Element	**Funding Agency**	**Questions Addressed**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Nutrient Strategy: Program Coordination	RMP	1-5	20	10					
	SWRCB	1-5	15	5					
	BACWA	1-5	10	60***					
Conceptual Model Development and Loads Assessment	RMP	1-5		100	TBD	TBD	TBD	TBD	TBD
Assessment (NNE)	RMP				TBD	TBD	TBD	TBD	TBD
	SFBRWQCB	2		60***	55***				
Monitoring	RMP	1,3	110	140**	TBD	TBD	TBD	TBD	TBD
	USGS	1	400	400	TBD	TBD	TBD	TBD	TBD
	SFBRWQCB	1	100	110	TBD	TBD	TBD	TBD	TBD
Modeling*	RMP	4,5		100***	100	100	TBD	TBD	TBD
Modeling	BACWA	4,5			TBD	TBD	TBD	TBD	TBD
General Allocation	RMP				200	300	TBD	TBD	TBD
		RMP Total	**130**	**350**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
		SWRCB Total	**15**	**70**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
		SFBRWQCB Total	**100**	**110**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
		BACWA Total	**10**	**60**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
		USGS Total	**400**	**400**	**400**	**TBD**	**TBD**	**TBD**	**TBD**
		Overall Total	**555**	**880**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

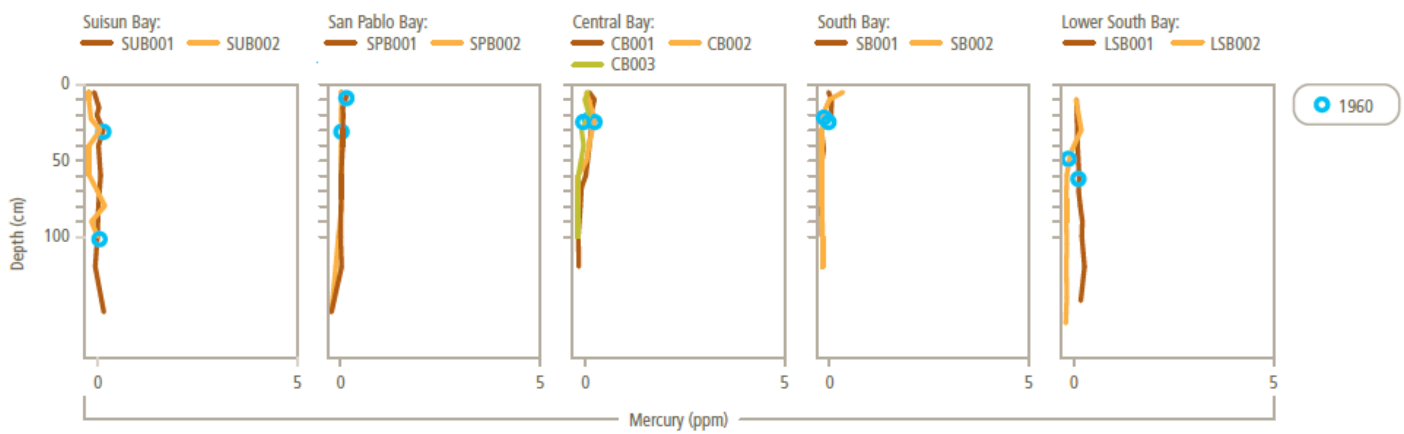
* joint with RMP Forecasting Strategy ** $110K to USGS, $30K for stormwater loads *** Anticipated TBD – To be determined through synthesis efforts and workgroup discussion.

FORECASTING (MODELING)

Relevant Management Policies and Decisions
- The next iteration of the mercury and PCBs TMDLs in 2016-2020
- Potential TMDLs for other contaminants
- Priorities for cleaning up small tributaries and contaminated margin sites
- Identifying best options for management actions to reduce impairment

Recent Noteworthy Findings
- Sediment cores from open-water sites exhibited total mercury and PCB concentrations in deeper sediments that were generally similar to surface sediments, suggesting diminished concern for prolonged recovery due to erosion of contaminated subsurface material.

Priority Questions for the Next Five Years
1) What patterns of exposure are forecast for major segments of the Bay under various management scenarios?
2) What is the contribution of contaminated Bay margins to Bay impairment?
3) What are the projected impacts of Bay margin management actions to Bay recovery?



Depth profiles of total mercury in Bay cores.

FORECASTING (MODELING)

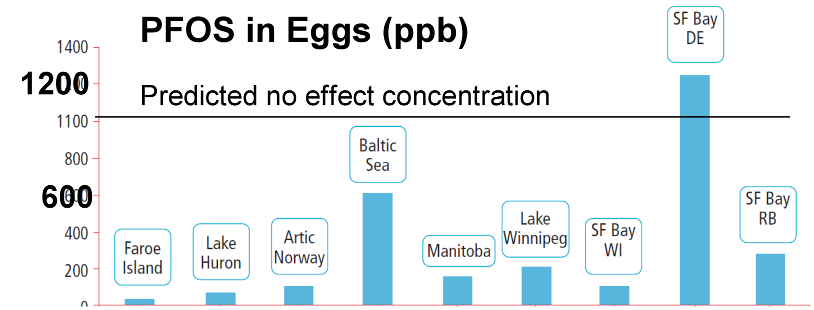
The ultimate goal of the Forecasting Strategy is to predict recovery of contaminated Bay regions and sites under different management scenarios. Efforts in the next two years will focus on the modeling the open Bay (with an emphasis on nutrients) and developing a strategy for modeling the margins.

Forecasting studies in the RMP from 2009 to 2017. Numbers indicate budget allocations in $1000s.

Element	Funding Agency	Forecasting Questions Addressed	2009	2010	2011	2012	2013	2014	2015	2016	2017
Margins Conceptual Model	RMP	1,2,3	40								
Bioaccumulation Conceptual Model	RMP	1,2,3		40							
Bay Modeling*	RMP	1,2,3				100	100	100	TBD	TBD	TBD
	BACWA	1,2,3				TBD	TBD	TBD	TBD	TBD	TBD
Margin Module 1	RMP	1,2,3						TBD	TBD	TBD	TBD
Margin Module 2	RMP	1,2,3						TBD	TBD	TBD	TBD
Margin Module 3	RMP	1,2,3						TBD	TBD	TBD	TBD
RMP Total			**40**	**40**	**0**	**100**	**100**	**100**	**TBD**	**TBD**	**TBD**
Non-RMP Total					**0**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
Overall Total			**40**	**40**	**0**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

* joint with Nutrient Strategy TBD – To be determined through synthesis efforts and workgroup discussion.

EMERGING CONTAMINANTS



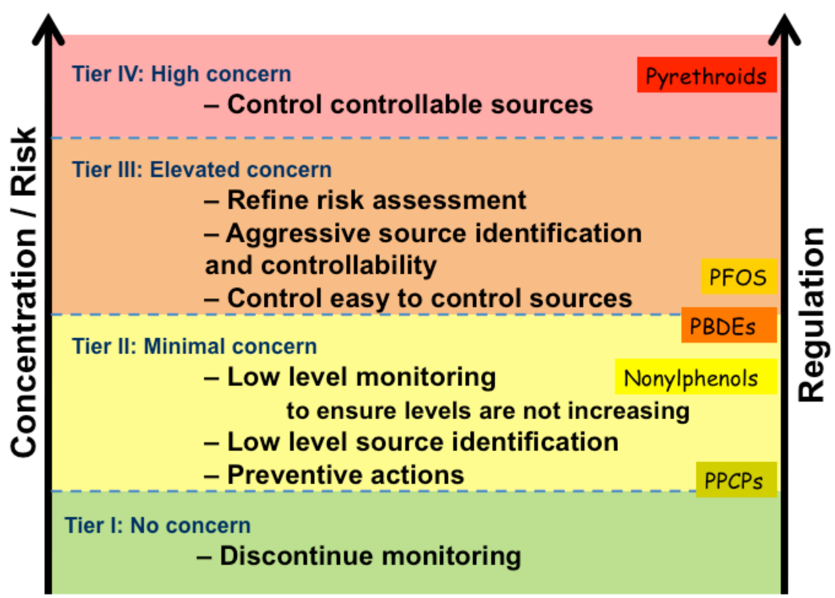
PFOS in bird eggs, 2006.

Relevant Management Policies and Decisions

- Water Board plan or policy in 2012-2013
- State Water Board Policy in 2012-2013
- State Board Toxicity Policy
- Narrative water quality objectives prohibiting toxicity and water quality degradation

Recent Noteworthy Findings

- Perfluorinated chemicals in bird eggs are high relative to other locations that have been studied and in South Bay exceed a published health risk threshold.
- Triclosan was detected in sediment at seven out of ten sites with concentrations ranging from 5-10 ppb in the Central and South Bay, and a maximum of 40 ppb. Sediment toxicity thresholds are not available, but these concentrations may be of some concern.
- A screening study of alternative flame retardants generally found low concentrations. Some phosphate-based chemicals are present in sediment at levels comparable to PCBs and PBDEs; work is underway to determine if they accumulate in biota.
- A screening study of pharmaceuticals and personal care products generally found concentrations well below available acute and chronic toxicity thresholds.
- Chlorinated paraffin concentrations in the Bay also are low relative to other ecosystems.
- A small screening study (6 samples from 4 locations) in 2009 found nonylphenol concentrations in small fish ranging from 50 to 420 ppb, similar to other estuaries in California.



Priority Questions for the Next Five Years

1. What emerging contaminants have the greatest potential to adversely impact beneficial uses in the Bay?

EMERGING CONTAMINANTS

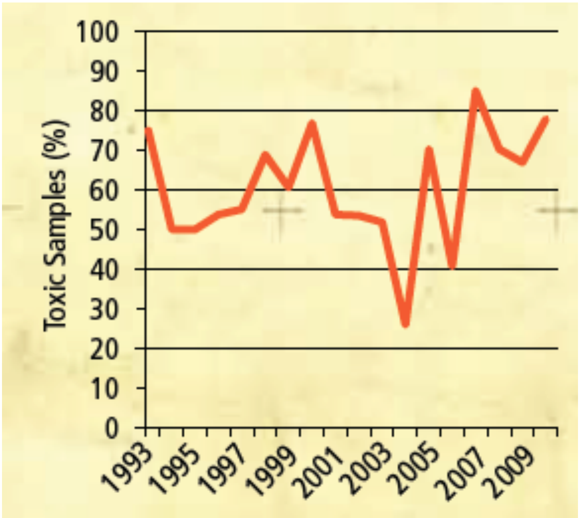
Emerging contaminant studies in the RMP have been augmented substantially by pro bono work and matching funds. A synthesis in 2011 and 2012 will set the stage for a multi-year plan for 2013 and beyond.

Emerging contaminant studies and monitoring in the RMP from 2008 to 2017. Numbers indicate budget allocations in $1000s. Matching funds and source indicated in parentheses. CDFO-Canada Department of Fisheries and Oceans; MMC-Marine Mammal Center; NIST-National Institute of Standards and Technology.

Element	Questions Addressed	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Perfluorinated Compounds	1	35	52			87	TBD	TBD	TBD	TBD	TBD
Alternative Flame Retardants (Duke Univ)	1	48					TBD	TBD	TBD	TBD	TBD
Chlorinated Paraffins in Biota (CDFO)	1	0 (5)									
Triclosan in Sediment (USEPA)	1	0 (5)					TBD	TBD	TBD	TBD	TBD
White Paper on ECs in Wastewater	1		30				TBD	TBD	TBD	TBD	TBD
Nonylphenol in Small Fish (Cal Poly)	1		0 (2)				TBD	TBD	TBD	TBD	TBD
Broadscan Screening of Biota for EC (NIST, SCCWRP, MMC, SDSU)	1			55 (75)	70 (75)		TBD	TBD	TBD	TBD	TBD
AXYS Mussel Study (AXYS)	1			27 (33)			TBD	TBD	TBD	TBD	TBD
AXYS Brominated Dioxins in Sediments and Biota (AXYS)	1			0(18)			TBD	TBD	TBD	TBD	TBD
NOAA Mussel Pilot Study (NOAA, SCCWRP, SWRCB)	1			33 (50)			TBD	TBD	TBD	TBD	TBD
EC Synthesis, Strategy Development	1				30	30	TBD	TBD	TBD	TBD	TBD
EC General Allocation	1						100	TBD	TBD	TBD	TBD
Nanoparticles (Duke Univ.)	1			0 (5)		TBD	TBD	TBD	TBD	TBD	TBD
RMP Total		**83**	**82**	**115**	**100**	**117**	**100**	**TBD**	**TBD**	**TBD**	**TBD**
Non-RMP Total		**10**	**2**	**176**	**75**	**0**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
Overall Total		**93**	**84**	**291**	**175**	**117**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

Gray cells – further work on this topic not anticipated

EXPOSURE AND EFFECTS



Percentage of RMP Sediment Samples Causing Toxicity in Lab Tests.

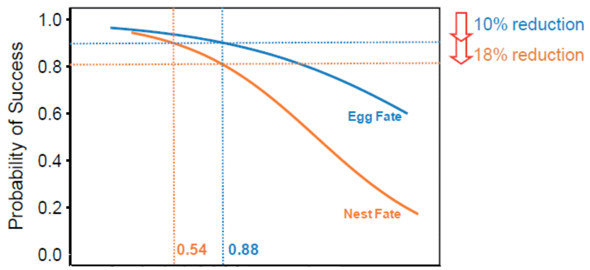
Relevant Management Policies and Decisions
- Implementation of sediment quality objectives
- The next iteration of the mercury TMDL in 2016-2018
- Permitting decisions regarding dredging projects
- Continued implementation of narrative water quality objective prohibiting toxicity

Recent Noteworthy Findings
- In every year since RMP sampling began in 1993, 26% or more of sediment samples have been determined to be toxic to one or more test species. The causes of this toxicity remain unidentified.
- Studies have indicated that mercury is impairing hatchability of Forster's tern eggs in San Francisco Bay, but that the reduction of nest success at the TMDL bird egg monitoring target of 0.5 ppm is less than 10%.
- A study examining possible endocrine responses in shiner surfperch and staghorn sculpin found hormonal imbalances that appeared to be related to PCB exposure.

Priority Questions for the Next Five Years
Effects on Benthos
1. What are the spatial and temporal patterns of impacts of sediment contamination?
2. Which pollutants are responsible for observed impacts?
3. Are the toxicity tests, benthic community assessment approaches, and the overall SQO assessment framework reliable indicators of impacts?

Effects on Fish
4. Are pollutants, individually or in combination, reducing the reproductive ability, growth, and health of sensitive fish populations?
5. What are appropriate thresholds of concern for contaminant concentrations for Bay species?
6. What are cost-effective indicators for monitoring effects of contaminants?

Effects on Birds
7. Is there clear evidence of pollutant effects on survival, reproduction, or growth of individual birds?
8. Are pollutants in the Bay adversely affecting bird populations?
9. What are appropriate guidelines for protecting bird populations that are at risk?
10. Do spatial patterns in accumulation indicate particular regions of concern?



The reduction of Forster's tern nest success afforded by the TMDL bird egg monitoring target of 0.5 ppm is less than 10%.

EXPOSURE AND EFFECTS

Exposure and effects effort on benthos and fish in 2011 and 2012 focus on completion of studies from prior years and development of long-term plans. For birds, significant progress has been made in answering the priority questions, and further effects work is not needed at this time.

Exposure and effects studies and monitoring in the RMP from 2008 to 2014. Numbers indicate budget allocations in $1000s.

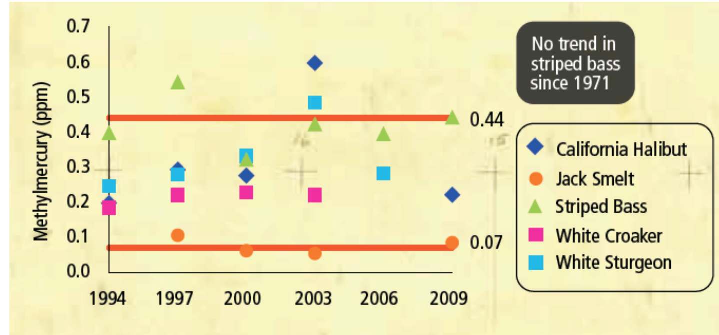
	Element	Questions Addressed	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Benthos	Benthic Assessment Tools	3	20	25	30		50	TBD	TBD	TBD	TBD	TBD
	Causes of Sediment Toxicity: TIEs and LC50 Work	2	10	80				TBD	TBD	TBD	TBD	TBD
	Causes of Sediment Toxicity: Molecular TIEs	2			60			TBD	TBD	TBD	TBD	TBD
	Causes of Sediment Toxicity: Moderate Toxicity Strategy	2,3					50	50				
	USEPA Water Quality Synthesis (National Coastal Condition Assessment) (USEPA)	1,3				(100)	(50)	TBD	TBD	TBD	TBD	TBD
	Hotspot Followup Study	1,2,3				60	30	TBD	TBD	TBD	TBD	TBD
	Reference Site, Benthos Recovery After Dredging	1						50				
Fish	Endocrine Disruption in Fish	4,6	35				TBD	TBD	TBD	TBD	TBD	TBD
	Effects of PAHs on Flatfish (NOAA)	4,5,6	40	50			TBD	TBD	TBD	TBD	TBD	TBD
	Effects of Copper on Salmon (NOAA)	4,5				37	TBD	TBD	TBD	TBD	TBD	TBD
Birds	Mercury and Selenium Effects on Terns (USGS)	7,8,9,10	75	54								
	PBDEs: Sensitivity in Terns	8			48							
RMP Total			**179**	**209**	**138**	**97**	**130**	**100**	**TBD**	**TBD**	**TBD**	**TBD**
Non-RMP Total			**0**	**0**	**0**	**100**	**50**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
Overall Total			**179**	**209**	**138**	**197**	**180**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**

Gray cells – further work on this topic not anticipated

MERCURY

Relevant Management Policies and Decisions

- Review new information and prepare plan to update the current TMDL and implementation plan in 2013-2014
- The next iteration of the TMDL in 2016-2018
- Identifying best options for management actions to reduce mercury impairment



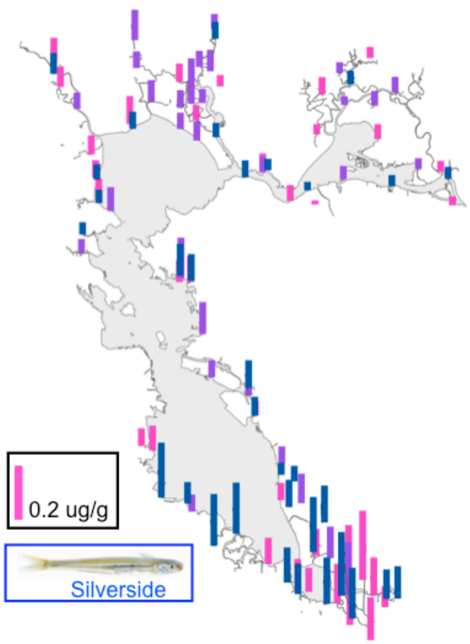
Mercury concentrations (ppm) in sport fish. 0.44 ppm is OEHHA no consumption advisory tissue level (ATL); 0.07 is 2 serving per week ATL. Baywide averages.

Recent Advances in Understanding

- The median mercury concentration in striped bass in 2009 was 0.44 ppm, higher than the TMDL target of 0.20 ppm. Concentrations have shown no decline since 1970.
- Monitoring of mercury in small fish indicates that a high proportion (85% in 2008-2010) of samples was above the 0.03 ppm TMDL target for wildlife prey.
- The small fish monitoring also indicates that concentrations are relatively high in the Lower South Bay region.
- Based on mercury concentrations in blood, nearly 60% of all breeding Forster's terns sampled in the Bay are at high risk of toxic effects.
- Sediment cores suggest extensive transport and mixing of past loads and diminished concern for erosion of contaminated subsurface material.
- A mass budget for methylmercury indicates that in-Bay production of methylmercury is about 100 times greater than external loading.
- Source control (principally erosion of mining waste, stormwater, and wastewater) is being pursued but will take many decades to be effective
- Control of internal net methylmercury production may achieve more rapid reductions
- Opportunities for reducing risk by controlling internal production vary by habitat (open Bay, managed pond, tidal marsh)

Priority Questions for the Next Five Years

1. Where is mercury entering the food web? – *we may have answered this sufficiently – topic for Strategy Team discussion*
2. Which processes, sources, and pathways contribute disproportionately to food web accumulation?
3. What are the best opportunities for management intervention for the most important pollutant sources, pathways, and processes?
4. What are the effects of management actions?
5. Will total mercury reductions result in reduced food web accumulation?



Mercury concentrations (ppm) in silverside from 2008-2010.

The Mercury Strategy began with a multi-year suite of studies in 2008. These studies are now being completed. A synthesis in 2011 will set the stage for a new multi-year plan for 2012 and beyond.

MERCURY

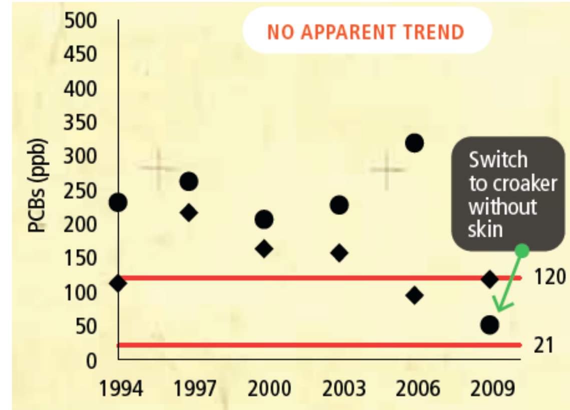
Mercury and methylmercury studies and monitoring in the RMP from 2008 to 2017. Numbers indicate budget allocations in $1000s.

General Area	Element	Mercury Questions Addressed	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mercury Strategy	Methylmercury Synthesis	1,2,3,4,5				75						
	Food Web Uptake (Small Fish) (Status and Trends)	1,4	150	150	150	20	TBD	TBD	TBD	TBD	TBD	TBD
	High Leverage Pathways (DGTs)	2	58	58			TBD	TBD	TBD	TBD	TBD	TBD
	High Leverage Pathways (Isotopes)	2,5	40	40			TBD	TBD	TBD	TBD	TBD	TBD
	Methylmercury Fate Model	3,4		25								
RMP Total			248	273	150	95	TBD	TBD	TBD	TBD	TBD	TBD
Non-RMP Total			0	0	0	0	TBD	TBD	TBD	TBD	TBD	TBD
Overall Total			248	273	150	95	TBD	TBD	TBD	TBD	TBD	TBD

PCBs

Relevant Management Policies and Decisions

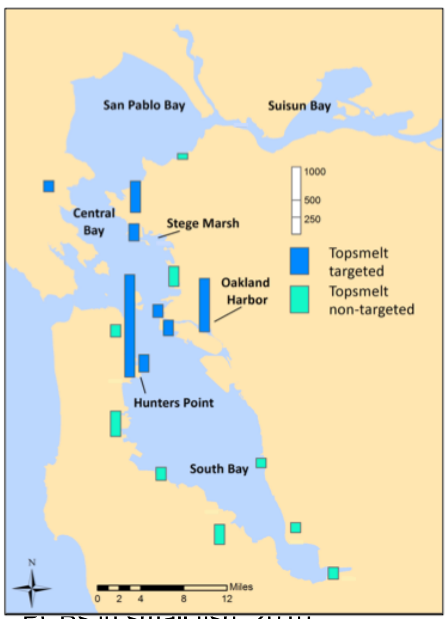
- Review new information and prepare plan to update the current TMDL in 2014-2015
- The next iteration of the PCBs TMDL in 2019-2020
- What management actions are the best options for reducing PCB impairment?



PCB concentrations in sport fish. 120 ppb is OEHHA no consumption advisory tissue level (ATL); 21 is 2 serving per week ATL. Baywide averages. Circles-white croaker, diamonds-shiner surfperch.

Recent Noteworthy Findings

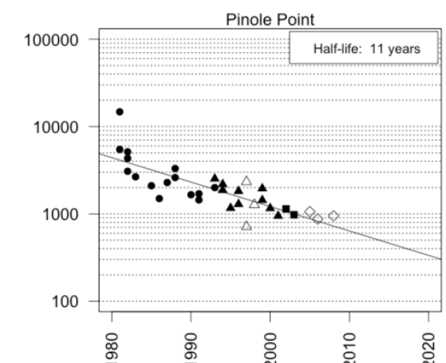
- Sport fish were lower on a wet weight basis in the most recent sampling (2009), though on a lipid weight basis concentrations were comparable to past sampling rounds.
- Risks to fish-eating birds persist. In 2000-2003, 17% of 149 tern eggs were above an effects threshold.
- Small fish accumulate high concentrations of PCBs that correlate with concentrations in sediment.
- Bivalve monitoring continues to indicate declines, with half-lives ranging among stations from 7 to 14 years, and longer half-lives in the South Bay.
- Bay sediment appears to be cleaner than in the 1990s. The Bay-wide average was 7.0 ppb in 2004-2009 compared to 31 ppb in the 1990s. A different sampling design and different methods probably contribute to this apparent decrease.
- Average concentrations in Suisun Bay sediments are lower than in the other Bay segments.
- Bay cores show some areas with higher concentrations at depth, but this is less of a concern than previously thought.
- A new PCB has been identified in effluents and the environment across the U.S. PCB 11 and several other PCBs are inadvertent byproducts in the manufacturing of commonly used pigments. These pigment PCBs are distinct from the Aroclor-derived PCBs that are the subject of the PCBs TMDL.



PCBs in small fish, 2010.

Priority Questions for the Next Five Years

1. What potential for impacts on humans and aquatic life exists due to PCBs?
2. What are appropriate guidelines for protection of beneficial uses?
3. What is the total maximum daily load of PCBs that can be discharged without impairment of beneficial uses?
4. What are the rates of recovery of the Bay, its segments, and in-Bay contaminated sites from PCB contamination?
5. What are the present loads and long-term trends in loading from each of the major pathways?
6. What role do in-Bay contaminated sites play in segment-scale recovery rates?
7. Which small tributaries and contaminated margin sites are the highest priorities for cleanup?
8. What management actions have the greatest potential for accelerating recovery or reducing exposure?
9. What is the most appropriate index for sums of PCBs?



PCB trend in mussels at Pinole Point.

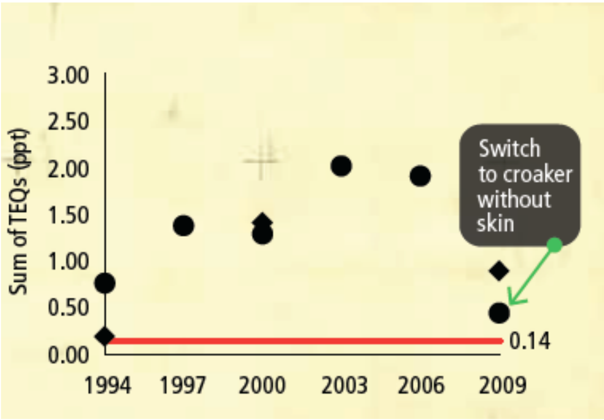
PCBs

Studies under the PCB Strategy began in 2010. A synthesis in 2011 will set the stage for a multi-year study plan for 2012 and beyond.

PCB studies and monitoring in the RMP from 2010 to 2017. Numbers indicate budget allocations in $1000s.

General Area	Element	PCB Questions Addressed	2010	2011	2012	2013	2014	2015	2016	2017
PCB Strategy	Food Web Uptake (Small Fish)	1,7	50		TBD	TBD	TBD	TBD	TBD	TBD
	PCB Conceptual Model Update	1,2,3,4,5,6,7,8,9		53	TBD	TBD	TBD	TBD	TBD	TBD

DIOXINS



Dioxin and furan TEQ concentrations (ppt) in white croaker (circles) and shiner surfperch (diamonds). Baywide averages.

Relevant Management Policies and Decisions

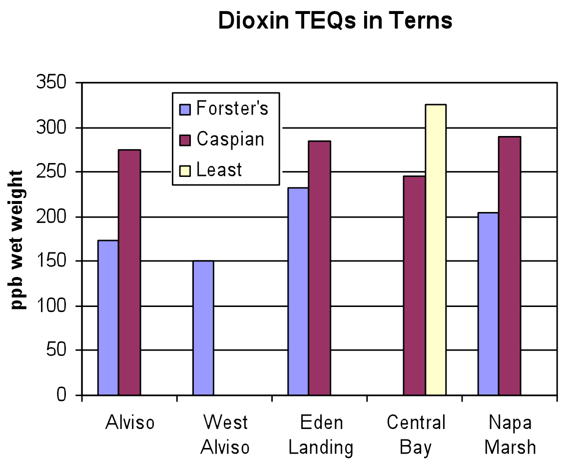
- Reissue permit requirements in 2013-2014
- Review 303(d) listings
- Establish TMDL development plan in 2013-2014

Recent Noteworthy Findings

- The key sport fish indicator species (shiner surfperch and white croaker) have been higher than the Water Board screening value of 0.14 ppt and show no sign of decline, but there is a great deal of uncertainty regarding the human health risk associated with dioxins in sport fish.
- Dioxin-toxic equivalents in Least Tern, Caspian Tern, and Forster's Tern eggs are at or above estimated thresholds for adverse effects; risks especially significant in combination with dioxin-like PCBs.
- Few data on dioxins are available on other priority questions – the Dioxin Strategy was developed to address this need.
- Recent wetland cores suggest rapidly declining inputs from local watersheds during recent decades, though additional coring data are needed to support this hypothesis

Priority Questions for the Next Five Years

1. Are the beneficial uses of San Francisco Bay impaired by dioxins?
2. What is the spatial pattern of dioxin impairment?
3. What is the dioxin reservoir in Bay sediments and water?
4. Have dioxin loadings/concentrations changed over time?
5. What is the relative contribution of each loading pathway as a source of dioxin impairment in the Bay?
6. What future impairment is predicted for dioxins in the Bay?



Mean concentrations of dioxin and furan TEQs in three tern species, 2000-2003. Mean concentrations for the California Least Tern fall within the effects threshold range. Concentrations within the effects threshold range were observed in some eggs of all species. From Adelsbach and Maurer (2007).

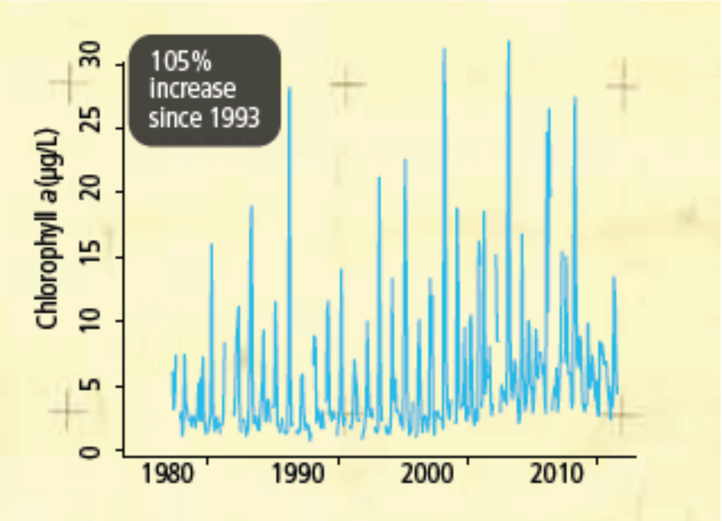
DIOXINS

Dioxin Strategy studies began in 2008, with a multi-year plan extending through 2012. Synthesis activities are planned for 2013 and 2014 after the data from the earlier studies are available.

Dioxin studies and monitoring in the RMP from 2008 to 2017. Numbers indicate budget allocations in $1000s. Unlike the other contaminants, dioxin costs have generally been itemized explicitly as add-ons to RMP studies.

General Area	Element	Dioxin Questions Addressed	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Dioxin Strategy	Quality Assurance	1,2,3,4,5,6		14						TBD	TBD	TBD
Status and Trends	Sport Fish	1,2,4		22					24	TBD	TBD	TBD
	Avian Eggs	1,2,4					13			TBD	TBD	TBD
	Surface Sediments	2,3		58	58			TBD	TBD	TBD	TBD	TBD
	Water	2,3		26		26		TBD	TBD	TBD	TBD	TBD
Loads	Small Tributary Loading	4,5,6			65		52	TBD	TBD	TBD	TBD	TBD
	River Loading (THg)	4,5,6			34			TBD	TBD	TBD	TBD	TBD
Forecast	Sediment Cores	3,4,6			57		32	TBD	TBD	TBD	TBD	TBD
	Synthesis: One-Box Model	3,4,5,6							20	TBD	TBD	TBD
	Synthesis: Food Web Model	5,6							20	TBD	TBD	TBD
Loads	Atmospheric Deposition	5,6			20			TBD	TBD	TBD	TBD	TBD
RMP Total			0	120	234	26	97	TBD	TBD	TBD	TBD	TBD
Non-RMP Total			0	0	0	0	0	TBD	TBD	TBD	TBD	TBD
Overall Total			0	120	234	26	97	TBD	TBD	TBD	TBD	TBD

STATUS AND TRENDS



Chorophyll trend in the South Bay.

Relevant Management Decisions

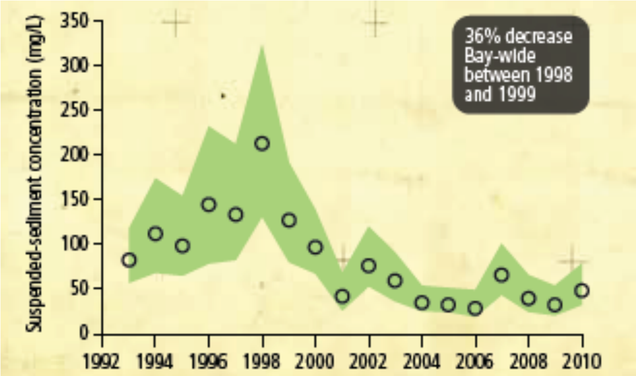
- Revision of Mercury and PCB TMDLs in 2016-2020
- Development of Se TMDL in 2013-2014 (North Bay) and 2015 beyond (South Bay)
- De-listing of legacy pesticides (2012-2013)
- Evaluation of sediment and water quality objectives
    - Copper site-specific objective and cyanide anti-degradation policy
    - 303 (d) listings
    - Reasonable potential analysis
- Dredged material management
    - Defining ambient conditions in Bay (PCBs, Hg, PAHs, etc.)
- Identification of causes of sediment toxicity in the Bay
- Development of and assessment with nutrient numeric endpoints; management of ammonium
- Providing fundamental science to evaluate the health of the Bay and to model the fate and transport of contaminants.

Recent Advances in Understanding

- Annual sampling of water and sediment chemistry has documented a general lack of trend in persistent pollutants and spatial patterns that vary by pollutant but are consistent from year to year.
- A sudden decrease in suspended sediment concentrations occurred in 1999.
- Increasing chlorophyll concentrations have been observed in the Bay and are attributed to a variety of possible drivers (e.g., decrease in SSC concentrations and an increase in bivalve predators).
- PBDEs appear to be leveling off (BDE 47) or declining (BDE 209)
- Concentrations of mercury in sediment correlate poorly with methylmercury in sediment (MeHg represents 1% of total Hg).

Priority Questions for the Next Five Years

1. Are chemicals at levels of concern?
2. What are the concentrations and masses of priority contaminants?
3. Have concentrations and masses increased or decreased?



Suspended sediment trend at a representative station.

STATUS AND TRENDS

Status and trends monitoring budget allocations in the RMP from 2012 to 2017. Allocations are spread evenly over the years, even though the expenditures (see next page) occur intermittently.

	2012	2013	2014	2015	2016	2017
% increase subcontractors	0.0%	2.5%	2.5%	2.5%	2.5%	2.5%
STATUS AND TRENDS TOTAL	**$1,266,500**	**$1,067,900**	**$1,069,273**	**$1,115,598**	**$1,100,342**	**$1,114,506**
Water Chemistry (biennial 22 sites)		$81,667	$83,708	$85,801	$61,250	$62,781
Aquatic Toxicity (every five years)		$2,333	$2,392	$2,451	$1,000	$1,025
Bivalves (biennial 11 sites)	$45,000	$30,000	$30,750	$31,519	$32,307	$33,114
Sediment Chemistry (biennial 47 sites dry/27 wet)	$110,000	$92,500	$92,500	$73,750	$74,000	$75,850
Sediment Toxicity (biennial 27 sites dry/27 wet)	$51,000	$25,750	$25,750	$26,394	$27,054	$27,730
Sediment Benthos (biennial 27 sites dry/27 wet)	$62,000	$30,900	$31,673	$32,464	$33,276	$34,108
Fieldwork and Logistics	$214,000	$221,000	$217,500	$222,938	$228,511	$234,224
Suspended Sediment in SF Bay	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Hydrography and Phytoplankton	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Fish Contamination Study (triennial)	$87,000	$0	$0	$54,000	$55,350	$56,734
Cormorant Eggs (triennial)	$35,000	$25,000	$25,625	$26,266	$26,922	$27,595
Forster's Tern Eggs (triennial)	$35,000	$25,000	$25,625	$26,266	$26,922	$27,595
Archiving	$17,500	$8,750	$8,750	$8,750	$8,750	$8,750
Data Management	$250,000	$165,000	$165,000	$165,000	$165,000	$165,000

Status and Trends sampling was scaled back significantly in 2012, with a change from annual to biennial sampling of water and sediment. The amount of information gained from annual sampling was diminishing, while needs for special studies to generate information on other topics were increasing. The reduction of Status and Trends effort freed up approximately $400,000 per year for studies on other topics.

STATUS AND TRENDS

Anticipated status and trends monitoring expenditures in the RMP from 2013 to 2019, indicating the years in which sampling will actually occur. Projections are in 2012 dollars.

	2012	2013	2014	2015	2016	2017	2018	2019
Water Chemistry (biennial 22 sites)	$0	$55,000	$0	$190,000	$0	$55,000	$0	$190,000
Aquatic Toxicity (every five years)	$0	$0	$0	$7,000	$0	$0	$0	$0
Bivalves (biennial 11 sites)	$60,000	$0	$60,000	$0	$60,000	$0	$60,000	$0
Sediment Chemistry (biennial 47 sites dry/27 wet)	$110,000	$0	$185,000	$0	$110,000	$0	$185,000	$0
Sediment Toxicity (biennial 27 sites dry/27 wet)	$51,500	$0	$51,500	$0	$51,500	$0	$51,500	$0
Sediment Benthos (biennial 27 sites dry/27 wet)	$61,800	$0	$61,800	$0	$61,800	$0	$61,800	$0
Fieldwork and Logistics	$214,000	$221,000	$214,000	$221,000	$214,000	$221,000	$214,000	$221,000
Fish Contamination Study (triennial)	$0	$0	$270,000	$0	$0	$0	$0	$270,000
Cormorant Eggs (triennial)	$75,000	$0	$0	$75,000	$0	$0	$75,000	$0
Forster's Tern Eggs (triennial)	$75,000	$0	$0	$75,000	$0	$0	$75,000	$0

PROGRAM MANAGEMENT

- Includes four general categories of activies
  - Program Management ($255,000)
    - Internal coordination (staff management), coordination with Program participants, external coordination with related groups, Program planning
  - Contract and Financial Management ($160,000)
  - Workgroup and Peer Review Coordination ($110,000)

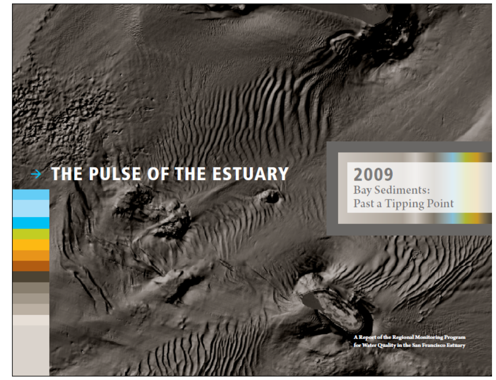
Program Review
Periodically, the RMP conducts an overall peer review of the Program as a whole. Two Program Reviews have been conducted to date, in 1997 and in 2003. The timing and scope of Program Reviews are determined by the Steering Committee.

- The RMP has evolved considerably since the 2003 Review, with greatly enhanced planning processes that have made the Program much more forward-looking and thoroughly peer-reviewed.
  - Workgroups have been permanently established to address the major topical areas of the Program.
  - Strategy Teams consisting of stakeholders and local scientists have been formed to identify the highest priority management questions on important topics and to formulate long-term workplans to answer them.
  - The Steering Committee has also taken a more forward-thinking approach, capturing all of the workgroup and strategy team plans in a RMP Master Plan, and in holding an annual planning workshop (beginning in 2010) to provide direction to all of the subcommittees.
  - With carefully considered guidance from stakeholders and peer reviewers, the RMP has prioritized and addressed the topics recommended in the 2003 review, and is continually sharpening its focus on using the resources that are available in an efficient manner to provide the information that is most needed to support TMDLs and other management initiatives.
- The Steering Committee does not consider a Program Review appropriate in 2013 because ongoing review of critical elements is well established. A Review will be conducted after the Master Planning process has become established and when a clear need for an overarching review becomes apparent.

Peer Review
Extensive peer review is a key to the cost-effective production of reliable information in the RMP. This peer review is accomplished through the following mechanisms.

- Workgroups. The RMP Workgroups include leading scientists that work with stakeholders to develop workplans. Peer review occurs at all stages of a project: planning, implementation, and reporting.
- Technical Review Committee. Provides general technical oversight of the Program.
- Peer-reviewed Publications. Another layer of peer review occurs when journal publications are prepared. This occurs for most significant RMP studies.

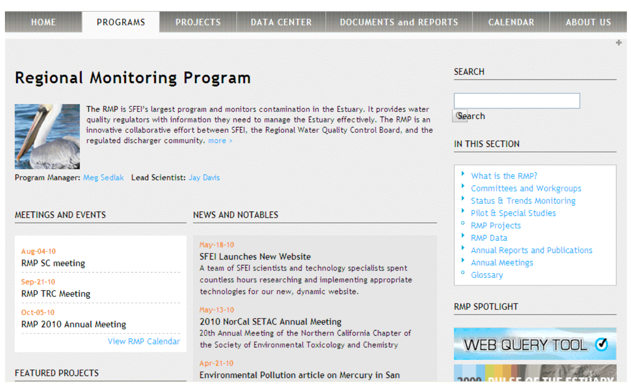
COMMUNICATIONS



- $275,000 per year (8% of the total budget).
- Includes the Pulse of the Estuary, Annual Meeting, Multi-Year Plan, State of the Estuary report card, RMP web site, Annual Monitoring Results, technical reports, journal publications, newsletter, oral presentations and posters, media outreach.
- These platforms are used to make information from the RMP available to the following target audiences.
  - Primary Audience
    - RMP Participants. Need information to encourage support for the RMP and water quality programs in the Bay. The Pulse, Annual Meeting, Multi-Year Plan, State of the Estuary report card, RMP web site, newsletter, fact sheets, oral presentations, media outreach.
  - Secondary Audiences
    - Other regional managers. Need information to inform their decisions and evaluate effectiveness of their actions. A target audience for all communication products.
    - Regional law and policy makers. Need information to encourage support for water quality programs in the Bay. The Pulse, State of the Estuary report card, media outreach.
    - Regional Scientists. Need to share information to increase understanding of water quality and maintain technical quality of the science. A target audience for all communication products.
    - Media, public outreach specialists, educators. Need information to encourage support for the RMP and water quality programs in the Bay, and to protect their health. The Pulse, Master Plan, State of the Estuary report card, RMP web site, newsletter, fact sheets, media outreach.
    - Managers and scientists from other regions.

Highlights for the Next Five Years

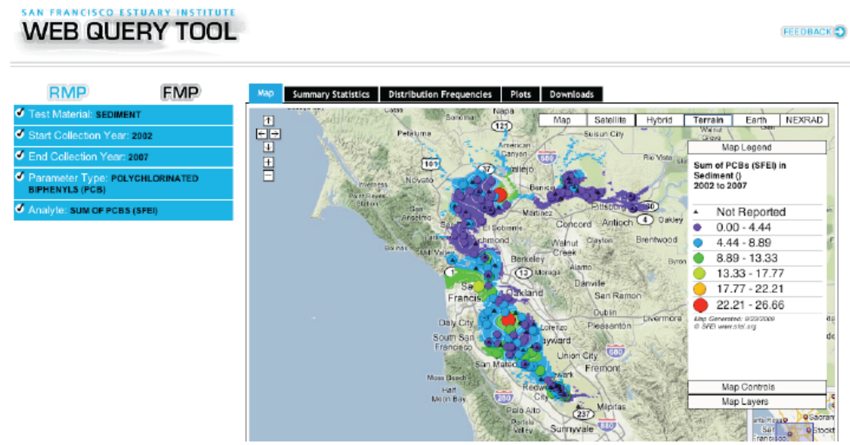
- Stakeholder information needs survey
- Pulse Lite in 2012
- Next Pulse: CECs in 2013
- Closer partnership with SFEP to reach broader audience
- Annual Meeting joint with State of the Estuary in 2013
- Workshops: Modeling, Mercury, Moderate Toxicity
- Continued web site improvement



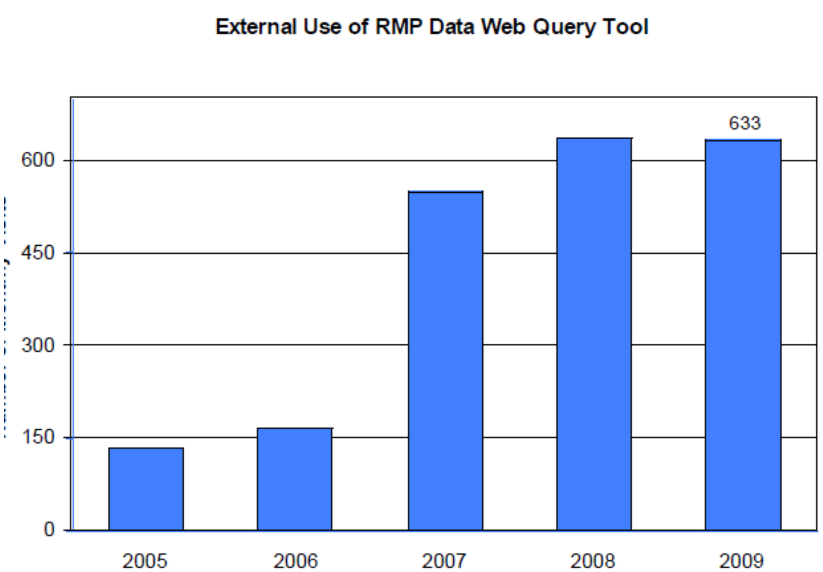
Home page for the RMP web site.

DATA MANAGEMENT AND QUALITY ASSURANCE

- **Data Management** ($125,000 per year)
  - The RMP database contains approximately 900,000 records generated since the Program began in 1993.
  - Includes formatting, uploading, and reporting each year's data; managing, maintaining, and improving the RMP database to enable easy access to RMP data through the RMP website; coordination with statewide data management initiatives (i.e., SWAMP and CEDEN); support for quality assurance evaluation, data analysis, and RMP report production.
  - Web-based data access tools include user-defined queries, data download and printing functionality, maps of sampling locations, and visualization tools. Through the user-defined query tool, results can be downloaded into Excel in both a cross-tabulated and flat-file format. Dynamic mapping of concentrations allows users to view spatial distributions across the Estuary, and statistical functions, such as cumulative distribution function plots, provide aggregated summaries.
  - These platforms are used to make information from the RMP available to water quality managers, stakeholders, scientists, and the public.



A data display by the RMP Web Query Tool.



633 users per month used the Web Query Tool in 2009.

- **Quality Assurance** ($30,000 per year)
  - Includes QA review of the data that are submitted by the laboratories. Development and application of the QAPP. Review in comparison to data quality objectives and prior results. Review of congener ratios.
  - Troubleshooting problems with chemical analyses.
  - Occasional special studies to assess sampling methods, analytical methods, or lab performance.

New Initiatives for the Next Five Years

- Efficiencies in Data Uploading and Formatting
- Enhancement of Visualization Tools
- Coordination with the Estuary Portal
- Coordination with SFEI Data Access Initiative: “Project Mario”

RMP AND NON-RMP STUDIES RELATED TO WATER QUALITY IMPACTS OF DREDGING AND DREDGED MATERIAL DISPOSAL

Notable Activities

- In 2011 the RMP created a web page to provide the latest information on thresholds for bioaccumulation testing and in-Bay disposal (http://www.sfei.org/content/dmmo-ambient-sediment-conditions). These thresholds are based on RMP Status & Trends data.

Dredging related studies. Dollar amounts in thousands.

	Study	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
RMP Status & Trends	S&T Sediment Triad	260	250	250	250		250		250	
RMP Status & Trends	USGS Suspended Sediment Studies	250	250	250	250	250	250	250	250	250
RMP Exposure and Effects	Benthic Assessment Tools		30		50					
RMP Exposure and Effects	Causes of Sediment Toxicity: TIES	76								
RMP Exposure and Effects	Causes of Sediment Toxicity: Molecular TIES		60							
RMP Exposure and Effects	Causes of Sediment Toxicity: Moderate Toxicity Strategy				50	50				
RMP Exposure and Effects	New Reference Site(1), Recovery of Benthos After Dredging					50				
RMP Exposure and Effects	Effects of PAHs on Flatfish	50								
LTMS	Eeelgrass Buffer Zone Study(2) - proposed									

1 identifying a reference site for toxicity testing rather than referring to disposal sites
2 evaluating the appropriateness of the 250 foot buffer zone in effect to protect eelgrass from dredging

RMP STUDIES SATISFYING SPECIFIC PERMIT CONDITIONS

Industrial Wastewater Treatment Plants

Policy	Provision	Study
Mercury Watershed Permit	Better understand mercury fate, transport, the conditions under which methylation occurs, and biological uptake	Mercury Strategy Studies: Food Web Uptake (small fish), DGTs, Isotopes
Copper Action Plan	Investigate possible copper sediment toxicity	S&T Sediment Toxicity
Copper Action Plan	Investigate sublethal effects on salmonids	Effects of Copper on Salmon (NOAA)

RMP STUDIES SATISFYING SPECIFIC PERMIT CONDITIONS

Municipal Wastewater Treatment Plants

Policy	Provision	Study
Mercury Watershed Permit	Better understand mercury fate, transport, the conditions under which methylation occurs, and biological uptake	Mercury Strategy Studies: Food Web Uptake (small fish), DGTs, Isotopes
Copper Action Plan	Investigate possible copper sediment toxicity	S&T Sediment Toxicity
Copper Action Plan	Investigate sublethal effects on salmonids	Effects of Copper on Salmon (NOAA)

RMP STUDIES SATISFYING SPECIFIC PERMIT CONDITIONS

Urban Stormwater

Policy	Provision	Study
Municipal Regional Stormwater Permit (MRP)	C.8.e Pollutants of Concern and Long-Term Trends Monitoring	Small Tributary Loading Strategy (STLS) Studies
MRP	C.11.b. Monitor Methylmercury	STLS
MRP	C.11.g. Monitor Stormwater Mercury Pollutant Loads and Loads Reduced	STLS
MRP	C.11.h. Fate and Transport Study of Mercury in Urban Runoff	Mercury Strategy Studies (Small Fish, DGTs, Isotopes); Modeling Strategy Studies
MRP	C.12.g. Monitor Stormwater PCB Pollutant Loads and Loads Reduced	STLS
MRP	C.12.h. Fate and Transport Study of PCBs in Urban Runoff	PCBs in small fish, Modeling Strategy Studies
MRP	C.13.e. Studies to Reduce Copper Pollutant Impact Uncertainties	S&T Sediment Toxicity, Effects of Copper on Salmon (NOAA)
MRP	C.14.a. Control Program for PBDEs, Legacy Pesticides, and Selenium.	STLS

APPENDIX 1

	A	B	T	U	V	W	X	Y
1	**REVENUE**							
2			**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
3	REVENUE	% budget increase:	0.0%	1.5%	2.0%	2.0%	2.0%	2.0%
4		Total Participant Fees (budgeted)	$3,236,734	$3,285,285	$3,350,991	$3,418,011	$3,486,371	$3,556,098
5		Additional Revenue	$0	$0	$0	$0	$0	$0
6		Interest Income (estimated)	$12,000	$12,000	$25,000	$25,000	$25,000	$25,000
7								
8		Contingency Fund carryover	$50,000	$25,000	$25,000	$25,000	$25,000	$25,000
9								
10								
11		**TOTAL AVAILABLE**	**$3,298,734**	**$3,322,285**	**$3,400,991**	**$3,468,011**	**$3,536,371**	**$3,606,098**
12								
13								
14	**EXPENSES**							
15			**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
16		% increase labor	4.0%	2.5%	2.5%	2.5%	2.5%	2.5%
17	PROG MGT	**Program Management**	**$1,136,800**	**$1,160,845**	**$1,189,612**	**$1,219,094**	**$1,249,307**	**$1,280,271**
18		Labor Total	$1,005,000	$1,025,750	$1,051,140	$1,077,160	$1,103,825	$1,131,151
19		Program Management, Contracts, Meetings	$525,000	$538,125	$551,578	$565,368	$579,502	$593,989
20		Data Management and QA	$155,000	$155,000	$158,875	$162,847	$166,918	$171,091
21		Communications	$275,000	$281,875	$288,922	$296,145	$303,549	$311,137
22		Contingency	$50,000	$50,750	$51,765	$52,800	$53,856	$54,933
23		Program Review						
24		Direct Costs (Program only)	$131,800	$135,095	$138,472	$141,934	$145,483	$149,120
25								
26								
27			**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
28		**Total Available for S&T and Special**	**$2,161,934**	**$2,161,440**	**$2,211,378**	**$2,248,917**	**$2,287,064**	**$2,325,828**
29		**Total Planned for S&T and Special**	$2,302,000	$2,047,900	$1,809,273	$1,415,598	$1,115,598	$1,100,342
30								
31			$1,421,500	$1,222,900	$1,228,148	$1,278,445	$1,267,260	$1,285,597
32			**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
33		% increase subcontractors	0.0%	2.5%	2.5%	2.5%	2.5%	2.5%
34	STATUS AND TRENDS	**STATUS AND TRENDS TOTAL**	**$1,266,500**	**$1,067,900**	**$1,069,273**	**$1,115,598**	**$1,100,342**	**$1,114,506**
35		Water Chemistry (biennial 22 sites)		$81,667	$83,708	$85,801	$61,250	$62,781
36		Aquatic Toxicity (every five years)		$2,333	$2,392	$2,451	$1,000	$1,025
37		Bivalves (biennial 11 sites)	$45,000	$30,000	$30,750	$31,519	$32,307	$33,114
38		Sediment Chemistry (biennial 47 sites dry/27 wet)	$110,000	$92,500	$92,500	$73,750	$74,000	$75,850
39		Sediment Toxicity (biennial 27 sites dry/27 wet)	$51,000	$25,750	$25,750	$26,394	$27,054	$27,730
40		Sediment Benthos (biennial 27 sites dry/27 wet)	$62,000	$30,900	$31,673	$32,464	$33,276	$34,108
41		Fieldwork and Logistics	$214,000	$221,000	$217,500	$222,938	$228,511	$234,224
42		Suspended Sediment in SF Bay	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
43		Hydrography and Phytoplankton	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
44		Fish Contamination Study (triennial)	$87,000	$0	$0	$54,000	$55,350	$56,734
45		Cormorant Eggs (triennial)	$35,000	$25,000	$25,625	$26,266	$26,922	$27,595
46		Forster's Tern Eggs (triennial)	$35,000	$25,000	$25,625	$26,266	$26,922	$27,595
47		Archiving	$17,500	$8,750	$8,750	$8,750	$8,750	$8,750
48		Data Management	$250,000	$165,000	$165,000	$165,000	$165,000	$165,000
49								
50			**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
51		**Total Available for Special Studies**	**$895,434**	**$1,093,540**	**$1,142,106**	**$1,133,319**	**$1,171,465**	**$1,225,486**
52		**Unencumbered**	**-$140,066**	**$113,540**	**$402,106**	**$833,319**	**$1,171,465**	**$1,225,486**
53								
54			**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
55	SPECIAL STUDY AREAS	**SPECIAL STUDIES TOTAL**	**$1,035,500**	**$980,000**	**$740,000**	**$300,000**	**$0**	**$0**
56		**Mercury**	$25,000	$0	$0	$0	$0	$0
57		**PCBs**	$0	$0	$0	$0	$0	$0
58		**Dioxins**	$95,500	$0	$40,000	$0	$0	$0
59		**Emerging Contaminants**	$117,000	$100,000	$0	$0	$0	$0
60		**Small Tributaries**	$428,000	$450,000	$300,000	$300,000	$0	$0
61		**Other SPL**	$0	$0	$0	$0	$0	$0
62		**Exposure and Effects**	$130,000	$100,000	$0	$0	$0	$0
63		**Forecasting**	$100,000	$100,000	$100,000	$0	$0	$0
64		**Nutrients**	$140,000	$230,000	$300,000	$0	$0	$0

A10

CASQA

California Stormwater Quality Association®

Dedicated to the Advancement of Stormwater Quality Management, Science and Regulation

April 19, 2012

Ms. Polly Zehm
Deputy Director
Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Subject: Better Brakes Rule

Dear Ms. Zehm:

Thank you for inviting California representatives—including a representative of our organization, the California Stormwater Quality Association (CASQA[1])—to participate in Washington Ecology's conversations with interested parties about development of draft rules to implement the Washington Better Brakes Law. We appreciate the cooperation between Washington Ecology and the California Department of Toxic Substances Control (DTSC) on the implementation of the two related state laws that grew out of the Brake Pad Partnership, which CASQA members co-founded in the 1990s.

Timely and effective implementation of California's brake pad law (SB 346) is a high priority for our members because it will provide California's cities and counties with the tool they need to comply with stringent federal and state water quality mandates, including copper TMDLs and avoid billions of dollars in costs and potential penalties. We greatly appreciate Ecology's commitment to working with all parties affected by its decisions, including those of us in California.

Through the Better Brakes Rule development process, Washington Ecology has worked with the brake pad manufacturing industry and other interested parties to develop a brake pad product compliance marking system. The development of the marking system was the reason for CASQA's involvement in Washington's regulatory process.

The system embodied in the proposed Better Brakes Rule relies on a combination of markings on brake pads and on product packages. California end users represented by the Automotive Services Council of California and the California Retailers Association have informed DTSC that this combined product plus box marking system—together with an aggressive supply chain education program—will meet their needs for successful implementation of California's SB 346. Implementation of the Washington-developed integrated pad and box marking system, which we support, will be just as important for California as it is for Washington.

[1] CASQA is comprised of stormwater quality management organizations and individuals, including cities, counties, special districts, industries, and consulting firms throughout California. Our membership provides stormwater quality management services to more than 23 million people in California. CASQA was originally formed in 1989 as the Stormwater Quality Task Force to recommend approaches for stormwater quality management to the California State Water Resources Control Board.

Thank you for including CASQA and DTSC in your regulatory development process. If you have any questions, please contact me at (650) 365-8620.

Sincerely,

Geoff Brosseau, Executive Director
California Stormwater Quality Association

cc: Evelia Rodriguez, DTSC
Suzanne Davis, DTSC
Ian Wesley, Washington Department of Ecology
Ken Zarker, Washington Department of Ecology
CASQA Board of Directors, Executive Program Committee, and Brake Pad Partnership Team

A11

June 29th, 2012

MEMORANDUM

To: Exposure and Effects Workgroup

From: David Baldwin
Environmental Conservation Division
NOAA Northwest Fisheries Science Center

Re: Status Update on the Impact of dissolved copper on the olfactory system of seawater-phase juvenile salmon

Numerous studies have shown that exposure to low-levels of dissolved copper can be toxic to the olfactory system of juvenile salmon. Many regulatory thresholds for environmental copper concentrations are now meant to be protective of salmon olfactory toxicity. An example is the site-specific objectives (SSOs) for copper in the San Francisco Estuary. These objectives are meant to protect seawater-phase salmon (post-smolts) within the estuary from copper olfactory toxicity. However, the available copper olfactory toxicity data is from freshwater-phase juvenile salmon (pre-smolts). The olfactory toxicity of copper to post-smolts is not known and, therefore, there is an uncertainty about whether the SSOs are protective for salmon within the estuary.

NOAA Fisheries' Northwest Fisheries Science Center (NWFSC) has begun experiments designed to address this data gap. A pilot range-finding study was conducted in late summer/early fall of 2011. Preliminary indications from these results indicate that the threshold for copper olfactory toxicity in seawater with low dissolved organic carbon (DOC) may be well above 100 ppb. If this is the case, current SSOs would protect post-smolt Chinook salmon from copper olfactory toxicity. A more detailed experiment, however, is needed to confirm those results. To that end, a 2012 NOAA study funded by the Regional Monitoring Program (RMP) has begun at the NWFSC. This experiment will increase the number of fish tested at each copper concentration and, if appropriate, test higher levels of DOC. As of June, the fish are being smolted. Data collection will begin in July and is expected to be complete in September.

This study will be based on previous NOAA studies that measured copper olfactory toxicity in freshwater-phase juvenile salmon (Baldwin et al. 2003; Sandahl et al. 2007; McIntyre et al. 2008). Briefly, the impact of copper exposure on the sensitivity of the salmon olfactory system to odors will be measured using direct electrophysiological recordings (electroolfactograms; EOGs) from the olfactory epithelium. Odor-evoked EOGs will be obtained from fish using a standard odorant, the amino acid L-serine. Fish will be either unexposed to copper (controls) or exposed for a short period (30 minutes; copper concentration will vary as needed). Copper-induced changes in the sensitivity of the olfactory system will be measured as a dose-dependent reduction in the amplitude of the odor-evoked EOGs. The objective will be to determine whether copper concentrations in the range of the SSOs are likely to cause olfactory toxicity. The initial exposures will use the ambient seawater at the Mukilteo Field Station, which has relatively little dissolved organic carbon (DOC < 2 mg/L). In freshwater, DOC is known to reduce copper toxicity (McIntyre et al. 2008), so if copper olfactory toxicity is observed additional DOC concentrations will be tested to determine the impact of elevated DOC on the olfactory toxicity of copper in seawater. Water samples will be analyzed by an outside lab (Pacific Northwest National Laboratory) to determine the copper complexation capacity (as well as the concentrations of copper and DOC) for comparison with SF Bay waters.

A draft report of the results will be provided to the San Francisco Estuary Institute and RMP by November 1st, 2012. The draft report will be circulated for review by the EEWG and TRC. The comment period will December 15th. Comments will be incorporated by January 15th and a final report will be available January 30th 2013.

Citations:

Baldwin, D. H., J. F. Sandahl, J. S. Labenia, and N. L. Scholz. 2003. Sublethal effects of copper on coho salmon: Impacts on nonoverlapping receptor pathways in the peripheral olfactory nervous system. Environmental Toxicology and Chemistry **22**:2266-2274.

McIntyre, J. K., D. H. Baldwin, J. P. Meador, and N. L. Scholz. 2008. Chemosensory deprivation in juvenile coho salmon exposed to dissolved copper under varying water chemistry conditions. Environmental Science & Technology **42**:1352-1358.

Sandahl, J. F., D. H. Baldwin, J. J. Jenkins & N. L. Scholz. 2007. A sensory system at the interface between urban stormwater runoff and salmon survival. Environmental Science & Technology **41**:2998-3004.

A12

PS/SS: PBDE Summary Report

Estimated Cost: $35,000
Oversight Group: Emerging Contaminant Work Group
Proposed by: Susan Klosterhaus, SFEI

Background

A PBDE Conceptual Model/Impairment Assessment (CM/IA) report was completed in 2007 to address concerns regarding the bioaccumulation, fate, and potential toxicity of polybrominated diphenyl ethers (PBDEs) in San Francisco Bay (Werme et al. 2007). The report concluded that elevated PBDE concentrations in sport fish and wildlife suggested possible impairment but that a definitive statement was not possible without defined standards (e.g., fish screening values). The report also identified a need for additional PBDE monitoring data in the Bay, particularly information on watershed loading. At that time, only a few years of occurrence data were available.

As a result of incorporating PBDEs into routine monitoring, the RMP now has over ten years worth of occurrence data for San Francisco Bay. New information on the potential for toxicity to Bay wildlife and humans eating contaminated Bay fish is also available. This information includes the release of California sport fish contaminant goals (Klasing and Brodberg 2011) and a bird egg injection study (Rattner et al. 2011), which have largely resulted in decreased concern for PBDE impairment in the Bay. A report that summarizes the current status of PBDE concentrations is needed to communicate to RMP participants, environmental managers, and other researchers that concerns over elevated concentrations in Bay wildlife are being addressed and that available information suggests there is currently no basis for regulatory action.

Study Objective and Applicable RMP Management Question

The objective of this effort is to draft a report that summarizes the current status of PBDEs in San Francisco Bay. This study would address the following RMP management question (MQ):

MQ1. Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?

- A: Which chemicals have the potential to impact humans and aquatic life and should be monitored?
- B: What potential for impacts on humans and aquatic life exists due to contaminants in the Estuary ecosystem?

Approach

SFEI staff will collaborate with the San Francisco Bay Regional Water Quality Control Board to develop the report. The report will include the following elements:

1. Bay occurrence data – The report will include a summary of the following RMP PBDE datasets, including concentration trends over time and congener profiles:

- Surface waters (2002-2011)
- Sediments (2002-2012)
- Deployed bivalves (2002,2003,2005,2006,2008,2010,2012)
- Sport fish (2000,2003,2006,2009)
- Cormorant and tern eggs (2002,2004,2006,2009,2012)

The report will also include the most recent information on the potential for BDE 209 to degrade to more toxic, lower brominated congeners.

2. Relevant toxicity information – The report will compare Bay occurrence data to available toxicity thresholds, including the California sport fish contaminant goals (Klasing and Brodberg 2011), the bird egg injection study funded by the RMP (Rattner et al. 2011), and the Canadian environmental quality goals (Environment Canada 2010), among others.

3. Occurrence data for PBDE replacements – The report will include a short summary of the work to date regarding the occurrence of the PBDE replacement compounds in the Bay.

Budget

Data formatting and analysis	$15,000
Draft report	$15,000
Final report	$5,000
Total	**$35,000**

References

Environment Canada. 2010. Risk management strategy for polybrominated diphenyl ethers (PBDEs). Chemicals Sectors Directorate, Environmental Stewardship Branch. Final revised: August 2010.

Klasing, S. and Brodberg, R. 2011. Development of fish contaminant goals and advisory tissue levels for common contaminants in California sport fish: polybrominated diphenyl ethers (PBDEs), Pesticide and Environmental Toxicology Branch Office of Environmental Health Hazard Assessment California Environmental Protection Agency.

Rattner, B., Lazarus, RS, Heinz, GH, Karouna-Renier, NK, Hale RC. 2011. Apparent Tolerance of Common Tern (Sterna hirundo) Embryos to a Pentabrominated Diphenyl Ether Mixture (DE-71). San Francisco Estuary Institute, Final Report. December 2011.

Werme, C., Oram, J, McKee, L, Oros, D, and Connor, M. 2007. PBDEs in San Francisco Bay, Conceptual Model/Impairment Assessment. Prepared for Clean Estuary Partnership. July 31, 2007.

Appendix B

MRP Regional Supplement for POCs and Monitoring
Appendix B

B1

BASMAA

Regional Monitoring Coalition

Creek Status and Long-Term Trends Monitoring Plan

Prepared for:

The Bay Area Stormwater Management Agencies Association (BASMAA)

Prepared by:

EOA, Inc.
on behalf of the Santa Clara Urban Runoff Pollution Prevention Program and the San Mateo Countywide Water Pollution Prevention Program

Armand Ruby Consulting
on behalf of the Contra Costa Clean Water Program

November 28, 2011

PREFACE AND ACKNOWLEDGEMENTS

This BASMAA Regional Monitoring Coalition (RMC) Creek Status and Trends Monitoring Plan is intended to provide a road map for monitoring activities conducted toward compliance with Provision C.8.c (Stauts Monitoring) and C.8.e (Long Term Monitoring) of the Municipal Regional Permit (MRP) adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The monitoring plan was developed under the oversight of a technical committee that consisted of:

- Arleen Feng – Alameda Countywide Clean Water Program
- Chris Sommers (EOA, Inc) - Santa Clara Valley Urban Runoff Pollution Prevention Program
- Jamison Crosby - Contra Costa Clean Water Program
- Jon Konnan and Lucy Buchan (EOA, Inc.) - San Mateo Countywide Water Pollution Prevention Program
- Kevin Cullen – Fairfield-Suisun Urban Runoff Management Program
- Janet O'hara and Kevin Lunde – San Francisco Bay Regional Water Quality Control Board

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Acronyms

ACCWP	Alameda County Clean Water Program
BASMAA	Bay Area Stormwater Management Agency Association
CCCWP	Contra Costa Clean Water Program
CEDEN	California Environmental Data Exchange Network
CRAM	California Rapid Assessment Method
FSURMP	Fairfield Suisun Urban Runoff Management Program
GRTS	Generalized Random Tesselated Stratified
MRP	Municipal Regional Permit
NAWQA	National Water Quality Assessment
NPDES	National Pollution Discharge Elimination System
PSA	Perennial Stream Assessment
QAPP	Quality Assurance Project Plan
RMC	Regional Monitoring Coalition
RMP	Regional Monitoring Program
RWQCB	Regional Water Quality Control Board
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFEI	San Francisco Estuary Institute
SMCWPPP	San Mateo County Water Pollution Prevention Program
SOP	Standard Operating Protocol
SPoT	Stream Pollution Trend Monitoring Program
SWAMP	Surface Water Ambient Monitoring Program

1.0 Introduction

In early 2010, several members of the Bay Area Stormwater Agencies Association (BASMAA) joined together to form the Regional Monitoring Coalition (RMC), to coordinate and oversee water quality monitoring required by the Municipal Regional National Pollutant Discharge Elimination System (NPDES) Stormwater Permit (MRP)[1]. The RMC includes the following participants:

- Clean Water Program of Alameda County (ACCWP)
- Contra Costa Clean Water Program (CCCWP)
- San Mateo County Wide Water Pollution Prevention Program (SMCWPPP)
- Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)
- Fairfield-Suisun Urban Runoff Management Program (FSURMP)
- City of Vallejo and Vallejo Sanitation and Flood Control District (Vallejo)

This plan describes the implementation activities associated with monitoring requirements included in MRP provisions C.8.c (Creek Status) and C.8.e (Creek Long-Term Trends). Requirements associated with these provisions are included for reference in Appendix A (RWQCB 2009). The remainder of this section describes the RMC monitoring area and core management questions addressed by monitoring described in this plan. Section 2.0 provides a more detailed description of the planned monitoring approaches and management questions to be addressed. Section 3.0 discusses how results will be analyzed and reported, and briefly describes other documents associated with this Plan. Section 4.0 describes the planned schedule to complete RMC creek status and trends monitoring and Section 5.0 includes all references cited in this plan.

1.1 Study Area

Status and trends monitoring is being conducted in flowing water bodies (i.e., creeks, streams and rivers) interspersed among 3,407 square miles of land in the San Francisco Bay Area (i.e., the RMC area). The water bodies to be monitored by the RMC include all perennial and non-perennial creeks and rivers that run through urban and non-urban areas within the portions of the five participating counties that fall within the San Francisco Bay Water Board boundary, and the eastern portion of Contra Costa County that drains to the Central Valley region (Figure 1).

1.2 Monitoring Questions and General Approach

To date, San Francisco Bay Area Stormwater Programs have implemented monitoring designs that target creek reaches of interest to address site-specific management questions. Because the representativeness of targeted data is unknown, the overall condition of all creek reaches in the Bay Area also remains unknown. The RMC has agreed to address this issue by augmenting targeted monitoring designs with a probabilistic creek status design that integrates many elements of the individualized monitoring programs that currently exist in the region.

[1] The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) issued the five-year MRP to 76 cities, counties and flood control districts (i.e., Permittees) in the Bay Area on October 14, 2009 (SFRWQCB 2009). 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

The probabilistic and targeted creek status monitoring designs described in subsequent sections of this Plan comply with the MRP C.8.c[2] and C.8.e provisions by addressing the core monitoring questions listed below. These monitoring designs allow each individual RMC participating program to assess stream ecosystem conditions within its Program area (County boundary) while contributing data to answer regional management questions about water quality and beneficial use condition in Bay Area creeks.

1. What is the condition of aquatic life in creeks in the San Francisco Bay Area; are water quality objectives met and are beneficial uses supported?
2. What are the major stressors to aquatic life?
3. What are the long-term trends in water quality in creeks over time?

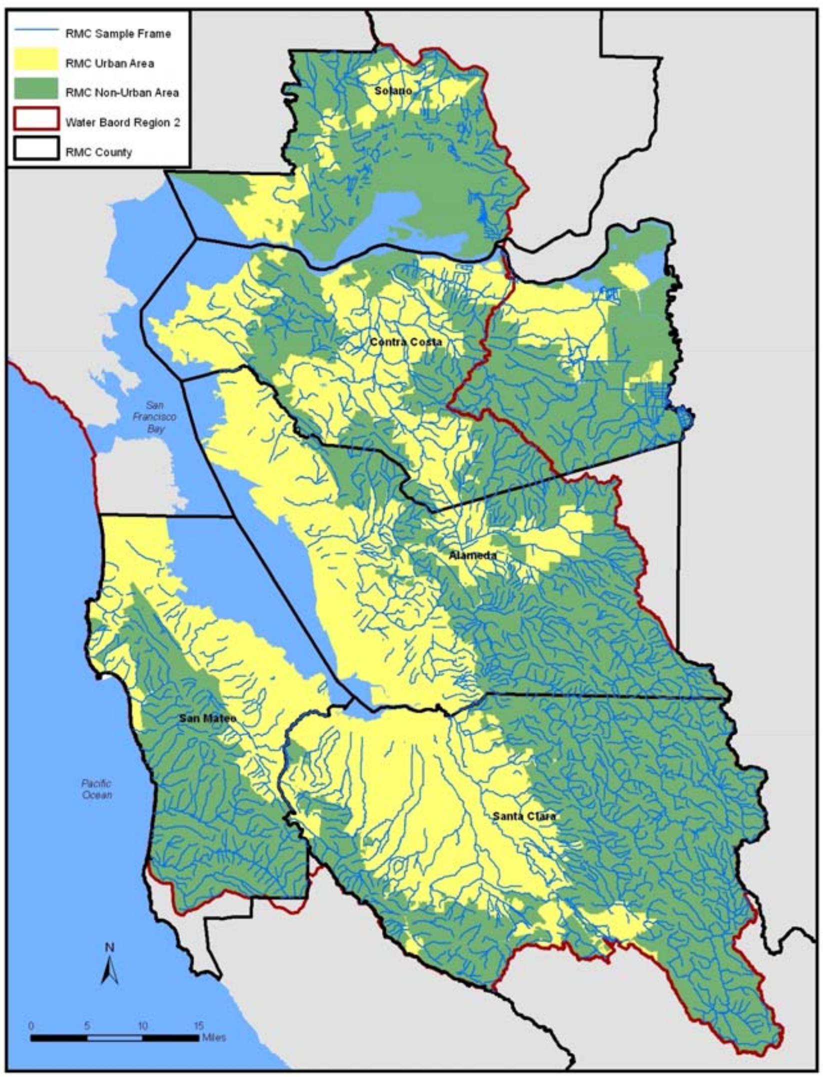

Figure 1: BASMAA Regional Monitoring Coalition (RMC) area and geographical extent of creeks.

[2] The MRP states that Provision C.8.c status monitoring is intended to answer the following questions: "Are water quality objectives, both numeric and narrative, being met in local receiving waters, including creeks, rivers and tributaries?"; "Are conditions in local receiving waters supportive of or likely to be supportive of beneficial uses?". The management questions described in this plan are intended to answer these questions.

2.0 Monitoring Design

This section describes the full scope of monitoring that will be conducted by MRP Permittees in compliance with MRP provisions C.8.c and C.8.e. Table 1 lists each chemical, biological and physical indicator that will be included as part of the RMC creek status and trends program, and the associated monitoring designs and reporting formats. With the exception of reporting (see Section 3.0), the monitoring attributes listed in Table 1 are further described in this section.

Table 1. Summary of creek status indicators, associated monitoring designs and scales of reporting.

Biological Response and Stressor Indicators	Monitoring Design		Reporting	
	Regional Ambient (Probabilistic)	Local (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		X		X
Temperature		X		X
Bacteria		X		X
Stream Survey		X		X

The various elements shown in Table 1 are organized into four categories in the sections that follow:

- **Condition Assessment and Description of the Probabilistic Monitoring Design:** describes parameters that will be sampled to address the first core management question and the probabilistic monitoring design used to select sampling locations.
- **Stressor Assessment:** describes the parameters that will be sampled to address the second core RMC management question and assess the extent and magnitude of chemical and physical stress on aquatic life in Bay Area creeks.
- **Additional MRP Provision C.8.c Monitoring:** describes two parameters, pathogen indicators and stream surveys, that will be sampled or conducted to understand their relative concentrations and overall physical/ecological conditions, respectively.
- **Trends Assessment:** describes the RMC plan to detect meaningful change in the concentrations of stream contaminants and their effects in large watersheds at time scales appropriate to management decision-making by coordinating with the Statewide SWAMP Stream Pollution Trend Monitoring (SPoT) Program (SWRCB 2008).

2.1 Condition Assessment & Probabilistic Design

RMC participants will conduct a condition assessment to address the first core monitoring question (***What is the condition of aquatic life use in creeks in the San Francisco Bay Area?)*** using two biological response indicators: benthic macroinvertebrates and algae. This question is addressed using a probabilistic monitoring design to establish a statistically representative understanding of the relative condition of aquatic life in wadable creeks in the RMC area. While the RMC area does not cover the entire San Francisco Bay Area, the monitoring question is stated in this manner in anticipation that the RMC monitoring area may be expanded in the future as additional stormwater programs become RMC participants. As currently designed, the ambient monitoring in the RMC area will provide information about the condition of aquatic life in the majority creeks in the San Francisco Bay Area.

The probabilistic survey is also designed to address the more specific management questions listed below. The results of condition assessment monitoring (i.e., bioassessments) will be compared to indicator thresholds (e.g., B-IBI or biological objective scores) in order to estimate the extent and magnitude of aquatic life condition within the entire RMC area, and between counties (as data allow). Over time, comparisons will also be made between urban and non-urban areas within the RMC area and within each county. To achieve such comparisons, the ambient design is stratified by general land use category (urban vs. non-urban) and by county. This stratification allows the monitoring to address the following questions:

a. What is the condition of aquatic life in creeks within the RMC area?
b. What is the condition of aquatic life in creeks within RMC participant counties?
c. To what extent does the condition of aquatic life in urban and non-urban creeks differ in the RMC area?
d. To what extent does the condition of aquatic life in urban and non-urban creeks differ in each of the RMC participating counties?

The regional probabilistic design was developed using the Generalized Random Tessellation Stratified (GRTS) approach developed by the United States Environmental Protection Agency (USEPA) and Oregon State University (Stevens and Olson 2004). GRTS offers multiple benefits for coordinating amongst monitoring entities including the ability to develop a spatially balanced design that produces statistically representative data with known confidence intervals. The GRTS approach has been implemented recently in California by several agencies including the statewide Perennial Streams Assessment (PSA) conducted by the California's Surface Water Ambient Monitoring Program (SWAMP) and the Southern California Stormwater Monitoring Coalition's (SMC) regional monitoring program conducted by municipal stormwater programs in Southern California. For the purpose of developing the RMC's probabilistic design, the RMC area is considered to represent the "sample universe".

2.1.1 Site Selection

Sample sites were selected and attributed using the GRTS approach that utilized geographic information system (GIS) data layers, including a creek network, county and RWQCB boundaries, and urban and non-urban land uses. These data layers provided the necessary information to form the RMC "sample frame". The National Hydrography Dataset (1:100,000) was selected as the creek network data layer to provide consistency with both the Statewide PSA and the SMC and the opportunity for future data coordination with these programs. The RMC sample frame was classified by county and land use (i.e., urban and non-urban) to allow for comparisons between these strata. Urban areas were delineated by joining the urban area and city boundaries defined by the U.S. Census (2000). Non-urban areas were defined as the remainder of the areas within the sample universe (RMC area).

2.1.2 Sample Size and Frequency

Per the MRP, RMC participants are required to monitor different parameters at different frequencies (Appendix A). For parameters that will be used to inform the aquatic life condition assessment in creeks (i.e., benthic macroinvertebrates and algae) the sampling frequency is as follows (by RMC participant):

- SCVURPPP and ACCWP - annually 20 sites each:
- CCCWP and SMCWPPP - annually 10 sites each:
- FSURMP – 4 sites, twice during the Permit term; and,
- Vallejo – 4 sites, once during the Permit term.

For each of the strata, it is necessary to obtain a sample size of at least 30 In order to evaluate the condition of aquatic life with known estimates of precision. This estimate is defined by a power curve from a binomial distribution (Appendix B). A minimum sample size of 30 provides an estimate of aquatic life use condition within a confidence interval of approximately 12%, and is considered to be sufficient to develop a cumulative distribution function to estimate the proportion of creek miles characterized by aquatic life indicators. Table 2 illustrates the approximate length of time that will be needed to achieve this minimum sample size required to answer the four specific management questions described at the beginning of this section.

Table 2. Monitoring year (shaded) when minimum sample size needed to develop a statistically representative dataset to address management questions related to condition of aquatic life is achieved. [a]

Monitoring Year	**RMC Area** (Region-wide)		**SCVURPPP**		**ACCWP**		**CCCWP**		**SMCWPPP**		**FSURMP and Vallejo** [b]	
Land Use	*Urban*	*Non-Urban*	*Urban*	*Non-Urban*	*Urban*	*Non-Urban*	*Urban*	*Non-Urban*	*Urban*	*Non-Urban*	*Urban*	*Non-Urban*
Year 1 (2011-12)	**48**	22	16	6	16	6	8	4	8	4	0	2
Year 2 (2012-13)	**100**	**44**	**32**	12	**32**	12	16	8	16	8	4	4
Year 3[c] (2013-14)	**156**	**66**	**48**	18	**48**	18	24	12	24	12	12	6
Year 4 (2014-15)	**204**	**88**	**64**	24	**64**	24	**32**	16	**32**	16	12	8
Year 5 (2015-16)	**256**	**110**	**80**	**30**	**80**	**30**	**40**	20	**40**	20	16	10

[a] Assumes San Francisco Bay RWQCB will sample two non-urban sites annually in each RMC County
[b] Assumes: FSURMP and Vallejo only monitor urban sites; FSURMP monitors 4 sites in Year 2, 3 and 5; and Vallejo monitors 4 sites in Year 3.
[c] Final year of monitoring under the MRP 5-Year Permit.

2.1.3 Sampling and Analysis Methods

The RMC will utilize benthic macroinvertebrate (BMI) and algae bioassessment sampling protocols and quality assurance procedures described in the BASMAA SOPs and QAPP documents (BASMAA 2011a and 2011b), which are consistent with SWAMP protocols. Aquatic life condition assessments will be conducted using the most up-to-date tools applicable to the Bay Area. These tools may include multi-metric Benthic Index(s) of Biotic Integrity (B-IBI), O/E models and other statistical methods.

2.2 Stressor Assessment

Stressor assessments described in this section address the second core RMC management question: (***What are the major stressors to aquatic life?***). Indicators listed in Table 3 will be used by the RMC to assess the extent and magnitude of chemical and physical stress on aquatic life in Bay Area creeks.

Table 3. Stressor indicators and parameters measured for the stressor assessment.

Stressor Indicator	Monitoring Design Type	Measured Parameters
In-stream Physical Habitat (PHAB)	Probabilistic	Multiple, including average substrate size and wetted width, habitat type, epifaunal substrate, sediment deposition, and channel alteration.
General Water Quality	Targeted	Grab samples and continuous water quality monitoring of dissolved oxygen, temperature, conductivity and pH
Nutrients	Probabilistic	Grab samples of total phosphorus, dissolved orthophosphate, total nitrogen, nitrate, ammonia, silica, chloride, dissolved organic carbon, and suspended sediment concentrations
Chlorine	Probabilistic	Grab samples of free and total chlorine
Temperature	Targeted	Continuous temperature monitoring at 60-minute intervals during the spring, summer and fall.
Water toxicity	Probabilistic	*Selenastrum* growth; *Ceriodaphinia* and *Pimephales* with lethal and sublethal endpoints; *Hyallella azteca* with lethal endpoint
Sediment toxicity	Probabilistic	*Hyallella azteca* with lethal endpoint
Sediment chemistry	Probabilistic	Copper, nickel, mercury, zinc, lead, chromium, cadmium, arsenic, PCBs, PAHs, DDT, chlordane, dieldrin, pyrethroid pesticides, grain size and total organic carbon

2.2.1 Site Selection

RMC participants will measure physical habitat, nutrients, chlorine, water and sediment toxicity, and sediment chemistry annually at a subset (Table 4) of the bioassessment sites selected and monitored via the probabilistic monitoring design. Due to the relatively small number of sites sampled annually for these parameters, analyses will be limited in scope until representative sample sizes are achieved. Stressor indicators sampled at sites selected using a probabilistic monitoring design will address the following management questions:

a. What are ranges of physical habitat, nutrients, chlorine, water toxicity, sediment toxicity, sediment chemistry in the RMC area?
b. Are there correlations between physical habitat, nutrients, chlorine, water toxicity, sediment toxicity, or sediment chemistry and aquatic life condition?

Stressor indicators that will be monitored at targeted sites selected by RMC participating programs include continuous general water quality (temperature, pH, conductivity and dissolved oxygen) using a multi-parameter probe for 15-minute intervals, and continuous temperature using a digital temperature logger for 60-minute intervals. Targeted monitoring of such parameters will address the following management questions:

c. What is the range of general water quality measurements at targeted sites of interest?
d. Do general water quality measurements indicate potential impacts to aquatic life?

As such, useful targeted sites may include those in urban stream locations where fisheries concerns such as migration or juvenile habitat are important.

2.2.2 Sample Size and Frequency

The MRP (see Appendix A) requires RMC participants to conduct creek status monitoring at specified frequencies. Table 4 lists the annual sampling frequency by RMC participants for parameters that will be used to inform the stressor assessments.

Table 4. Annual sampling frequency for parameters used to inform the stressor assessment.

Stressor Indicator	Season	SCVURPPP	ACCWP	CCCWP	SMCWPPP	FSURMP[a]	Vallejo[b]
Physical Habitat	Spring	20	20	10	10	4	4
General Water Quality (Grab)	Spring	20	20	10	10	4	4
Nutrients	Spring	20	20	10	10	4	4
Chlorine	Spring	20	20	10	10	2	2
	Dry Season	3	3	2	2	1	1
Water Toxicity	Dry Season	3	3	2	2	1	1
	Storm Event	3	3	2	2	1	1
Sediment Toxicity	Dry Season	3	3	2	2	1	1
Sediment Chemistry	Dry Season	3	3	2	2	1	1
General Water Quality (Continuous)	Dry Season	3	3	2	2	1	1
Temperature (Continuous)	Dry Season	8	8	4	4	1	1

[a] Sites to be sampled twice during the Permit term.
[b] Sites to be sampled once during the Permit term.

2.2.3 Sampling and Analysis Methods

The RMC will utilize sampling protocols and quality assurance procedures described in the BASMAA SOPs and QAPP (BASMAA 2011a and 2011b). All protocols and procedures are consistent with SWAMP. Stressor indicator data will be analyzed in order to develop a better understanding of the potential for a stressor to impact aquatic life in Bay Area creeks, both at the individual site and at broader scales where feasible. Tools that may be used to assess stressor impact at the site and regional scale include relative risk indices (Van Sickle et al. 2006) and population attributable risk indices (Van Sickle and Paulsen 2008), as well as comparisons to water quality objectives. Relative risk indices measure the site effect of a given stressor indicator on a condition (response) indicator (in this case BMIs and algae), while population attributable risk indices measure the relative effects of aquatic stressors at the county or regional scales. Examples of relative and attributable risk outputs are illustrated in Appendix C. Water quality objective exceedances will trigger follow-up stressor/source identification monitoring projects (no more than ten during the 2009 – 2014 permit term, two of which must be toxicity follow-ups, unless monitoring results do not indicate the presence of toxicity).

2.3 Additional MRP Provision C.8.c Monitoring

Two additional parameters, pathogen indicators and stream surveys, will be sampled or conducted, respectively, at sites selected using a targeted design (pathogens) or either a targeted or probabilistic design (stream surveys). Pathogen indicators will be collected and analyzed to address the following management question:

1) What are the pathogen indicator concentrations at creek sites where water contact recreation may occur?

Stream surveys will be conducted to assess the overall physical and/or ecological conditions of creek reach and specific point impacts within each reach. Additional information on protocols that may be used to conduct stream surveys is provided in Section 2.3.3. Stream surveys conducted using the Unified Stream Assessment protocol (Center for Watershed Protection 2005) will be based on a targeted monitoring design. Stream surveys using the CRAM protocol (Collins et al. 2008) may be based on a probabilistic or targeted monitoring design.

2.3.1 Site Selection

Participating RMC programs will choose their targeted sites to collect pathogen indicators and conduct stream surveys based on program or water body specific management questions. For pathogen indicators, it is recommended that participating programs choose monitoring sites at high priority creek locations where full body contact recreation (e.g., swimming) has been known to occur. Recommended locations for stream surveys include creek reaches where there is a potential for restoration, stressor identification projects may occur, or initial information is needed on the physical habitat quality and water quality impacts in a creek reach of interest.

2.3.2 Sample Size and Frequency

Pathogen indicators will be sampled and stream surveys conducted at a frequency consistent with the MRP (Table 5).

Table 5. Annual number of pathogen indicator monitoring sites and stream survey miles required by the MRP.

Indicators	SCVURPPP	ACCWP	CCCWP	SMCWPPP	FSURMP & Vallejo
E.coli and Fecal Coliform (sites)	5	5	5	5	3[a]
Stream Survey (miles)	9	9	6	6	3

[a] Sites to be sampled twice during the Permit term.

2.3.3 Sampling and Analysis Methods

Fecal coliform and *E. coli* will be sampled using methods described in the BASMAA SOPs (BASMAA 2011a). Stream surveys may be conducted using the Unified Stream Assessment protocol (Center for Watershed Protection 2005) or an equivalent method such as the California Rapid Assessment Method (Collins et al. 2008). Both of these methods are briefly described below.

The USA protocol assesses overall creek reach conditions and specific point impacts within each reach. To assess conditions within a creek reach a continuous upstream walk is conducted, during which time information is collected about stream corridor conditions, such as average bank stability, in-stream and riparian habitat, and floodplain connectivity. Parameters are scored on a continuous scale and summarized as a weighted average to reflect overall in-stream condition, overall buffer and floodplain condition, and overall reach condition. In addition to assessing reach-wide conditions, notable impacts occurring within each reach are recorded on separate forms. Eight categories of impacts are included in the USA: 1) severe stream erosion, 2) impacted stream buffers, 3) utilities, 4) trash and debris, 5) stream crossings, 6) channel modifications, 7) stormwater outfalls, and 8) a catch-all category for miscellaneous features. To assess sites with potential recreational uses, a ninth assessment form was developed by EOA (2008).

CRAM (Collins et al. 2008) is a cost-effective, standard ambient monitoring and assessment tool that can be used to assess ecological condition on a variety of scales, ranging from individual wetlands to watersheds and larger regions. CRAM enables practitioners, working together in the field for one half day or less, to assess the overall health of a wetland by choosing the best-fit set of narrative descriptions of observable conditions ranging from the worst commonly observed to the best achievable for the type of wetland being assessed. CRAM yields an overall score for each assessed area based on the component scores for the attributes and their metrics. The overall score for a wetland indicates how it is doing relative to the best achievable conditions for that wetland type in the state. CRAM also provides guidelines for identifying stressors that might account for low scores.

2.4 Trends Assessment

The RMC plans to use the monitoring conducted by the Statewide SWAMP Stream Pollution Trend Monitoring (SPoT) Program (SWRCB 2008) to comply with MRP provision C.8.e that requires ACCWP, CCCWP, SCVURPPP, and SMCWPPP to sample one location annually to monitor long-term trends. The goal of the SPoT Program is to detect meaningful change in the concentrations of stream contaminants and their effects in large watersheds at time scales appropriate to management decision-making, and more specifically to:

- Determine long-term trends in stream pollutant concentrations and their biological effects statewide;
- Relate water quality indicators to land-use characteristics and to the effectiveness of agency management efforts; and,
- Establish a network of sites throughout the state to serve as a backbone for collaboration with local, regional, and federal monitoring programs.

The five management questions SPoT is designed to address are:

1. Which contaminants are detected in depositional stream sediments, and in which large California watersheds are they detected?
2. In which large California watersheds is sediment toxicity observed?
3. What is the relationship between pollutant concentrations and watershed land use characteristics?
4. What is the relationship between pollutant concentrations and the level of management activity?
5. What is the direction and magnitude of change in pollutant concentrations and toxicity over multi-year time periods?

If for some reason the SPoT program is unable to fulfill the long-term trend monitoring requirements described in the MRP, RMC participants will begin conducting monitoring in compliance with these requirements.

2.4.1 Site Selection

To detect long-term trends, 100 monitoring sites (statewide) were selected by the SPoT Program at points where contaminants released throughout large watersheds are likely to accumulate. These sites are similar to the "integrator" sites used in the United States Geological Survey's National Water Quality Assessment (NAWQA) program. Sites were originally selected based on hydrology, land use, and the needs of partner programs. The sites were then visited for reconnaissance to find a 100-m reach within which there are at least five to ten depositional areas from which fine-grained sediment can be collected. To select adequate reaches, the actual sampling location can be moved 1 km or more upstream or (usually) downstream of the original target sites. Table 5 describes locations on water bodies in the RMC area where the SPoT Program has recently and plans to continue, to monitor. Please note that the FSURMP and Vallejo do not have long-term monitoring requirements and therefore associated long-term monitoring requirements are not listed in Table 6.

Table 6. Long-term monitoring locations monitored by the SWAMP's statewide Stream Pollution Trend Monitoring (SPoT) Program.

RMC Participant	Water Body	Suggested Location
SCVURPPP	Guadalupe River or	USGS Gaging Station 11169025
	Coyote Creek	Montague
ACCWP	Alameda Creek or	East of Alvarado Boulevard
	Lower San Leandro Creek	Empire Road
CCCWP	Kirker Creek or	Floodway
	Walnut Creek	Concord Avenue
SMCWPPP	San Mateo Creek	Gateway Park

2.4.2 Sample Frequency

Long-term monitoring will be conducted through SPoT annually during base flow or near-base flow conditions following annual peak flows. The intent is to collect depositional sediment that has been recently transported from watershed surfaces, but is not subject to extreme variation due to storm events. In the RMC area, this time period is late spring to early summer.

2.4.3 Sampling and Analysis Methods

Under the SPoT Program, sediment samples are collected and analyzed according to the Standard Operating Procedures (SOPs) described in the SPoT specific Quality Assurance Program Plan (SWAMP 2010). If RMC participants should undertake long-term trends monitoring in compliance with the MRP, standard operating and quality control procedures described in BASMAA (2011a and 2011b) will be followed. These procedures are consistent with SWAMP's.

Regardless of the lead monitoring program, natural variability in sediment pollutant concentrations is expected and will be addressed by compositing sediment from five to ten depositional areas in the 100-

m reach that comprises each site. Sampling will focus on recent sediment deposits in active areas of the streambed and avoid banks, benches, and other areas where sediment may have been deposited more than one year previously. Sediment will be sampled to a depth of up to 5 cm if the entire 5 cm core is homogeneous and appears to have been deposited within the same hydrologic cycle of seasonal high water receding to annual base flow. Surficial sediment as shallow as 1 cm may need to be collected if there is clear layering indicating deposition over multiple annual cycles.

3.0 Reporting & Associated Products

This section describes the reporting products and formats that will be developed by RMC participants and submitted to the San Francisco Bay RWQCB in compliance with MRP provision C.8.g.

3.1 Electronic Data Submittal

All monitoring data (targeted and probabilistic) collected October 1 to September 30 will be submitted annually to the Water Board and to the CEDEN data node at SFEI by each RMC participant no later than January 15 of the following year. Data will be submitted as an Electronic Status Monitoring Data Report to the Water Board in a standardized format comparable with the SWAMP database. Water quality exceedences will be highlighted in this report. The first electronic data submittal of monitoring data to the Regional Board will occur by January 15, 2013.

3.2 Urban Creek Monitoring Reports

Annually, creek status and trends monitoring results will be analyzed and synthesized into one regional report and a series of local assessment reports specific to each RMC participant's monitoring. Reports will summarize monitoring conducted during the foregoing October 1 to September 30 period and will be submitted to the Water Board by March 15 following this period. The initial RMC reports will be submitted by March 15, 2013.

No later than March 15, 2014, RMC participants shall also prepare and submit local and regional integrated monitoring reports[3] that summarize all data collected during the term of the MRP.

All monitoring reports shall include the standard content as described below:

- The purpose of the monitoring and brief description of the study area and study design rationale;
- Quality Assurance/Quality Control summaries for sample collection and analytical methods, including a discussion of any limitations of the data;
- Brief descriptions of sampling protocols and analytical methods;
- Sample location description, including water body name and segment and latitude and longitude coordinates;
- Sample ID, collection date (and time if relevant), media (e.g., water, filtered water, bed sediment, tissue);
- Concentrations detected, measurement units and detection limits.

Results will be discussed relative to prior conditions, beneficial uses, and applicable water quality standards as described in Table 8.1 of the MRP (see Appendix A), the Basin Plan (RWQCB), the Ocean

[3] Urban Creek Monitoring Reports due March 14, 2014 will be included as part of the Integrated Report.

Plan (SWRCB 2005), the California Toxics Rule (Federal Register 1997), or other applicable water quality control plans. Where appropriate, hypotheses should be developed to investigate potential pollutant sources, trends, and BMP effectiveness. Reports will identify and prioritize water quality problems, sources of water quality problems, describe follow-up actions and any additional management actions needed to address water quality problems, and evaluate the effectiveness of existing control measures.

3.2.1 Regional Urban Creeks Monitoring Report

The *Regional San Francisco Bay Urban Creeks Monitoring Report* will include an assessment of the following condition and stressor indicators (see Table 1): benthic macroinvertebrates, algae, nutrients, chlorine, water toxicity, sediment toxicity, and sediment chemistry. Results for each indicator will be presented by their respective evaluation methods (see Chapter 2) across the four spatial scales indicated in the management questions, e.g., RMC area, RMC area by urban/non-urban land use, RMC participant county, and RMC participant county by urban/non-urban land use. Results of the relative risk analyses for these stressor indicators will also be presented in the regional report (see Appendix C for examples). Monitoring results will be presented in a variety of formats including text, tables, graphs, and maps (see Appendix C for examples) to address the management questions related to the condition and stressor assessments.

3.2.2 Local Urban Creeks Monitoring Reports

At a minimum, the local reports produced by each RMC participant will include an assessment of all monitoring data collected via a targeted design. Targeted parameters (listed in Table 1) include general water quality (continuous), temperature (continuous), pathogen indicators, and stream surveys. Results for stressor indicators sampled using a targeted monitoring design will be summarized in tables and graphs highlighting the number of samples exceeding applicable water quality standards as described in Table 8.1 of the MRP (see Appendix A). Results of the relative risk analyses will be presented for targeted stressor indicators as graphs (see Appendix C). Long-term trend data will be summarized, as feasible[4], with any apparent trends in stormwater or receiving water quality.

3.3 Associated Products

In parallel to the development of this plan, three other “sister” products were also developed:

- RMC Creek Status and Trends Quality Assurance Project Plan (QAPP) (BASMAA 2011a);
- Standard Operating Procedures (SOPs) for field monitoring, site reconnaissance and reporting (BASMAA 2011b); and
- Creek Status and Trends Information Management System Work Plan (BASMAA 2011c).

4.0 Schedule

The creek status monitoring discussed in previous chapters will be conducted according to the schedule shown in Table 7. Note that Table 7 illustrates the monitoring schedule for a five-year timeframe (2011 to 2016) although the MRP term ends in 2014. The five-year timeframe is shown in order to establish a longer-term schedule that can be implemented to produce data necessary to answer the management questions set forth in this plan.

[4] Depending on the timing of its availability from the SPoT Program.

Table 7. RMC Creek Status and Long-Term Trends Monitoring Schedule

Task	2011							2012											
	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Creek Status (Condition and Stressor Assessments)																			
Regional Ambient Creek Sample Draw	●	●																	
Ambient Creek Site Evaluation			●	●											●	●			
Storm Event Sampling					●	●	●	●	●	●	●						●	●	●
Dry Season Sampling												●	●	●	●	●			
Spring Season Sampling												●	●	●					
Long-Term Trends Monitoring																			
Dry Season Sampling												●	●	●					
Analysis and Information Management																			
Laboratory Analysis					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Information Management					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Data Analysis														●	●	●	●	●	●
Reporting																			
Electronic Data Submittal																			
Monitoring Progress Report				●						●						●			
Regional Urban Creeks Monitoring Report Submittal																			
Local Creeks Monitoring Report Submittal																			

Task	2013										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Creek Status (Condition and Stressor Assessments)											
Regional Ambient Creek Sample Draw											
Ambient Creek Site Evaluation								●	●		
Storm Event Sampling	●	●	●	●						●	●
Dry Season Sampling					●	●	●	●	●		
Spring Season Sampling					●	●	●				
Long-Term Trends Monitoring											
Dry Season Sampling					●	●	●				
Analysis and Information Management											
Laboratory Analysis	●	●	●	●	●	●	●	●	●	●	●
Information Management	●	●	●	●	●	●	●	●	●	●	●
Data Analysis	●	●					●	●	●	●	●
Reporting											
Electronic Data Submittal	●										
Monitoring Progress Report											
Regional Urban Creeks Monitoring Report Submittal			●								
Local Creeks Monitoring Report Submittal			●								

Task	2014												
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Creek Status (Condition and Stressor Assessments)													
Regional Ambient Creek Sample Draw													
Ambient Creek Site Evaluation									●	●			
Storm Event Sampling	●	●	●	●	●						●	●	●
Dry Season Sampling						●	●	●	●	●			
Spring Season Sampling						●	●	●					
Long-Term Trends Monitoring													
Dry Season Sampling						●	●	●					
Analysis and Information Management													
Laboratory Analysis	●	●	●	●	●	●	●	●	●	●	●	●	●
Information Management	●	●	●	●	●	●	●	●	●	●	●	●	●
Data Analysis	●	●	●					●	●	●	●	●	●
Reporting													
Electronic Data Submittal		●											
Monitoring Progress Report													
Regional Urban Creeks Monitoring Report Submittal				●									
Local Creeks Monitoring Report Submittal				●									

Task	2015											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Creek Status (Condition and Stressor Assessments)												
Regional Ambient Creek Sample Draw						●	●					
Ambient Creek Site Evaluation								●	●			
Storm Event Sampling	●	●	●	●						●	●	●
Dry Season Sampling					●	●	●	●	●			
Spring Season Sampling					●	●	●					
Long-Term Trends Monitoring												
Dry Season Sampling					●	●	●					
Analysis and Information Management												
Laboratory Analysis	●	●	●	●	●	●	●	●	●	●	●	●
Information Management	●	●	●	●	●	●	●	●	●	●	●	●
Data Analysis	●	●					●	●	●	●	●	●
Reporting												
Electronic Data Submittal	●											
Monitoring Progress Report												
Regional Urban Creeks Monitoring Report Submittal			●									
Local Creeks Monitoring Report Submittal			●									

Task	2016											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Creek Status (Condition and Stressor Assessments)												
Regional Ambient Creek Sample Draw						●	●					
Ambient Creek Site Evaluation								●	●			
Storm Event Sampling	●	●	●	●								
Dry Season Sampling					●	●	●	●	●			
Spring Season Sampling				●	●	●						
Long-Term Trends Monitoring												
Dry Season Sampling					●	●	●					
Analysis and Information Management												
Laboratory Analysis	●	●	●	●	●	●	●	●	●	●	●	●
Information Management	●	●	●	●	●	●	●	●	●	●	●	●
Data Analysis	●	●	●				●	●	●	●	●	●
Reporting												
Electronic Data Submittal	●											
Monitoring Progress Report												
Regional Urban Creeks Monitoring Report Submittal			●									
Local Creeks Monitoring Report Submittal			●									

5.0 References

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Appendix A. Municipal Regional Permit Provisions

C.8. Water Quality Monitoring

C.8.a. Compliance Options

i. Regional Collaboration – All Permittees shall comply with the monitoring requirements in C.8, however, Permittees may choose to comply with any requirement of this Provision through a collaborative effort to conduct or cause to be conducted the required monitoring in their jurisdictions. Where all or a majority of the Permittees collaborate to conduct water quality monitoring, this shall be considered a regional monitoring collaborative.

Where an existing collaborative body has initiated plans, before the adoption of this Permit, to conduct monitoring that would fulfill a requirement(s) of this Provision, but the monitoring would not meet this Provision's due date(s) by a year or less, the Permittees may request the Executive Officer adjust the due date(s) to synchronize with such efforts.

The types, quantities, and quality of data required within Provision C.8 establish the minimum level-of-effort that a regional monitoring collaborative must achieve. Provided these data types, quantities, and quality are obtained, a regional monitoring collaborative may develop its own sampling design. For Pollutants of Concern and Long-Term monitoring required under C.8.e, an alternative approach may be pursued by Permittees provided that: either similar data types, data quality, data quantity are collected with an equivalent level of effort described under C.8.e; or an equivalent level of monitoring effort is employed to answer the management information needs stated under C.8.e.

ii. Implementation Schedule – Monitoring conducted through a regional monitoring collaborative shall commence data collection by October 2011. All other Permittee monitoring efforts shall commence data collection by October 2010. By July 1, 2010, each Permittee shall provide documentation to the Water Board, such as a written agreement, letter, or similar document that confirms whether the Permittee will conduct monitoring individually or through a regional monitoring collaborative.[19]

iii. Permittee Responsibilities – A Permittee may comply with the requirements in Provision C.8 by performing the following:

(1) Contributing to its stormwater countywide program, as determined appropriate by the Permittee members, so that the stormwater countywide Program conducts monitoring on behalf of its members;

(2) Contributing to a regional collaborative effort;

[19] This documentation will allow the Water Board to know when monitoring will commence for each Permittee. Permittees who commit to monitoring individually may join the regional monitoring collaborative at any time. Any Permittee who discontinues monitoring through the regional collaborative must commence complying with all requirements of Provision C.8 immediately.

(3) Fulfilling monitoring requirements within its own jurisdictional boundaries; or

(4) A combination of the previous options, so that all requirements are fulfilled.

iv. Third-party Monitoring – Permittees may choose to fulfill requirements of Provision C.8 using data collected by citizen monitors or other third-party organizations, provided the data are demonstrated to meet the data quality objectives described in Provision C.8.h. Where an existing third-party organization has initiated plans to conduct monitoring that would fulfill a requirement(s) of this Provision, but the monitoring would not meet this Provision's due date(s) by a year or less, the Permittees may request that the Executive Officer adjust the due date(s) to synchronize with such efforts.

C.8.b. San Francisco Estuary Receiving Water Monitoring

With limited exceptions, urban runoff from the Permittees' jurisdictions ultimately discharges to the San Francisco Estuary. Monitoring of the Estuary is intended to answer questions[20] such as:

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

Permittees shall participate in implementing an Estuary receiving water monitoring program, at a minimum equivalent to the San Francisco Estuary Regional Monitoring Program for Trace Substances (RMP), by contributing their fair-share financially on an annual basis.

C.8.c. Status Monitoring/Rotating Watersheds

i. Status Monitoring is intended to answer these questions: Are water quality objectives, both numeric and narrative, being met in local receiving waters,

[20] These are the management questions approved by the Regional Monitoring Program's Steering Committee on May 9, 2008, and stated at http://www.sfei/rmp/rmp_steering_meetings/rmp_steering_meeting_5_09_08/Item%2010a%20Attachment%201%20%20Draft%20RMP%20Management%20Questions%2005-02-08%20Annotated.pdf. While the stated objectives may change over time, the intent of this provision is for Permittees to continue contributing financially and as stakeholders in such a program as the RMP, which monitors the quality of San Francisco Bay.

including creeks, rivers and tributaries? Are conditions in local receiving waters supportive of or likely to be supportive of beneficial uses?

ii. Parameters and Methods – Permittees shall conduct Status Monitoring using the parameters, methods, occurrences, durations, and minimum number of sampling sites as described in Table 8.1. Spring sampling shall be conducted during the April - June timeframe; dry weather sampling shall be conducted during the July - September timeframe. Minor variations of the parameters and methods may be allowed with Executive Officer concurrence.

iii. Frequency – Permittees shall complete the Status Monitoring in Table 8.1 at the following frequencies:

- Alameda Permittees – annually
- Contra Costa Permittees – annually
- Fairfield-Suisun Permittees – twice during the Permit term
- San Mateo Permittees – annually
- Santa Clara Permittees – annually
- Vallejo Permittees – once during the Permit term

Table 8.1 Status Monitoring Elements

Status Monitoring Parameter	Sampling and/or Analytical Method[21]	Minimum Sampling Occurrence[22]	Duration of Sampling	**Minimum # Sample Sites to Monitor/Yr[23]** Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	Result(s) that Trigger a Monitoring Project in Provision C.8.d.i.
Biological Assessment[24] (Includes Physical Habitat Assessment and General Water Quality Parameters[25]) Nutrients (total phosphorus, dissolved orthophosphate, total nitrogen, nitrate, ammonia, silica, chloride,	SWAMP Std Operating Procedure[26,27,28] for Biological Assessments & PHab; SWAMP	1/yr (Spring Sampling)	Grab sample	Spring 20 / 10 / 4	BMI metrics that indicate substantially degraded community as per Attachment H, Table H-1 For Nutrients: 20% of results in one waterbody exceed one or more water quality standard

21 Refers to field protocol, instrumentation and/or laboratory protocol.

22 Refers to the number of sampling events at a specific site in a given year.

23 The number of sampling sites shown is based on the relative population in each Regional Stormwater Countywide Program and is listed in this order: Santa Clara & Alameda Countywide / Contra Costa & San Mateo Countywide / Vallejo & Fairfield-Suisun Programs.

24 The same general location must be used to collect benthic community, sediment chemistry, and sediment toxicity samples. General Water Quality Parameters need not be collected twice, where it is collected by a multi-parameter probe at a subset of these sample sites (see next row of Table 8.1).

25 Includes dissolved oxygen, temperature, conductivity, and pH.

26 Ode, P.R. 2007. Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California, California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP), as subsequently revised (http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/phab_sopr6.pdf). Permittees may coordinate with Water Board staff to modify their sampling procedures if these referenced procedures change during the Permit term.

27 Biological assessments shall include benthic macroinvertebrates and algae. Bioassessment sampling method shall be multihabitat reach-wide. Macroinvertebrates shall be identified according to the Standard Taxonomic Effort Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists, using the most current SWAMP approved method. Current methods are documented in (1) SWAMP Standard Operating Procedure (SOP) and Interim Guidance on Quality Assurance for SWAMP Bioassessments, Memorandum to SWAMP Roundtable from Beverly H. van Buuren and Peter R. Ode, 5-21-07, and (2) Amendment to SWAMP Interim Guidance on Quality Assurance for SWAMP Bioassessments, Memorandum to SWAMP Roundtable from Beverly H. van Buuren and Peter R. Ode, 9-17-08. For algae, include mass (ash-free dry weight), chlorophyll a, diatom and soft algae taxonomy, and reachwide algal percent cover. Physical Habitat (PHab) Assessment shall include the SWAMP basic method plus 1) depth and pebble count + CPOM, 2) cobble embeddedness, 3) discharge measurements, and 4) in-stream habitat. Permittees may coordinate with Water Board staff to modify these sampling procedures if SWAMP procedures change during the Permit term.

28 Algae shall be collected in a consistent timeframe as Regional SWAMP. For guidance on algae sampling and evaluation: Fetscher, A. and K. McLaughlin, May 16, 2008. Incorporating Bioassessment Using Freshwater Algae into California's Surface Water Ambient Monitoring Program (SWAMP). Technical Report 563 and current SWAMP-approved updates to Standard Operating Procedures therein. Available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/563_periphyton_bioassessment.pdf.

Status Monitoring Parameter	Sampling and/or Analytical Method[21]	Minimum Sampling Occurrence[22]	Duration of Sampling	**Minimum # Sample Sites to Monitor/Yr**[23] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	Result(s) that Trigger a Monitoring Project in Provision C.8.d.i.
dissolved organic carbon, suspended sediment concentration)	comparable methods for Nutrients				or established threshold
General Water Quality[29]	Multi-Parameter Probe	2/yr (Concurrent with bioassessment & during the Aug. - Sept. timeframe)	15-minute intervals for 1-2 weeks	3 / 2 / 1	20% of results in one waterbody exceed one or more water quality standard or established threshold
Chlorine (Free and Total)	USEPA Std. Method 4500 Cl F[30]	2/yr Spring & Dry Seasons	Grab sample	Spring 20 / 10 / 2 Dry 3 / 2 / 1	After immediate resampling, concentrations remain > 0.08 mg/L
Temperature	Digital Temperature Logger	60-minute intervals	60-minute intervals April through Sept.	8 / 4 / 1	20% of results in one waterbody exceed applicable temperature threshold[31]
Toxicity – Water Column[32]	Applicable SWAMP Comparable Method	2/yr (1/Dry Season & 1 Storm Event)	Grab or composite sample	3 / 2 / 1	If toxicity results < 50% of control results, repeat sample. If 2nd sample yields < 50% of control results, proceed to C.8.d.i.

29 Includes dissolved oxygen, temperature, conductivity, and pH.

30 The method of analysis shall achieve a method detection limit at least as low as that achieved by the Amperometric Titration Method (4500-Cl from *Standard Methods for Examination of Water and Wastewater*, Edition 20).

31 If temperatures exceed applicable threshold (e.g., Maximum Weekly Average Temperature, Sullivan K., Martin, D.J., Cardwell, R.D., Toll, J.E., Duke, S. 2000. *An Analysis of the Effects of Temperature on Salmonids of the Pacific Northwest with Implications for Selecting Temperature Criteria, Sustainable Ecosystem Institute*) or spike with no obvious natural explanation observed.

32 *US EPA three species toxicity tests: Selenastrum* growth and *Ceriodaphnia* and *Pimephales* with lethal and sublethal endpoints. Also H*yalella azteca with lethal endpoint.*

Status Monitoring Parameter	**Sampling and/or Analytical Method**[21]	**Minimum Sampling Occurrence**[22]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[23] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.d.i.**
Toxicity– Bedded Sediment, Fine-grained[33]	Applicable SWAMP Comparable Method	1/yr	Grab sample	3 / 2 / 1 At fine-grained depositional area at bottom of watershed	See Attachment H, Table H-1
Pollutants – Bedded Sediment,[34] fine-grained	Applicable SWAMP Comparable Method inc. grain size	1/yr	Grab sample	3 / 2 / 1 At fine-grained depositional area at bottom of watershed	See Attachment H, Table H-1
Pathogen Indicators[35]	U.S. EPA protocol[36]	1/yr (During Summer)	Follow U.S. EPA protocol	5 / 5 / * *Fairfield-Suisun & Vallejo Permittees: 3 sites twice in permit term	Exceedance of USEPA criteria
Stream Survey (stream walk & mapping)[37]	USA[38] or equivalent	1 waterbody/yr	N/A	9 / 6 / 3 stream miles/year	N/A

33 Bedded sediments should be fine-grain from depositional areas. Grain size and TOC must be reported. Coordinate with TMDL Provision requirements as applicable.

34 Bedded sediments should be fine-grain from depositional areas. Grain size and TOC must be reported. Analytes shall include all of those reported in MacDonald et al. 2000 (including copper, nickel, mercury, PCBs, DDT, chlordane, dieldrin) as well as pyrethroids (see Table 8.4 for list of pyrethroids). Coordinate with TMDL Provision requirements as applicable. MacDonald, D.D., G.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environ. Contamination and Toxicology* 39(1):20–31.

35 Includes fecal coliform and *E. Coli.*

36 Rather than collecting samples over five separate days, Permittees may use Example #2, pg. 54, of USEPA's *Implementation Guidance for Ambient Water Quality Criteria for Bacteria*, March 2004 Final.

37 The Stream Surveys need not be repeated on a watershed if a Stream Survey was completed on that waterbody within the previous five years. The number of stream miles to be surveyed in any given year may be less than that shown in Table 8-1 in order to avoid repeating surveys at areas surveyed during the previous five years.

38 Center for Watershed Protection, Manual 10: *Unified Stream Assessment: A User's Manual*, February 2005.

iv. Locations – For each sampling year (per C.8.c.iii.), Permittees shall select at least one waterbody to sample from the applicable list below. Locations shall be selected so that sampling is sufficient to characterize segments of the waterbody(s). For example, Permittees required to collect a larger number of samples should sample two or more waterbodies, so that each sampling effort represents a reasonable segment length and/or type. Samples shall be collected in reaches that receive urban stormwater discharges, except in possible infrequent instances where non-urban-impacted stream samples are needed for comparison[39]. Waterbody selection shall be based on factors such as watershed area, land use, likelihood of urban runoff impacts, and existing monitoring data.

Table 8.2 Status Monitoring Locations – Waterbodies

SCVURPPP	**ACCWP**	**CCCWP**	**SMCWPPP**	**FSUMRP**	**VALLEJO**
Coyote Creek and tributaries	Arroyo Valle (below Livermore or lower)	Kirker Creek	San Pedro Creek and tributaries	Laurel Creek	Chabot Creek
Guadalupe River and tributaries	Arroyo Mocho	Mt. Diablo Creek	Pilarcitos Creek	Ledgewood Creek	Austin Creek & tributaries
San Tomas Creek and tributaries	Tassajara Creek	Walnut Creek and tributaries	Colma Creek		
Calabazas Creek	Alamo Creek	Rodeo Creek	San Bruno Creek and tributaries		
Permanente Creek and tributaries	Arroyo de la Laguna	Pinole Creek	Millbrae Creek and tributaries		
Stevens Creek and tributaries	Alameda Creek (at Fremont or below)	San Pablo Creek	Mills Creek and tributaries		
Matadero Creek and tributaries	San Lorenzo Creek & tribs	Alhambra Creek	Easton Creek and tributaries		
Adobe Creek	San Leandro Creek & tribs	Wildcat Creek	Sanchez Creek and tributaries		
Lower Penitencia Creek and tributaries	Oakland, Berkeley, or Albany Creeks		Burlingame Creek and tributaries		
Barron Creek			San Mateo Creek (below dam only)		
San Francisquito Creek & tributaries			Borel Creek & tributaries		
			Laurel Creek & tribs		
			Belmont Creek & tribs		
			Pulgas Creek & tribs		
			Cordilleras & tributaries		
			Redwood Creek & tribs		
			Atherton Creek & tribs		
			San Francisquito Creek and tributaries		

39 Sampling efforts shall focus on stream reaches with urban stormwater system discharges. Sampling upstream of urban outfalls is not precluded where needed to meet sampling plan objectives.

v. Status Monitoring Results – When Status Monitoring produces results such as those described in the final column of Table 8.1, Permittees shall conduct Monitoring Project(s) as described in C.8.d.i.

C.8.d. **Monitoring Projects –** Permittees shall conduct the Monitoring Projects listed below.

i. **Stressor/Source Identification –** When Status results trigger a follow-up action as indicated in Table 8.1, Permittees shall take the following actions, as also required by Provision C.1. If the trigger stressor or source is already known, proceed directly to step 2. The first follow-up action shall be initiated as soon as possible, and no later than the second fiscal year after the sampling event that triggered the Monitoring Project.

(1) Conduct a site specific study (or non-site specific if the problem is wide-spread) in a stepwise process to identify and isolate the cause(s) of the trigger stressor/source. This study should follow guidance for Toxicity Reduction Evaluations (TRE)[40] or Toxicity Identification Evaluations (TIE).[41] A TRE, as adapted for urban stormwater data, allows Permittees to use other sources of information (such as industrial facility stormwater monitoring reports) in attempting to determine the trigger cause, potentially eliminating the need for a TIE. If a TRE does not result in identification of the stressor/source, Permittees shall conduct a TIE.

(2) Identify and evaluate the effectiveness of options for controlling the cause(s) of the trigger stressor/source.

(3) Implement one or more controls.

(4) Confirm the reduction of the cause(s) of trigger stressor/source.

(5) Stressor/Source Identification Project Cap: Permittees who conduct this monitoring through a regional collaborative shall be required to initiate no more than ten Stressor/Source Identification projects during the Permit term in total, and at least two must be toxicity follow-ups, unless monitoring results do not indicate the presence of toxicity. If conducted through a stormwater countywide program, the Santa Clara and Alameda

[40] USEPA. August 1999. *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*. EPA/833B-99/002. Office of Wastewater Management, Washington, D.C.

[41] Select TIE methods from the following references after conferring with SWAMP personnel: For sediment: (1) Ho KT, Burgess R., Mount D, Norberg-King T, Hockett, RS. 2007. *Sediment toxicity identification evaluation: interstitial and whole methods for freshwater and marine sediments*. USEPA, Atlantic Ecology Division/Mid-Continental Ecology Division, Office of Research and Development, Narragansett, RI, or (2) Anderson, BS, Hunt, JW, Phillips, BM, Tjeerdema, RS. 2007. *Navigating the TMDL Process: Sediment Toxicity*. Final Report- 02-WSM-2. Water Environment Research Federation. 181 pp. For water column: (1) USEPA. 1991. *Methods for aquatic toxicity identification evaluations. Phase I Toxicity Characterization Procedures.* EPA 600/6-91/003. Office of Research and Development, Washington, DC., (2) USEPA. 1993. *Methods for aquatic toxicity identification evaluations. Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity*. EPA 600/R-92/080. Office of Research and Development, Washington, DC., or (3) USEPA. 1996. *Marine Toxicity Identification Evaluation (TIE), Phase I Guidance Document.* EPA/600/R-95/054. Office of Research and Development, Washington, DC.

Permittees each shall be required to initiate no more than five (two for toxicity); the Contra Costa and San Mateo Permittees each shall be required to initiate no more than three (one for toxicity); and the Fairfield-Suisun and Vallejo Permittees each shall be required to initiate no more than one Stressor/Source Identification project(s) during the Permit term.

(6) As long as Permittees have complied with the procedures set forth above, they do not have to repeat the same procedure for continuing or recurring exceedances of the same receiving water limitations unless directed to do so by the Water Board.

ii. BMP Effectiveness Investigation – Investigate the effectiveness of one BMP for stormwater treatment or hydrograph modification control. Permittees who do this project through a regional collaborative are required to initiate no more than one BMP Effectiveness Investigation during the Permit term. If conducted through a stormwater countywide program, the Santa Clara, Alameda, Contra Costa, and San Mateo Permittees shall be required to initiate one BMP Effectiveness Investigation each, and the Fairfield-Suisun and Vallejo Permittees shall be exempt from this requirement. The BMP(s) used to fulfill requirements of C.3.b.iii., C.11.e. and C.12.e. may be used to fulfill this requirement, provided the BMP Effectiveness Investigation includes the range of pollutants generally found in urban runoff. The BMP Effectiveness Investigation will not trigger a Stressor/Source Identification Project. Data from this Monitoring Project need not be SWAMP-comparable.

iii. Geomorphic Project – This monitoring is intended to answer the questions: How and where can our creeks be restored or protected to cost-effectively reduce the impacts of pollutants, increased flow rates, and increased flow durations of urban runoff?

Permittees shall select a waterbody/reach, preferably one that contains significant fish and wildlife resources, and conduct one of the following projects within each county, except that only one such project must be completed within the collective Fairfield-Suisun and Vallejo Permittees' jurisdictions:

(1) Gather geomorphic data to support the efforts of a local watershed partnership[42] to improve creek conditions; or

(2) Inventory locations for potential retrofit projects in which decentralized, landscape-based stormwater retention units can be installed; or

(3) Conduct a geomorphic study which will help in development of regional curves which help estimate equilibrium channel conditions for different-sized drainages. Select a waterbody/reach that is not undergoing changing land use. Collect and report the following data:

- Formally surveyed channel dimensions (profile), planform, and cross-sections. Cross-sections shall include the topmost floodplain terrace and

[42] A list of local watershed partnerships may be obtained from Water Board staff.

be marked by a permanent, protruding (not flush with ground) monument.

- Contributing drainage area.
- Best available information on bankfull discharges and width and depth of channel formed by bankfull discharges.
- Best available information on average annual rainfall in the study area.

Permittees shall complete the selected geomorphic project so that project results are reported in the Integrated Monitoring Report (see Provision C.8.g.v).

C.8.e. Pollutants of Concern and Long-Term Trends Monitoring

Pollutants of Concern (POC) monitoring is intended to assess inputs of Pollutants of Concern 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 information needs toward which POC monitoring must be directed: 1) identifying which Bay tributaries (including stormwater conveyances) contribute most to Bay impairment from pollutants of concern; 2) quantifying annual loads or concentrations of pollutants of concern from tributaries to the Bay; 3) quantifying the decadal-scale loading or concentration trends of pollutants of concern from small tributaries to the Bay; and 4) quantifying the projected impacts of management actions (including control measures) on tributaries and identifying where these management actions should be implemented to have the greatest beneficial impact.

Permittees shall implement the following POC monitoring components or pursue an alternative approach that addresses each of the aforementioned management information needs. An alternative approach may be pursued by Permittees provided that: either similar data types, data quality, data quantity are collected with an equivalent level of effort described; or an equivalent level of monitoring effort is employed to answer the management information needs.

Long-Term monitoring is intended to assess long-term trends in pollutant concentrations and toxicity in receiving waters and sediment, in order to evaluate if stormwater discharges are causing or contributing to toxic impacts on aquatic life. Permittees shall implement the following Long-Term monitoring components or, following approval by the Executive Officer, an equivalent monitoring program.

i. Pollutants of Concern Loads Monitoring Locations – Permittees shall conduct Pollutants of Concern monitoring at stations listed below. Permittees may install these stations in two phases providing at least half of the stations are monitored in the water year beginning October 2010, and all the stations are monitored in the water year beginning October 2012. Upon approval by the Executive Officer, Permittees may use alternate POC monitoring locations.

(1) Castro Valley Creek S3 at USGS gauging station in Castro Valley

(2) Guadalupe River

(3) Zone 4 Line A at Chabot Road in Hayward

(4) Rheem Creek at Giant Road in Richmond

(5) Walnut Creek at a downstream location

(6) Calabazas Creek at Lakeside Drive in Sunnyvale, at border with Santa Clara

(7) San Mateo Creek at downstream location

(8) Laurel Creek at Laurie Meadows park, off Casanova Drive in City of San Mateo.

ii. Long-Term Monitoring Locations – Permittees shall conduct Long-Term monitoring at stations listed below. After conferring with the Regional SWAMP program, and upon approval by the Executive Officer, Permittees may use alternate Long-Term monitoring locations.

Table 8.3. Long-Term Monitoring Locations

Stormwater Countywide Program	Waterbody	Suggested Location
Alameda Permittees	Alameda Creek OR	East of Alvarado Blvd*
	Lower San Leandro Creek	Empire Road*
Contra Costa Permittees	Kirker Creek OR	Floodway*
	Walnut Creek	Concord Avenue*
Santa Clara Permittees	Guadalupe River OR	USGS Gaging Station 11169025*
	Coyote Creek	Montague*
San Mateo Permittees	San Mateo Creek	Gateway Park*

* SWAMP is scheduled to collect sediment toxicity and sediment chemistry samples annually at these stations during the month of June.

iii. Parameters and Frequencies – Permittees shall conduct Pollutants of Concern sampling pursuant to Table 8.4, Categories 1 and 2. In Table 8.4, Category 1 pollutants are those for which the Water Board has active water quality attainment strategies (WQAS), such as TMDL or site-specific objective projects. Category 2 pollutants are those for which WQAS are in development. The lower monitoring frequency for Category 2 pollutants is sufficient to develop preliminary loading estimates for these pollutants.

Permittees shall conduct Long-Term monitoring pursuant to Table 8.4, Category 3. SWAMP has scheduled collection of Category 3 data at the Long-Term monitoring locations stated in C.8.e.ii. As stated in Provision C.8.a.iv., Permittees may use SWAMP data to fulfill Category 3 sampling requirements.

iv. Protocols – At a minimum, sampling and analysis protocols shall be consistent with 40 CFR 122.21(g)(7)(ii).

v. **Methods** – Methyl mercury samples shall be grab samples collected during storm events that produce rainfall of at least 0.10 inch, shall be frozen immediately upon collection, and shall be kept frozen during transport to the laboratory. All other Category 1 and 2 samples shall be wet weather flow-weighted composite samples, collected during storm events that produce rainfall of at least 0.10 inch. Sampled storms should be separated by 21 days of dry weather, but, at a minimum, sampled storms must have 72 hours of antecedent dry weather. Samples must include the first rise in the hydrograph. Category 3 monitoring data shall be SWAMP-comparable.

Table 8.4 Pollutants of Concern Loads & Long-Term Monitoring Elements

Category/Parameter	Sampling Years	Minimum Sampling Occurrence	Sampling Interval
Category 1 • Total and Dissolved Copper • Total Mercury[43] • Methyl Mercury • Total PCBs[44] • Suspended Sediments (SSC) • Total Organic Carbon • Toxicity – Water Column • Nitrate as N • Hardness	Annually	Average of 4 wet weather events per year For methyl mercury only: average of 2 wet & 2 dry weather events per year	Flow-weighted composite For methyl mercury only: grab samples collected during the first rise in the hydrograph of a storm event.
Category 2 • Total and Dissolved Selenium • Total PBDEs (Polybrominated Diphenyl Ethers) • Total PAHs (Poly-Aromatic Hydrocarbons) • Chlordane • DDTs (Dichloro-Diphenyl-Trichloroethane) • Dieldrin • Nitrate as N • Pyrethroids - bifenthrin, cyfluthrin, beta-cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin • Carboryl and fipronil • Total and Dissolved Phosphorus	Oct. 2010 - 2011 water year and Oct. 2012 - 2013 water year	2 times per year	Flow-weighted composite
Category 3 Toxicity – Bedded Sediment, fine-grained[45]	Biennially, Coordinate	Once per year, during April-June,	Grab sample

43 The monitoring type and frequency shown for mercury is not sufficient to determine progress toward achieving TMDL load allocations. Progress toward achieving load allocations will be accomplished by assessing loads avoided resulting from treatment, source control, and pollution prevention actions.

44 The monitoring type and frequency shown for PCBs is not sufficient to determine progress toward achieving TMDL load allocations. Progress toward achieving load allocations will be accomplished by assessing loads avoided resulting from treatment, source control, and pollution prevention actions.

Category/Parameter	Sampling Years	Minimum Sampling Occurrence	Sampling Interval
Pollutants – Bedded Sediment, fine-grained	with SWAMP	coordinate with SWAMP	

vi. Sediment Delivery Estimate/Budget – The objective of this monitoring is to develop a strong estimate of the amount of sediment entering the Bay from local tributaries and urban drainages. By July 1, 2011, Permittees shall develop a design for a robust sediment delivery estimate/sediment budget in local tributaries and urban drainages. Permittees shall implement the study by July 1, 2012.

vii. Emerging Pollutants – Permittees shall develop a work plan and schedule for initial loading estimates and source analyses for emerging pollutants: endocrine-disrupting compounds, PFOS/PFAS (Perfluorooctane Sulfonates (PFOS), Perfluoroalkyl sulfonates (PFAS); these perfluorocompounds are related to Teflon products), and NP/NPEs (nonylphenols/nonylphenol esters —estrogen-like compounds). This work plan, which is to be implemented in the next Permit term, shall be submitted with the Integrated Monitoring Report (see Provision C.8.g.).

C.8.f. Citizen Monitoring and Participation

i. Permittees shall encourage Citizen Monitoring.

ii. In developing Monitoring Projects and evaluating Status & Trends data, Permittees shall make reasonable efforts to seek out citizen and stakeholder information and comment regarding waterbody function and quality.

iii. Permittees shall demonstrate annually that they have encouraged citizen and stakeholder observations and reporting of waterbody conditions. Permittees shall report on these outreach efforts in the annual Urban Creeks Monitoring Report.

C.8.g. Reporting

i. Water Quality Standard Exceedence – When data collected pursuant to C.8.a.-C.8.f. indicate that stormwater runoff or dry weather discharges are or may be causing or contributing to exceedance(s) of applicable water quality standards, including narrative standards, a discussion of possible pollutant sources shall be included in the Urban Creeks Monitoring Report. When data collected pursuant to C.8.a.-C.8.f. indicate that discharges are causing or contributing to an exceedance of an applicable water quality standard, Permittees shall notify the Water Board within no more than 30 days of such a determination and submit a follow-up report in accordance with Provision C.1 requirements. The preceding reporting requirements shall not apply to

[45] If Ceriodaphnia, H*yalella azteca*, or Pimephales survival or Selenastrum growth is < 50% of control results, repeat wet weather sample. If 2nd sample yields < 50% of control results, proceed to C.8.d.i.

continuing or recurring exceedances of water quality standards previously reported to the Water Board or to exceedances of pollutants that are to be addressed pursuant to Provisions C.8 through C.14 of this Order in accordance with Provision C.1.

ii. Status Monitoring Electronic Reporting – Permittees shall submit an Electronic Status Monitoring Data Report no later than January 15 of each year, reporting on all data collected during the foregoing October 1–September 30 period. Electronic Status Monitoring Data Reports shall be in a format compatible with the SWAMP database.[46] Water Quality Objective exceedances shall be highlighted in the Report.

iii. Urban Creeks Monitoring Report – Permittees shall submit a comprehensive Urban Creeks Monitoring Report no later than March 15 of each year, reporting on all data collected during the foregoing October 1–September 30 period, with the initial report due March 15, 2012, unless the Permittees choose to monitor through a regional collaborative, in which case the due date is March 15, 2013. Each Urban Creeks Monitoring Report shall contain summaries of Status, Long-Term, Monitoring Projects, and Pollutants of Concern Monitoring including, as appropriate, the following:

(1) Maps and descriptions of all monitoring locations;

(2) Data tables and graphical data summaries; Constituents that exceed applicable water quality standards shall be highlighted;

(3) For all data, a statement of the data quality;

(4) An analysis of the data, which shall include the following:

- Calculations of biological metrics and physical habitat endpoints.
- Comparison of biological metrics to:
  - Each other
  - Any applicable, available reference site(s)
  - Any applicable, available index of biotic integrity
  - Physical habitat endpoints.
- Identification and analysis of any long-term trends in stormwater or receiving water quality.

(5) A discussion of the data for each monitoring program component, which shall:

- Discuss monitoring data relative to prior conditions, beneficial uses and applicable water quality standards as described in the Basin Plan, the Ocean Plan, or the California Toxics Rule or other applicable water quality control plans.

[46] See http://mpsl.mlml.calstate.edu/swdataformats.htm. Permittees shall maintain an information management system that will support electronic transfer of data to the Regional Data Center of the ***California Environmental Data Exchange Network*** (***CEDEN***), located within the San Francisco Estuary Institute.

- Where appropriate, develop hypotheses to investigate regarding pollutant sources, trends, and BMP effectiveness.
- Identify and prioritize water quality problems.
- Identify potential sources of water quality problems.
- Describe follow-up actions.
- Evaluate the effectiveness of existing control measures.
- Identify management actions needed to address water quality problems.

iv. Monitoring Project Reports – Permittees shall report on the status of each ongoing Monitoring Project in each annual Urban Creeks Monitoring Report. In addition, Permittees shall submit stand-alone summary reports within six months of completing BMP Effectiveness and Geomorphic Projects; these reports shall include: a description of the project; map(s) of project locations; data tables and summaries; and discussion of results.

v. Integrated Monitoring Report – No later than March 15, 2014, Permittees shall prepare and submit an Integrated Monitoring Report through the regional collaborative monitoring effort on behalf of all participating Permittees, or on a countywide basis on behalf of participating Permittees, so that all monitoring conducted during the Permit term is reported.[47] This report shall be in lieu of the Annual Urban Creeks Monitoring Report due on March 15, 2014.

The report shall include, but not be limited to, a comprehensive analysis of all data collected pursuant to Provision C.8., and may include other pertinent studies. For Pollutants of Concern, the report shall include methods, data, calculations, load estimates, and source estimates for each Pollutant of Concern Monitoring parameter. The report shall include a budget summary for each monitoring requirement and recommendations for future monitoring. This report will be part of the next Report of Waste Discharge for the reissuance of this Permit.

vi. Standard Report Content –All monitoring reports shall include the following:

- The purpose of the monitoring and briefly describe the study design rationale.
- Quality Assurance/Quality Control summaries for sample collection and analytical methods, including a discussion of any limitations of the data.
- Brief descriptions of sampling protocols and analytical methods.
- Sample location description, including waterbody name and segment and latitude and longitude coordinates.
- Sample ID, collection date (and time if relevant), media (e.g., water, filtered water, bed sediment, tissue).
- Concentrations detected, measurement units, and detection limits.

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[47] Permittees who do not participate in the Regional Monitoring Group or in a stormwater countywide program must submit an individual Integrated Receiving Water Impacts Report.

- Assessment, analysis, and interpretation of the data for each monitoring program component.
- Pollutant load and concentration at each mass emissions station.
- A listing of volunteer and other non-Permittee entities whose data are included in the report.
- Assessment of compliance with applicable water quality standards.
- A signed certification statement.

vii. Data Accessibility – Permittees shall make electronic reports available through a regional data center, and optionally through their web sites. Permittees shall notify stakeholders and members of the general public about the availability of electronic and paper monitoring reports through notices distributed through appropriate means, such as an electronic mailing list.

C.8.h. Monitoring Protocols and Data Quality

Where applicable, monitoring data must be SWAMP comparable. Minimum data quality shall be consistent with the latest version of the SWAMP Quality Assurance Project Plan (QAPP)[48] for applicable parameters, including data quality objectives, field and laboratory blanks, field duplicates, laboratory spikes, and clean techniques, using the most recent Standard Operating Procedures. A Regional Monitoring Collaborative may adapt the SWAMP QAPP for use in conducting monitoring in the San Francisco Bay Region, and may use such QAPP if acceptable to the Executive Officer.

[48] The current SWAMP QAPP at the time of Permit issuance is dated September 1, 2008, and is available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.

ATTACHMENT H

Provision C.8.
Status and Long-Term Monitoring
Follow-up Analysis and Actions

Status and Long-Term Monitoring Follow-up Analysis and Actions for Biological Assessment, Bedded Sediment Toxicity, and Bedded Sediment Pollutants

When results from Biological Assessment, Bedded Sediment Toxicity, and/or Bedded Sediment Pollutants monitoring indicate impacts at a monitoring location, Permittees shall evaluate the extent and cause(s) of impacts to determine the potential role of urban runoff as indicated in Table H-1.

Table H-1. Sediment Triad Approach to Determining Follow-Up Actions

Chemistry Results[161]	Toxicity Results[162]	Bioassessment Results[163]	Action
No chemicals exceed Threshold Effect Concentrations (TEC), mean Probable Effects Concentrations (PEC) quotient < 0.5 and pyrethroids < 1.0 Toxicity Unit (TU)[164]	No Toxicity	No indications of alterations	No action necessary
No chemicals exceed TECs, mean PEC quotient < 0.5 and pyrethroids< 1.0 TU	Toxicity	No indications of alterations	(1) Take confirmatory sample for toxicity. (2) If toxicity repeated, attempt to identify cause and spatial extent. (3) Where impacts are under Permittee's control, take management actions to minimize upstream sources causing toxicity; initiate no later than the second fiscal year following the sampling event.

161 TEC and PEC are found in MacDonald, D.D., G.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environ. Contamination and Toxicology* 39(1):20–31.

162 Toxicity is exhibited when *Hyallela* survival statistically different than and < 20 percent of control.

163 Alterations are exhibited if metrics indicate substantially degraded community.

164 Toxicity Units (TU) are calculated as follows: TU = Actual concentration (organic carbon normalized) ÷ Reported *H. azteca* LC_{50} concentration (organic concentration normalized). Weston, D.P., R.W. Holmes, J. You, and M.J. Lydy, 2005. Aquatic Toxicity Due to Residential Use of Pyrethroid Insecticides. *Environ. Science and Technology* 39(24):9778–9784.

Chemistry Results[161]	Toxicity Results[162]	Bioassessment Results[163]	Action
No chemicals exceed TECs, mean PEC quotient < 0.5 and pyrethroids< 1.0 TU	No Toxicity	Indications of alterations	Identify the most probable cause(s) of the alterations in biological community. Where impacts are under Permittee's control, take management actions to minimize the impacts causing physical habitat disturbance; initiate no later than the second fiscal year following the sampling event.
No chemicals exceed TECs, mean PEC quotient < 0.5 and pyrethroids< 1.0 TU	Toxicity	Indications of alterations	(1) Identify cause(s) of impacts and spatial extent. (2) Where impacts are under Permittee's control, take management actions to minimize impacts; initiate no later than the second fiscal year following the sampling event.
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	No Toxicity	Indications of alterations	(1) Identify cause of impacts. (2) Where impacts are under Permittee's control, take management actions to minimize the impacts caused by urban runoff; initiate no later than the second fiscal year following the sampling event.
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	Toxicity	No indications of alterations	(1) Take confirmatory sample for toxicity. (2) If toxicity repeated, attempt to identify cause and spatial extent. (3) Where impacts are under Permittee's control, take management actions to minimize upstream sources; initiate no later than the second fiscal year following the sampling event.
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	No Toxicity	No Indications of alterations	If PEC exceedance is Hg or PCBs, address under TMDLs
3 or more chemicals exceed PECs, the mean PEC quotient is > 0.5, or pyrethroids > 1.0 TU	Toxicity	Indications of alterations	(1) Identify cause(s) of impacts and spatial extent. (2) Where impacts are under Permittee's control, take management actions to address impacts.

ATTACHMENT I

Provision C.8.
Standard Monitoring Provisions

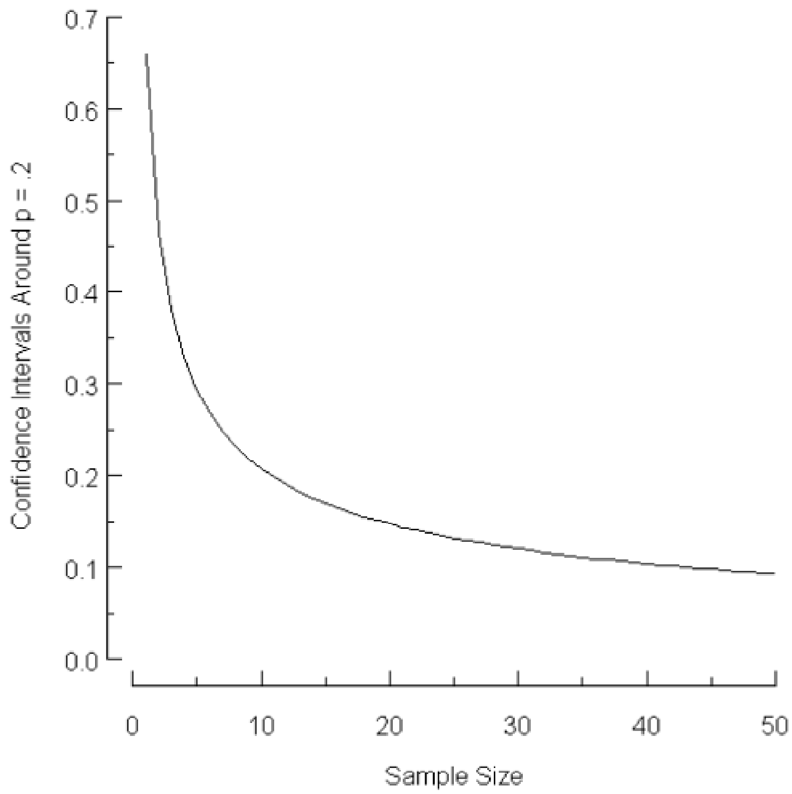
All monitoring activities shall meet the following requirements:

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. [40 CFR 122.41(j)(1)]
2. Permittees shall retain records of all monitoring information, including all calibration and maintenance of monitoring instrumentation, and copies of all reports required by this Order for a period of at least five (5) years from the date of the sample, measurement, report, or application. This period may be extended by request of the Water Board or USEPA at any time and shall be extended during the course of any unresolved litigation regarding this discharge. [40 CFR 122.41(j)(2), CWC section 13383(a)]
3. Records of monitoring information shall include [40 CFR 122.41(j)(3)]:
   a. The date, exact place, and time of sampling or measurements;
   b. The individual(s) who performed the sampling or measurements;
   c. The date(s) analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or methods used; and,
   f. The results of such analyses.
4. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this Order shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both. [40 CFR 122.41(j)(5)]
5. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in the monitoring Provisions. [40 CFR 122.41(l)(4)(iii)]
6. All chemical, bacteriological, and toxicity analyses shall be conducted at a laboratory certified for such analyses by the California Department of Health Services or a laboratory approved by the Executive Officer.
7. For priority toxic pollutants that are identified in the California Toxics Rule (CTR) (65 Fed. Reg. 31682), the Permittees shall instruct its laboratories to establish calibration standards that are equivalent to or lower than the Minimum Levels (MLs) published in Appendix 4 of the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP). If a Permittee can demonstrate that a particular ML is not attainable, in accordance with procedures set forth in 40 CFR 136, the lowest quantifiable concentration of the lowest calibration standard analyzed by a specific analytical procedure (assuming that all the method specified sample weights, volumes, and processing steps have been followed) may be used instead of the ML listed in Appendix 4 of the SIP. The Permittee must submit documentation from the laboratory to the Water Board for approval prior to raising the ML for any priority toxic pollutant.
8. The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-

compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both. [40 CFR 122.41(k)(2)]

9. If the discharger monitors any pollutant more frequently than required by the Permit, unless otherwise specified in the Order, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the reports requested by the Water Board. [40 CFR 122.41(l)(4)(ii)]

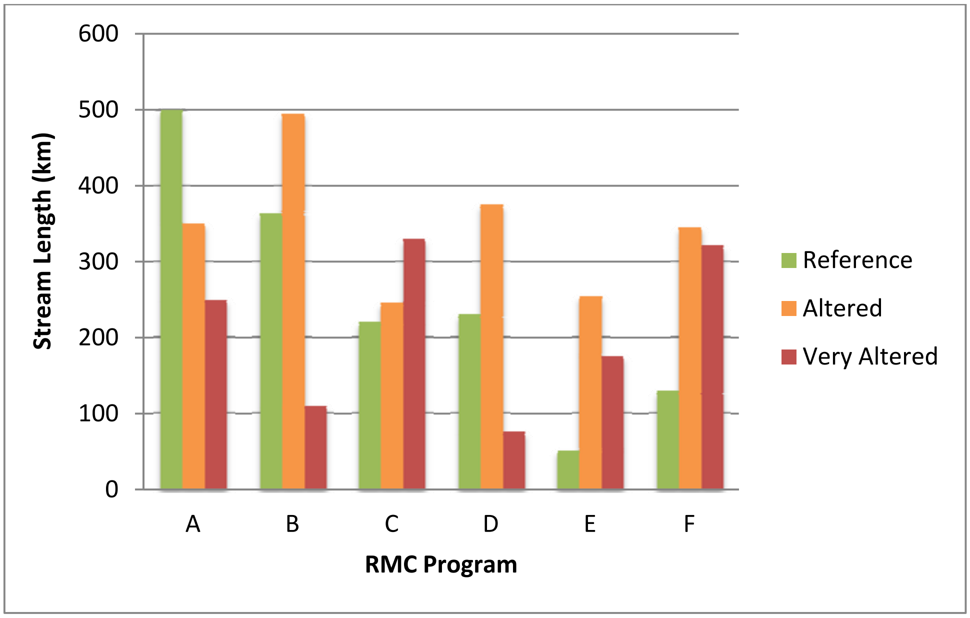
Appendix B. Sample Size Power Analysis



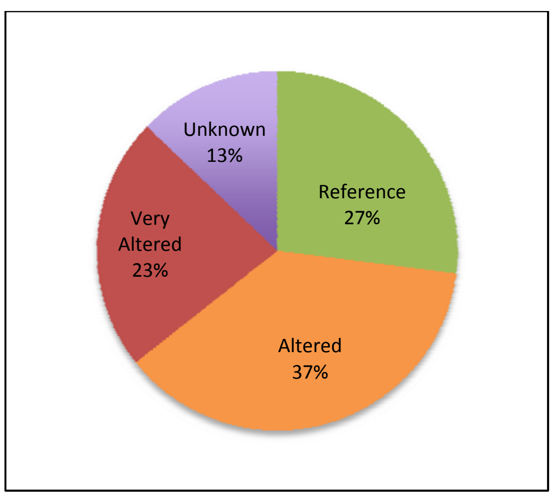
Power curve from a binomial distribution estimating sample size and associated confidence intervals (SMC 2007). A sample size of 30 provides an estimate of spatial extent +/- 12% which is considered sufficient for decision-making in the RMC area.

Appendix C. Example Report Figures

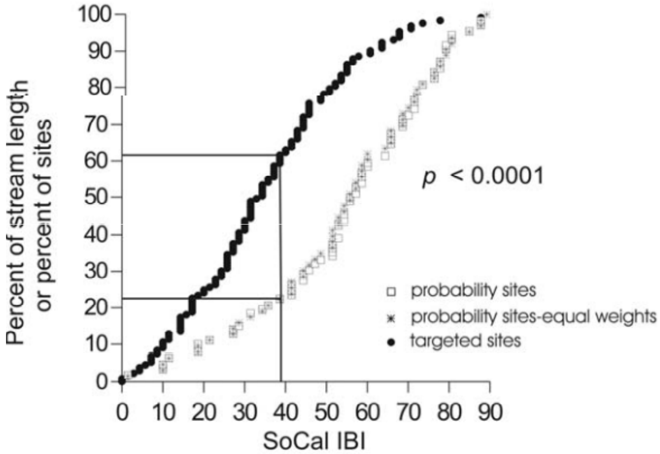
Condition Assessment:

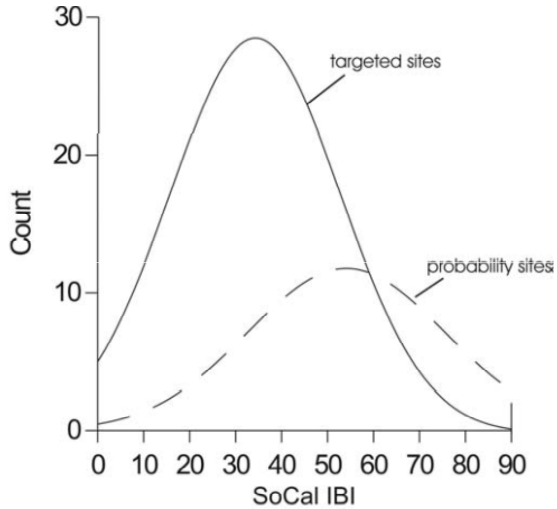


Example bar chart depicting creek kilometers in different condition categories across the specified RMC participant areas. Note: RMC bar charts will include error bars and a bar for the entire RMC illustrating region-wide creek kilometers in each condition category.



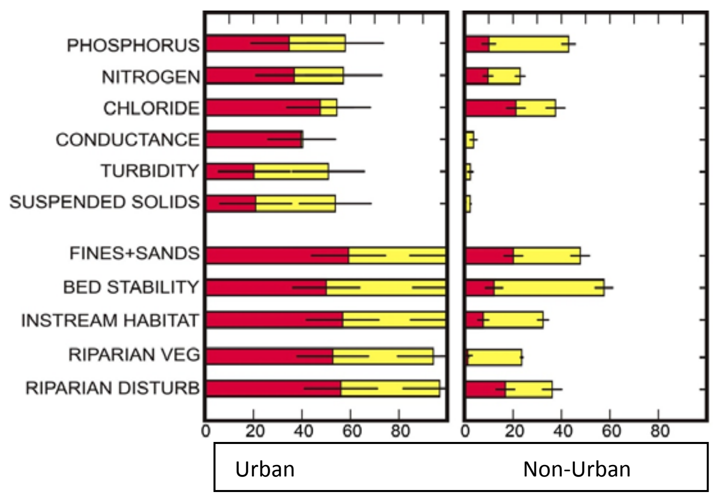
Example pie chart graph (companion to the bar chart above) depicting the % of stream length that falls into each of the aquatic life condition categories. Unknown category represents percentage of sites not sampled due to property owner denial, accessibility, etc.



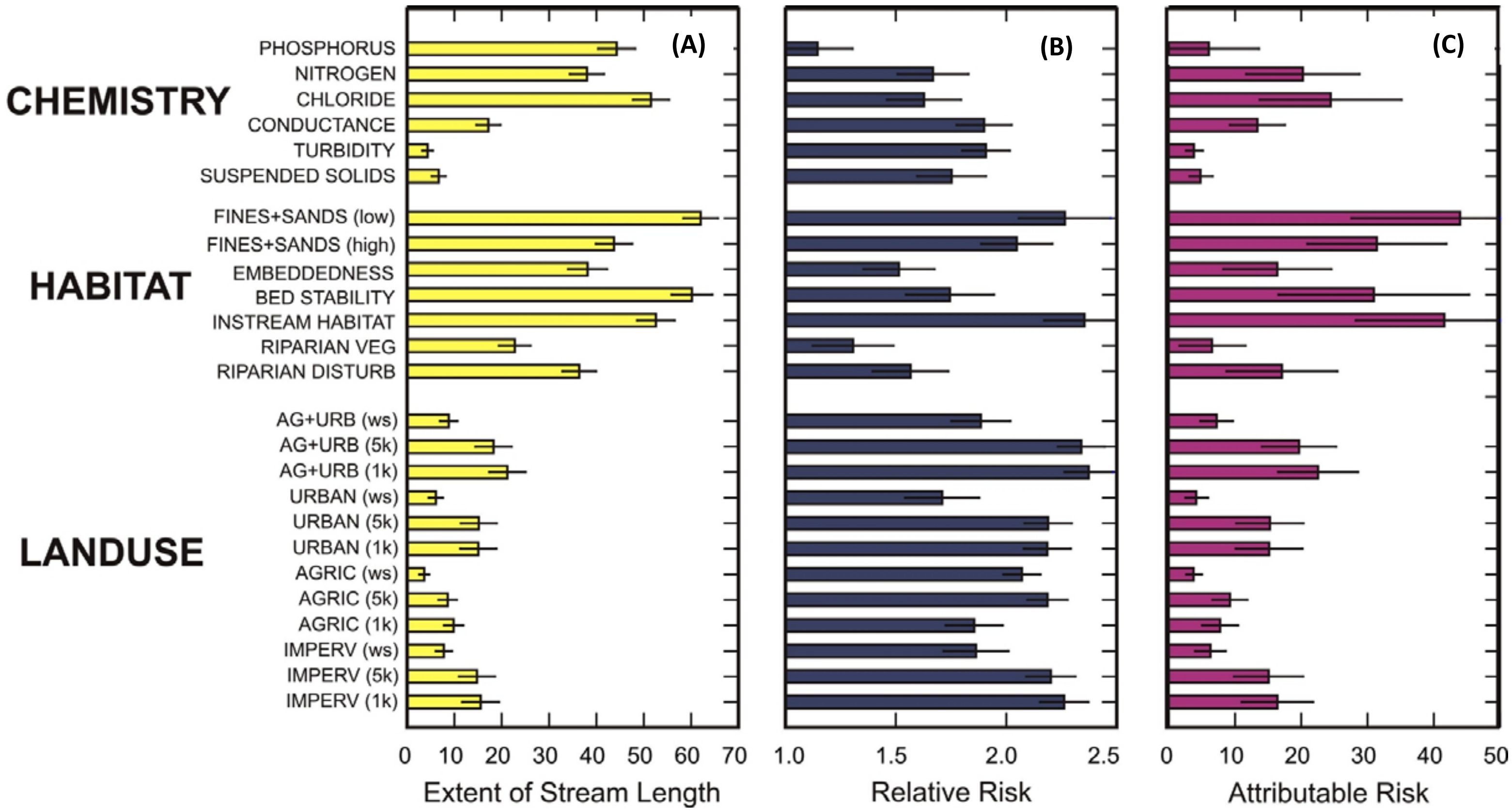


Example cumulative distribution functions (CDFs) of variables measured using the RMC ambient sample design (e.g., B-IBI scores & algal metrics) and targeted data.

Stressor Assessment:



Example horizontal bar graphs depicting the percentages of urban and non-urban creek kilometers in the RMC area that exceed threshold values for stressor indicators (modified SWAMP 2011).



Example horizontal bar charts depicting (A) the extent of stream length impacted by different stressors based on exceedances of water quality standards or threshold values; (B) relative risk that a stressor is contributing to the impact at each impacted site; and (C) the estimated extent of stream length that that a stressor is contributing to an impact (SWAMP 2011).

B2

BASMAA

Regional Monitoring Coalition

Creek Status Monitoring Program
Quality Assurance Project Plan

Prepared for:

The Bay Area Stormwater Management Agencies Association (BASMAA)

Prepared by:

EOA, Inc.
on behalf of the Santa Clara Urban Runoff Pollution Prevention Program and the San Mateo Countywide Water Pollution Prevention Program

Applied Marine Sciences
on behalf of the Alameda Countywide Clean Water Program

Armand Ruby Consulting
on behalf of the Contra Costa Clean Water Program

Final Draft February 1, 2012
(Version 1.0)

1. (A1) Title and Approval Sheet

Program Title	Regional Monitoring Coalition Creek Status Monitoring Program
Lead Organization	Bay Area Stormwater Management Agencies Association (BASMAA) P.O. Box 2385, Menlo Park, CA 94026, 510-622-2326 info@basmaa.org
Primary Contact	
Effective Date	
Revision Number	Version 1.0

1.1. Approval Signatures:

Table 1-1. Managing Organization:

Title	Name	Signature	Date
Program Manager			
Central QA Officer			
Central Information Management Coordinator			
Creek Status Monitoring Coordinator			

2. (A2) Table of Contents

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List of Acronyms

ASTM	American Society for Testing and Materials
BASMAA	Bay Area Stormwater Management Agencies Association
CCCWP	Contra Costa Clean Water Program
CEDEN	California Environmental Data Exchange Network
CIMCC	Central Information Management Coordinator
CQAO	Central Quality Assurance Officer
CWA	Clean Water Act
CWP	Clean Water Program of Alameda County
DMT	Data Management Team
DOC	Dissolved Organic Carbon
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EPA	Environmental Protection Agency (U.S.)
FC	Field Crew
FSURMP	Fairfield-Suisun Urban Runoff Management Program
IATA	International Air Transport Association
IDL	Instrument Detection Limits
IDW	Investigation-Derived Waste
IMC	Information Management Coordinator
LIMC	Local Information Management Coordinator
LPM	Laboratory Project Manager
LQAO	Local Quality Assurance Officer
MCC	Creek Status Monitoring Coordinator
MDL	Method Detection Limit
MPC	Monitoring and Pollutants of Concern Committee
MQO	Measurement Quality Objective
MRP	Municipal Regional Permit
NPDES	National Pollutant Discharge Elimination System
OC	Organochlorine
OERR	Office of Emergency and Remedial Response
PAH	Polycyclic Aromatic Hydrocarbon
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PM	Program Manager
PML	Stormwater Program Local Project Managers
PPE	Personal Protective Equipment
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Method Reporting Limit
RMC	Regional Monitoring Coalition
RMP	Regional Monitoring Program for Water Quality in the San Francisco Estuary
RP	Report Preparer
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SMSTOPPP	San Mateo Countywide Stormwater Pollution Prevention Program
SOP	Standard Operating Procedure
SSC	Suspended Sediment Concentration
SWAMP	California Surface Water Ambient Monitoring Program

TOC	Total Organic Carbon
TMDL	Total Maximum Daily Load
USA	Unified Stream Assessment
VSFCD	Vallejo Sanitation and Flood Control District

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3. (A3) Distribution List and Contact Information

The RMC QAPP was developed by the RMC to be comparable with the SWAMP Quality Assurance Program Plan (QAPrP), Version 1.0 (SWAMP 2008).

Table 3-1. RMC QAPP Distribution List

Title	Name and Affiliation	Telephone No.	QAPP #
Program Manager	Name	555-555-5555	1
Central QA Officer	Name		2
Central Information Mgmt Coordinator			3
Creek Status Monitoring Coordinator	Name		4
Local Program Project Mgr	Arleen Feng, CWP		5
Local Program Project Mgr	Jamison Crosby, CCCWP		6
Local Program Project Mgr	Kevin Cullen, FSURMP		7
Local Program Project Mgr	Chris Sommers, SCVURPPP		8
Local Program Project Mgr	Jon Konnan, SMCWPPP		9
Local Program Project Mgr	?, VSFCD		10
RWQCB Representative	Jan O'Hara		11
RWQCB Representative	Kevin Lunde		12
Lab PM			13
Lab PM			14
Lab PM			15
Report Preparer			16

4. (A4) Program Organization

4.1. Involved Parties and Roles

The Bay Area Stormwater Management Agencies Association (BASMAA) is a 501(c)(3) non-profit organization comprised of the municipal stormwater programs in the San Francisco Bay Area. The BASMAA programs supporting implementation of the Municipal Regional Stormwater NPDES Permit No. CAS612008 (MRP) include all 76 identified MRP municipalities and special districts, the Alameda Countywide Clean Water Program (ACCWP), Contra Costa Clean Water Program (CCCWP), the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), the Fairfield-Suisun Urban Runoff Management Program (FSURMP), the City of Vallejo and the Vallejo Sanitation and Flood Control District (VSFCD) (Table 4-1). Additionally, for the purposes of projects managed under this QAPP, the cities of Antioch, Brentwood, and Oakley, which are not named as Permittees under the MRP, have voluntarily elected to participate in MRP-related regional activities with the expectation that regionally coordinated activities undertaken by the Contra Costa Clean Water Program and other BASMAA partners will fulfill requirements that will be established by the Central Valley Regional Water Quality Control Board through its separate NPDES permit regulating stormwater discharges from eastern Contra Costa County.

To address requirements of water quality monitoring associated with implementation of the MRP, the above-mentioned parties formed the Regional Monitoring Coalition (RMC), a collaboration of San Francisco Bay Area stormwater programs and associated Permittees focused on effectively and efficiently developing and implementing a regionally coordinated water quality monitoring program that will improve stormwater management in the region. The goals of the RMC are to:

1. Assist Permittees in complying with requirements in MRP Provision C.8 (Water Quality Monitoring);
2. Develop and implement regionally consistent creek monitoring approaches and designs in the Bay Area, through the improved coordination among RMC participants and other agencies (e.g., Water Board) that share common goals; and
3. Stabilize the costs of creek monitoring by reducing duplication of effort and streamlining reporting.

Through its implementation, the RMC allows Permittees and the Water Board to effectively modify their existing creek monitoring programs, which improves their ability to collectively answer core management questions in a cost effective and scientifically rigorous way. Participation in the RMC is coordinated by stormwater program and or Permittee representatives (or equivalent), and facilitated through the BASMAA Monitoring and Pollutants of Concern Committee (MPC). The RMC implementation area is shown in Figure 4-1.

While more than seventy MRP Permittees are participating in the in the RMC, the majority of effort expended to manage the monitoring efforts is anticipated to be performed at the countywide or other regional organization level. For the purposes of this document, the term “Stormwater Program” will be used herein to refer to these organizing levels.

Table 4-1. San Francisco Bay Area Stormwater Programs and Associated MRP Permittees Participating in the BASMAA Regional Monitoring Coalition (RMC).

Stormwater Programs	RMC Participants
Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)	Cities of Campbell, Cupertino, Los Altos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga, Sunnyvale, Los Altos Hills, and Los Gatos; Santa Clara Valley Water District; and, Santa Clara County
Clean Water Program of Alameda County	Cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City; Alameda County; Alameda County Flood Control and Water Conservation District; and, Zone 7
Contra Costa Clean Water Program (CCCWP)[1]	Cities of Antioch, Brentwood, Clayton, Concord, El Cerrito, Hercules, Lafayette, Martinez, Oakley, Orinda, Pinole, Pittsburg, Pleasant Hill, Richmond, San Pablo, San Ramon, Walnut Creek, Danville, and Moraga; Contra Costa County; and, Contra Costa County Flood Control and Water Conservation District
San Mateo County Wide Water Pollution Prevention Program (SMCWPPP)	Cities of Belmont, Brisbane, Burlingame, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Redwood City, San Bruno, San Carlos, San Mateo, South San Francisco, Atherton, Colma, Hillsborough, Portola Valley, and Woodside; San Mateo County Flood Control District; and, San Mateo County
Fairfield-Suisun Urban Runoff Management Program (FSURMP)	Cities of Fairfield and Suisun City
Vallejo Permittees	City of Vallejo and Vallejo Sanitation and Flood Control District

[1] The Cities of Antioch, Brentwood and Oakley, and portions of Unincorporated Contra Costa County are subject to an NDPES Permit issued by the Central Valley Regional Water Quality Control Board (as opposed to the MRP). Monitoring requirements in this Permit are similar to those in the MRP and therefore these Permitees have agreed to participate in the RMC.

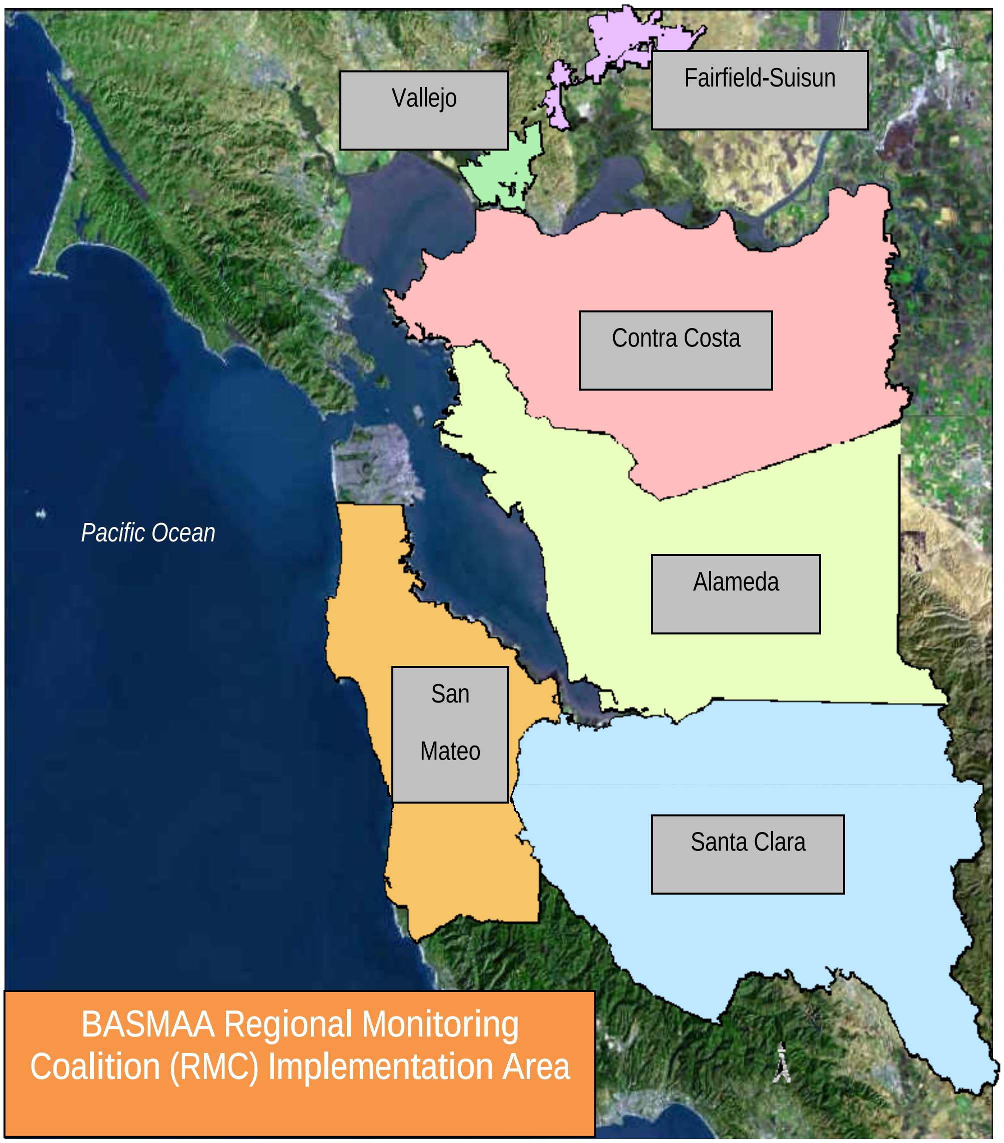
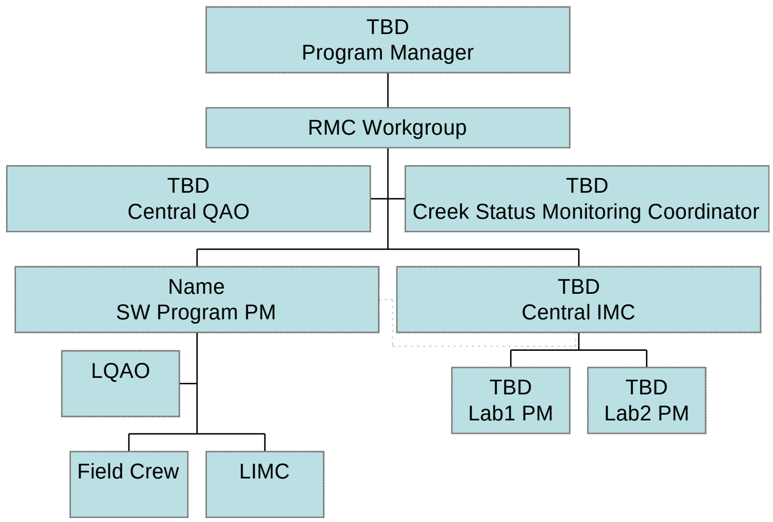


Figure 4-1. BASMAA Regional Monitoring Coalition (RMC) Implementation Area.

A general organization chart for managing dataflow within the RMC is depicted in Figure 4-2. Additional information regarding dataflow roles, responsibilities and access are provided in the RMC Information Management System .

Figure 4-2. RMC Dataflow Diagram.



4.2. Program Manager Role

The Program Manager (PM) will be responsible for oversight of RMC management level activities, including budgeting, reporting, and updating of the QAPP when appropriate. In addition, the Program Manager will coordinate with the Program partners and key regional agencies, including the California Regional Water Quality Control Board (Water Board), and oversee preparation of required reports to the Water Board.

4.3. RMC Work Group

The PM will be assisted in design and implementation of RMC Creek Status Monitoring activities by a project management team consisting of representatives from BASMAA member agencies, the RMC Workgroup (Workgroup). Workgroup members will provide guidance for the overall RMC effort (e.g., centralized reporting, identifying modifications to the RMC, and contracting with laboratories).

4.4. Central Quality Assurance Officer Role

The role of the RMC Central Quality Assurance Officer (CQAO) is to provide independent oversight and review of the quality of the data being generated by the Program with respect to the quality that is required. Thus, the CQAO will be independent from those generating all Program information and will not report to the proposed Program Manager or to any of the proposed technical staff. In this role, the

CQAO has the responsibility to require data that is of insufficient quality to be flagged, or not used, or for work to be redone as necessary so that the data meets specified quality measurements.

The CQAO will be responsible for overall Program quality assurance, but due to the size of the effort and number of participating agencies, will not be responsible for day-to-day quality assurance efforts that are the responsibility of the individual Stormwater Programs. As such, the CQAO will ensure that appropriate measures are in place within the QAPP to ensure data quality and monitor that actions required through the QAPP are undertaken by those with these responsibilities (e.g., Local QAOs).

4.5. Central Information Management Coordinator Role

The RMC Creek Status Central Information Management Coordinator (CIMC) is responsible for ensuring laboratory program compliance with the QAPP. The CIMC will also ensure that raw data is available to LIMCs for transfer to SFEI annually for input into CEDEN.

4.6. Creek Status Monitoring Coordinator Role

The Creek Status Monitoring Coordinator (MCC) will oversee the technical conduct of the field related components of the Creek Status Monitoring Program, including ensuring field program compliance with the QAPP for tasks overseen at the programmatic level. As required, the MCC will consult with the CQAO to make proposals to the Workgroup to initiate changes to the RMC (e.g., identifying potential modifications to SOPs or QAPP) or address questions posed by RMC participants.

4.7. Local Project Managers

Individual Stormwater Program Local Project Managers (PMLs) will be responsible for the day-to-day operations associated with implementation of the Creek Status monitoring component of the MRP. It will be their responsibility to ensure that data generated and reported through implementation of the Creek Status Monitoring program meet data quality objectives and work with the CQAO as required to resolve any uncertainties or discrepancies.

4.8. Local Program Local Information Management Coordinator

The Stormwater Program Local Information Management Coordinator (LIMC) will serve as the primary contact for communication with contract laboratory(ies), field crews, and the CIMC. Also, the LIMC will be responsible for management of all data not managed by the CIMC. LIMCs will be responsible for reviewing field datasheets prepared by FCs and, as applicable, ensuring correction of errors and providing feedback to FCs. LIMCs will also receive and store laboratory electronic data deliverables (EDDs) at the local stormwater program level.

4.9. Local Program Quality Assurance Officer

The role of the Local Quality Assurance Officer (LQAO) is to provide independent oversight and review of the quality of the data being generated by the individual Stormwater Program producing that data and, as applicable, transferring to the Program level. Thus, the LQAO will be independent from those generating all information and will not report to the proposed PML or to any of the proposed technical staff. In this role, the CQAO has the responsibility to require data that is of insufficient quality to be flagged, or not used, or for work to be redone as necessary so that the data meets specified quality measurements. The LQAO will also be responsible for ensuring that all required local QA activities are being conducted (e.g., field calibrations, field audits, etc.), and will forward this information along to the CQAO for compilation.

4.10. Local Program Field Crew Role

The Stormwater Program Field Crews (FCs) will be responsible for conducting all monitoring- and reporting-related activities, including completion of field datasheets, chain of custodies, and collection of field measurements and field samples, consistent with the QAPP and Standard Operating Procedures (SOPs).

4.11. Laboratory Project Manager

The Laboratory Project Manager (LPM) at the selected analytical laboratory(ies) will be responsible for ensuring that the laboratory's quality assurance program and standard operating procedures are consistent with this QAPP, and that laboratory analyses meet all applicable requirements or explain any deviations. The LPM will also be responsible for coordinating with the CQAO and CIMC as required for the project.

4.12. Report Preparer

The Report Preparer (RP) will be responsible for developing and submitting regional reporting activities as outlined in the QAPP and MRP. Specific deliverables will include development of the draft versions of the regional creek status portion, the regional POC loads monitoring portion.

Titles and contact information for the RMC personnel responsibilities at central and local levels are provided in Tables 4-2 and 4-3

Table 4-2. RMC Personnel Responsibilities at Central Level

Name	Organizational Affiliation	Title	Contact Information (Name; Phone / Fax; email)
	RMC	Program Manager	555.555.5555 name@domain.org
	RMC	Central Information Management Coordinator	555.555.5555 name@domain.org
	RMC	Central QA Officer	555.555.5555 name@domain.org
	RMC	Monitoring Coordinator	555.555.5555 name@domain.org

Table 4-3. RMC Personnel Responsibilities at Local Level

Name	Organizational Affiliation	Title	Contact Information (Name; Phone / Fax; email)
	SW Program	Local Project Manager	555.555.5555 name@domain.org
	SW Program	Local Information Management Coordinator	555.555.5555 name@domain.org
	SW Program	Local QA Officer	555.555.5555 name@domain.org
	SW Program	Local Field Crew	555.555.5555 name@domain.org

5. (A5) Problem Definition/Background

5.1. Problem Statement

This QAPP was developed to assist in conducting the monitoring required in Provision C.8 of the MRP, adopted Oct. 2009 (RWQCB 2009).

5.2. Decisions or Outcomes

RMC Status and trends monitoring in local creeks/rivers is intended to answer the following core management questions:

1. Are conditions in local creeks supportive of or likely to be supportive of beneficial uses?
2. Are conditions in local creeks getting better or worse over time?
3. Are water quality objectives, both numeric and narrative, being met?
4. What are the long-term trends in pollutant concentrations and toxicity in receiving waters and sediment?

The Program will provide information about creek status through multiple lines of inquiry, including monitoring of biological community and physical habitat, general water quality, water chemistry, water toxicity, sediment chemistry, sediment toxicity, and pathogen indicators.

5.3. Water Quality or Regulatory Criteria

This Program will yield data through many related monitoring efforts. This data will be reported by RMC agencies and may be used by the Permittees and Water Board for status reporting, comparison to Basin Plan water quality objectives (and 303d listing or de-listing), comparison with triggers identified within the MRP Attachment H, and watershed assessments. Results that exceed identified triggers may results in a required Stressor / Source Identification Monitoring Project to be conducted as identified within MRP Provision C.8.d.i.

6. (A6) Program/Task Description

6.1. Work Statement and Produced Products

Cumulative, the Creek Status Monitoring Program will include water quality measurements and also collection of individual samples for analysis of chemical analytes and/or organisms in water, sediment, and tissue as described in MRP Table 8.1. Sampling and measurements will be made during both wet and dry weather conditions. Station types sampled may include: rivers, streams and/or creeks, sampled at varying frequencies depending on parameter and jurisdiction.

Results will be discussed relative to prior conditions, beneficial uses, and applicable water quality standards as described in the Basin Plan, the Ocean Plan (CSWRCB 2005), or the California toxics Rule (Federal Register 1997), or other applicable water quality control plans. Where appropriate, hypotheses will be developed to investigate potential pollutant sources, trends, and BMP effectiveness. Reports will identify and prioritize water quality problems, sources of water quality problems, describe follow-up actions and any additional management actions needed to address water quality problems, and evaluate the effectiveness of existing control measures.

In compliance with MRP provision C.8.g monitoring results will be analyzed and synthesized into regional and local assessment reports annually to address the RMC management questions as described below. Reports will summarize monitoring conducted during the foregoing October 1 – September 30 period and will be submitted to the Regional Board by March 15 following this period. The initial reports for RMC participants will be on March 15, 2013.

6.2. Sampling Detail

The Creek Status Monitoring Program entails a wide variety of sample collection, water quality measurements, and field assessments designed to comply with Provisions C.8.c and C.8.e of the MRP. Table 6-1 lists the parameters that will be monitored, their sampling frequency and the associated monitoring design. Sampling design is summarized in Section B2 of this report and in greater detail within the RMC Creek Status and Long-Term Monitoring Plan (BASMAA 2011).

Table 6-1. Summary of RMC Monitoring Parameters, Designs, and Reporting.

Parameter	RMP Required # of Annual Sites/Miles[1]	Monitoring Design	
		Regional Condition Status (Probabilistic)	Targeted
Bioassessment, PHAB, Water Quality, Nutrients	20/10/4	X	
General Water Quality (sondes)	Spring 3/2/1 Dry 3/2/1		X (Spring and Dry)
Chlorine	Spring 20/10/2 Dry 3/2/1	X (Spring and Dry)	
Temperature (Hobos)	8/4/1		X
Water Toxicity	Dry 3/2/1 Storm 3/2/1	X	*TBD*
Sediment Toxicity	3/2/1	X	*TBD*
Sediment Chemistry	3/2/1	X	*TBD*
Bacteria	5/5/*		X
Stream Survey	9/6/3 (miles)		X

[1] The number of sampling sites shown is based on the relative population in each Regional Stormwater Countywide Program and is listed in this order: Santa Clara & Alameda Countywide / Contra Costa & San Mateo Countywide / Vallejo & Fairfield-Suisun Programs.

Sampling parameters associated with probabilistic and targeted creek status monitoring designs are discussed in more detail below. Methods used to measure these parameters are provided in Section B3 of this report and in the RMC Monitoring Plan

6.2.1. Probabilistic Monitoring Design Parameters

The following parameters will be measured at sites that are selected using a probabilistic monitoring design: biological assessments (including physical habitat assessments), general water quality, nutrients, chloride, sediment toxicity and chemistry and water toxicity.

6.2.1.1. Biological Assessments

Bioassessments will be conducted one time each year during spring index period (approximately April 15 – July 15), with the goal of assessing all sites within a two month period each year. To the extent practical, the RMC will conduct sampling approximately 30 days following any significant storm event that occurs during the index period or prior to the start of the index period.

Bioassessments will consist of the collection of benthic macroinvertebrate and algae samples and the measurement of physical parameters related to biological habitat. Physical water quality measurements are measured synoptically with bioassessments. Measurements will include (1) dissolved oxygen; (2) temperature, (3) conductivity, and (4) pH. Water samples will also be collected during bioassessments and analyzed for nutrients and other constituents listed below:

- Total Phosphorus (as P)
- Dissolved Orthophosphate (as P)
- Total Kjeldahl Nitrogen (TKN)

- Nitrate (as N)
- Nitrite (as N)
- Total Nitrogen (calculated as a sum of TKN, Nitrate and Nitrite)
- Ammonia (as N)
- Silica
- Chloride (total and free)
- Organic Carbon (Dissolved)
- Suspended Sediment Concentration

6.2.1.2. Aquatic Toxicity Monitoring

Twice per year, field crews will collect appropriate volumes of water to support aquatic toxicity testing. One sample will be collected during a storm event, and a second during dry season sampling. Sampling will be conducted at pre-determined number of site(s) (Table 6-1) that were selected using a probabilistic design for bioassessment monitoring.

Acute toxicity tests are short-term tests that measure the effects of exposure of a test organism to relatively high concentrations of chemicals in a given media. The measurement endpoint generally reflects the extent of lethality. In comparison, chronic toxicity tests generally are longer-term tests that measure the effects of exposure to relatively lower, less toxic concentrations. For a chronic toxicity test, the measurement endpoint concerns a sublethal effect (e.g., reproduction, growth) or both lethal and sublethal effects (USEPA 1994a). The following aquatic toxicity tests will be performed as part of the RMC effort:

- *Selenastrum capricornutum* (sublethal endpoint)
  The chronic algal growth test performed on *Selenastrum capriconutum* identifies both biostimulatory and chronic toxic effects of a sample to a one-celled freshwater alga (USEPA 1994b). The test uses the static design and lasts 96 hours, to a growth endpoint.

- *Ceriodaphnia dubia* (lethal and sublethal endpoints)
  The *Ceriodaphnia dubia* survival and reproduction test estimates chronic toxicity of a sample to *Ceriodaphnia dubia*, a water flea. The test uses the static-renewal design, will run for 96 hours, and monitors survival and reproduction of test organisms as endpoint.

- *Pimephales promelas* (lethal and sublethal endpoints)
  Acute and chronic tests extending 7 days in duration are performed on *Pimephales promelas*, the fathead minnow, under static conditions. Toxicity tests are performed on *P. promelas* larvae, to a growth and survival endpoint.

- *Hyalella azteca* (lethal endpoint)
  Acute tests extending 10 days in duration are performed on *Hyalella azteca*, an amphipod, under static conditions. The endpoint for acute tests is survival.

6.2.1.3. Sediment Toxicity Sampling

Once per year during the dry season, field crews will collect samples for analysis of sediment toxicity. Sampling will be conducted at pre-determined number of site(s) (Table 6-1) that were selected using a probabilistic design for bioassessment monitoring. Samples will be collected by direct removal of surficial sediments from depositional areas within the wetted perimeter of creeks, homogenized on-site, aliquotted into appropriate containers, and handled appropriate for the designated analyses. The collected samples will be analyzed at a contracted laboratory for sediment toxicity using the 10-Day *Hyalella azteca* sediment toxicity test, with endpoint of survival.

6.2.1.4. Sediment Chemistry Sampling

Concurrent with sediment toxicity sampling described above, sediment chemistry samples will be collected for analysis of the following:

- grain size
- TOC
- metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc)
- Organochlorine pesticides (DDTs, chlordane, dieldrin, endrin, heptachlor epoxide, and lindane (gamma-HCH))
- PAHs (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b) fluoranthene, benzo(e) pyrene, benzo(g,h,i) perylene, benzo(k) fluoranthene, biphenyl, chrysene, dibenz(a,h) anthracene, dibenzo-thiophene, 2,6-dimethyl-naphthalene, fluoranthene, fluorene, indeno(1,2,3-c,d) pyrene, 1-methyl-naphthalene, 2-methyl-naphthalene, 2-methyl-phenanthrene, naphthalene, perylene, phenanthrene, and pyrene)
- pyrethroids bifenthrin, cyfluthrin, total cypermethrin, total deltamethrin, total esfenvalerate/ fenvalerate, total lambda-cyhalothrin, total cis-permethrin, trans-permethrin).

Samples for analysis of sediment chemistry will be aliquotted from the same homogenate prepared for analysis of sediment toxicity.

6.2.2. Targeted Monitoring Design Parameters

6.2.2.1. General Water Quality Measurements

Field parameters under targeted monitoring design include continuous measurements of dissolved oxygen, specific conductivity, pH, and temperature. These parameters will be measured twice per year, once during the spring and during the August – September timeframe. Monitoring equipment will be placed in the field so that measurements of each of the target parameters will be recorded at fifteen-minute intervals of the course of a one- to two-week deployment.

6.2.2.2. Continuous Temperature Monitoring

Field crews will deploy digital temperature loggers at selected sites within Stormwater Program jurisdictions. The loggers will be deployed for the period April through September, and will be programmed to record temperature data at sixty-minute intervals

6.2.2.3. Pathogens Indicators Sampling

Once per year, during the dry season, field crews will collect water samples for analysis of pathogen indicators. Sampling techniques will include direct filling of containers, preservation in the field (as required), and immediate transfer of samples to analytical laboratories within specified hold time requirements. The following analytes will be measured: (1) *E. coli*, and (2) fecal coliform.

6.2.2.4. Stream Surveys

Once per year, field crews will conduct stream surveys using a modified Unified Stream Assessment (USA) approach (CWP 2005) or equivalent method.

6.3. Project Schedule

The proposed schedule for monitoring activities and deliverables is summarized in Table 6-2 below. The sampling schedule below is based upon the MRP monitoring requirements for those Programs with the most extensive required level of effort. The sampling schedule below is based on the MRP monitoring requirements for those Programs with the most extensive required level of effort. Note that successive sampling years follow the same schedule.

Table 6-2. Program Schedule Timeline.

Activity	Date of Initiation	Date of Completion	Deliverable	Due Date
Preparation for monitoring	10/19/10	08/15/11	Approved QAPP Monitoring Plan	10/01/11
Aquatic Toxicity, Storm Event	10/01/11	04/30/12	Lab results	See below
Continuous Temperature Recording	04/01/12	09/30/12	60-minute interval data April through Sept	See below
Biological Assessment[1], WQ Field Measurements, Nutrients & Chlorine	04/15/12	07/15/12	BMI community analysis, WQ measurements	See below
Continuous WQ Monitoring	04/15/12	07/15/12	15-minute data, 1 to 2 weeks	See below
Aquatic Toxicity, Dry Season	07/01/12	09/30/12	Lab results	See below
Pathogen Indicators	07/01/12	09/30/12	Lab results	See below
Sediment Toxicity & Chemistry	07/01/12	09/30/12	Lab results	See below
Stream Survey	07/01/12	09/30/12	Survey results	See below
Continuous WQ Monitoring	08/01/12	09/30/12	15-minute data, 1 to 2 weeks	See below
Status & Trends Electronic Reporting	10/01/12	01/15/13	SWAMP comparable data report forwarded to Water Board and SFEI for input to CEDEN	01/15/13
Urban Creeks Monitoring Report(s)	10/01/12	01/15/13	Summary and interpretation	03/15/13

[1] RMC goal will be to conduct all bioassessments within a two month period within the 3 month index period each year.

The sampling trips will be conducted at varying frequencies and times dependent on project needs and MRP requirements; exact timing will be determined based on flow, weather and water quality conditions, and anticipated activities. Laboratory analyses will follow specific status monitoring efforts and the final analytical report will be finished by March 15th of each successive monitoring year.

6.4. Geographical Setting

The RMC Ambient Status Monitoring Program applies to all non-tidally influenced perennial and non-perennial creeks in Alameda, Contra Costa, San Mateo, Santa Clara and Solano Counties that are within Water Board Region 2 boundary and the eastern portion of Contra Costa County that are within Water Board Region 5 boundary (Figure 6-1).

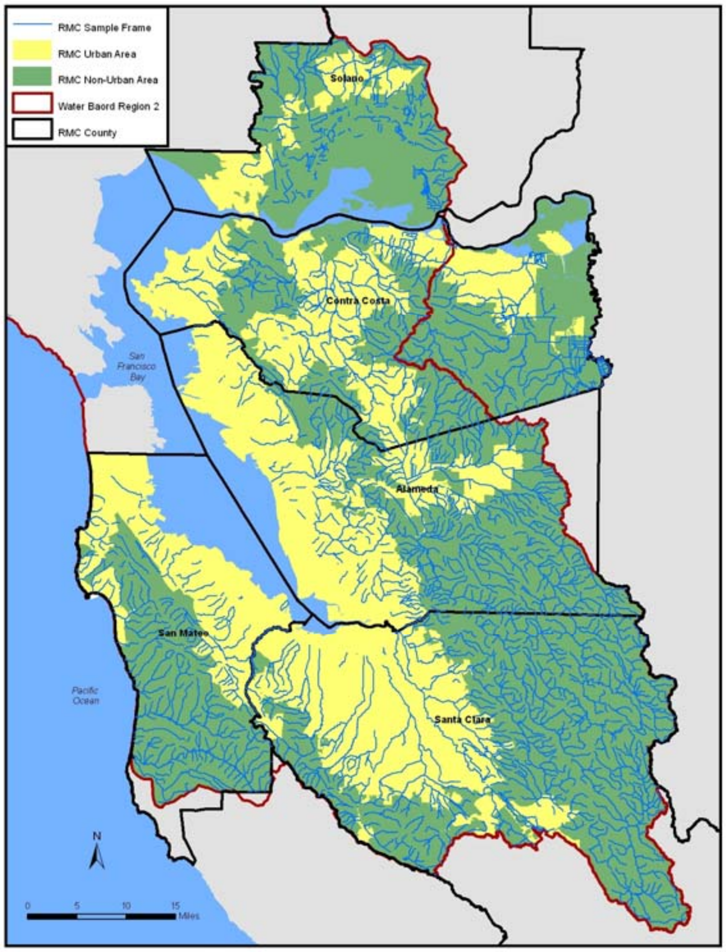


Figure 6-1. RMC Geographical Area

6.5. Constraints

Extreme wet weather may pose a safety hazard to sampling personnel and may therefore impact planned storm event sampling. Extreme dry weather may limit or prevent representative sampling due to low flow and/or harsh conditions that would adversely affect the parameters being monitored. If some planned sampling sites are not accessible because of legal restrictions, then there will be some gaps that could affect some of the conclusions drawn from the data. Budget constraints caused by unexpected problems in accessing the planned monitoring locations or unanticipated analytical difficulties (such as interferences requiring selection of other methods, accepting higher detection levels, or requiring additional clean up of samples prior to their analysis) could result in fewer locations or samples. Lower measurement quality would result in lowering data quality objectives for the Program.

7. (A7) Quality Objectives and Criteria for Measurement Data

The quantitative measurements that estimate the true value or concentration of a physical or chemical property always involve some level of uncertainty. The uncertainty associated with a measurement generally results from one or more of several areas: (1) natural variability of a sample; (2) sample handling conditions and operations; (3) spatial and temporal variation; and (4) variations in collection or analytical procedures. Stringent QA and QC procedures are essential for obtaining unbiased, precise, and representative measurements and for maintaining the integrity of the sample during collection, handling, and analysis, as well and for measuring elements of variability that cannot be controlled. Stringent procedures also must be applied to data management to assure that accuracy of the data is maintained.

Data Quality Objectives (DQOs) are established to ensure that data collected are sufficient and of adequate quality for the intended use. DQOs include both quantitative and qualitative assessment of the acceptability of data. The qualitative goals include representativeness and comparability, and the quantitative goals include completeness, sensitivity (detection and quantization limits), precision, accuracy, and contamination.

DQOs for the non-biological laboratory analytical components of the RMC are described in narrative form in sections below. Specific DQOs for the Program will be based on Measurement Quality Objectives (MQOs) for each analyte. Data acquisition activities will include both field measurements and laboratory analyses, which are specified in Appendix A for RMC Analytes.

Approaches used for data quality assurance for water chemistry do not have the same application to biological data. Instead of using the repeatable physical and chemical properties of target constituents to assess accuracy and precision, biological data are quantified using trained taxonomists relying on organism morphological features. Even for highly trained and experienced taxonomists, if organisms are immature, damaged, or otherwise indistinct, accurate identification can be difficult. Moreover, phylogenies can and do change over time based on increases in taxonomic understanding.

Compounding the challenge between chemistry and biology is the inherent small-scale spatial and temporal variability in biological data. Unlike chemical data where replicate sampling and analysis of samples are expected to be similar, no such expectation exists for biological data. Hence, MQOs in this QAPP have a strong emphasis on training and oversight. In addition, chemical approaches that focus on accuracy do not apply to biological samples. For example, matrix spikes used for chemistry have no parallel in biological samples. Thus, a new approach using independent third party verification through a reference laboratory becomes the primary mechanism for assuring accuracy.

The MQOs in this plan, developed by SWAMP (SCCWRP 2009), focus on five aspects of biological data quality: representativeness, completeness, sensitivity, precision and accuracy. Specifically, these MQOs address the sampling, sorting, and identification phases for producing benthic macroinvertebrate data. The overarching objectives of the MQOs for BMI bioassessment data is to first validate the taxonomic data and ensure that the final data have an overall error ≤10%, and to provide constructive feedback concerning errors that occurred during identification to the taxonomist with the purpose of allowing them to prevent the errors from occurring in the data in the future. The BMI MQOs and data production processes are summarized in Appendix B.

In general, MQOs were set at levels found in the survey of other BMI bioassessment programs. MQOs were set at 99% for objectives where perfect compliance was a reasonable expectation (e.g., most completeness MQOs). Where perfect compliance was not a reasonable expectation, the MQOs were set at 90%. However, where available data supported more stringent thresholds, MQOs were set at 95%. It is expected that, as data become available, these MQOs will change to reflect the most stringent threshold that can be reasonably attained.

Data quality objectives for benthic algae are not addressed in this version of the RMC Bioassessment QAPP. The SWAMP bioassessment group is currently developing guidelines for quality assurance and quality control for algae data, including the development of laboratory SOPs, on-line identification tools, master taxonomic list, and a standard taxonomic level of effort (similar to what SAFIT develops for BMIs). It is anticipated that SWAMP will incorporate forthcoming tools and documentation into a statewide QAPP for benthic algae. The RMC will update this QAPP to include MQOs for algae as they become available.

There are no SWAMP data quality objectives for physical habitat data that is collected synoptically with benthic macroinvertebrate and algae data. Similar to algae, the RMC will update this QAPP to include MQOs for physical habitat as they become available. Until a statewide SWAMP QAPP is developed that addresses both algae and physical habitat, the RMC will place strong emphasis on training and oversight for both field and laboratory personnel to ensure highest data quality (Section 8).

Quality objectives associated with representativeness, comparability, completeness, sensitivity, precision and accuracy in narrative form for both chemical and biological data are presented below.

7.1. Representativeness

7.1.1 Chemical Data

The representativeness of data is the ability of the sampling locations and the sampling procedures to adequately represent the true condition of the sample sites. Field personnel will strictly adhere to the field sampling protocols to ensure the collection of representative, uncontaminated samples. The most important aspects of quality control associated with chemistry sample collection are as follows:

- Field personnel will be thoroughly trained in the proper use of sample collection equipment and will be able to distinguish acceptable versus unacceptable samples in accordance with pre-established criteria.

- Field personnel are trained to recognize and avoid potential sources of sample contamination (e.g., dirty hands, insufficient field cleaning).

- Samplers and utensils that come in direct contact with the sample will be made of non-contaminating materials, and will be thoroughly cleaned between sampling stations.

- Separate samples will be collected for each analysis, thus avoiding the need for sub-sampling and sample splitting between labs.
- Sample containers will be pre-cleaned and of the recommended type.

7.1.1 Biological Data

There are three scales of representativeness for biological sampling including watershed, reach, and sample scales. In probabilistic studies, representativeness is ensured at the watershed scale by a spatially-balanced random sampling design, where there is a known probability of inclusion for all sites in the study. This representativeness is ensured by evaluating random sites in order for sampling or rejection. For the RMC, sites are evaluated in order within each management unit.

Representativeness of the sampling event is ensured by sampling within the **nominal targets**—that is, sampling occurs at the intended place and time. The MQOs for sampling event representativeness are measured by proximity to the nominal coordinates (i.e., within 300 m or 10 seconds latitude and longitude, as determined by a global positioning system), within the nominal index period (i.e., 4 to 12 weeks after the last major rainfall, or April 15 to July 15), and within the nominal stratum (i.e., the correct stream order and land use). Corrective action for this MQO is to flag samples that are collected more than 10 seconds from the nominal coordinates, and to reject samples collected outside the index period or nominal stratum.

At the reach scale, representativeness is ensured through the use of reach-wide sampling, which is assumed to sample microhabitats in proportion to their abundance at a reach.

At the sample scale, representativeness is ensured through the sample **homogenization** and **subsampling** procedures that give each individual organism an equal probability of selection during the sorting phase. Samples are subsampled into aliquots by evenly spreading the sample onto gridded trays, and grids are randomly assigned a picking order. Sample depth should be no greater than 0.5 inches. For the first subsample, one-eighth of the grid is transferred to a tray or Petri dish for sorting under a dissecting microscope. Organisms overlapping multiple grids (or portions of grids) are selected if the majority (i.e., >50%) of their body is within the grid to be sorted. If <20 organisms are taken from the first grid, then larger portions (i.e., one-quarter, one-half, or a whole grid) of subsequent grids are to be sorted. A minimum of three grids or 25% of the total sample volume must be selected for sorting, and all selected grids are sorted to completion. Sorting is completed when both of the following conditions are met: 1) At least 600 organisms are picked from a sample; and 2) At least three grids are sorted *or* at least 25% of the total sample volume is sorted. For samples with very high densities of organisms, it is possible to pick more than 600 individuals before processing the minimum three grids or 25% of the total sample volume. In these cases, data are flagged, but are still considered valid for analysis and assessment. Corrective action for this MQO include flagging data as potentially not representative.

Representativeness of taxonomic identifications is ensured by identifying all the organisms that were sorted.

Example lab benchsheets for sorting and identification are provided in Appendix C.

7.2. Comparability

Comparability is the degree to which data can be compared directly to other relevant studies. All data collected through implementation of the RMC will also be performed in a manner so that data is comparable with California Surface Water Ambient Monitoring Program (SWAMP) protocols.

7.3. Completeness

7.3.1. Chemical Data

Completeness is defined as the percentage of valid data collected and analyzed compared to the total expected to being obtained under normal operating conditions. Overall completeness accounts for both sampling (in the field) and analysis (in the laboratory). Valid samples include those for analytes in which the concentration is determined to be below detection limits.

Completeness is expressed as overall completeness for a given parameter for each component of the RMC. Under ideal circumstances, the objective is to collect 100 percent of all field samples desired, with successful laboratory analyses on 100% of measurements (including QC samples). However, circumstances surrounding sample collections and subsequent laboratory analysis are influenced by numerous factors, including weather, shipping damage or delays, sampling crew or lab analyst error, and QC samples failing DQOs. An overall completeness of greater than 90% is considered acceptable for the Program.

7.3.2. Biological Data

Completeness describes the success of sample collection and laboratory analysis (both sorting and taxonomic identification), which should be sufficient to fulfill the statistical criteria of the project (Appendix B).

7.3.2.1. Sampling Completeness

Completeness of sampling is measured as the percent of sites sampled and percent of variables measured.

In all biological surveys, all sites selected for sampling must be evaluated in order to achieve the intended statistical power. Therefore, this MQO measures how completely a program fulfills its sampling goals. It is expected that 95% of all sites will be sampled. This MQO accounts for adverse weather conditions, safety concerns, and equipment problems. A loss of 5% of the samples in this study would represent a minimal loss in statistical power to address the study objectives. Corrective action for this DQO is to collect additional samples within the index period, if possible.

All variables must be measured at each site. This MQO ensures that a complete suite of indicators and supporting data are collected at each site in the survey. It is expected that 95% of all variables will be sampled. This MQO applies to biological samples (including macroinvertebrates and benthic algae), all components of physical habitat (e.g., gradient, pebble counts, etc.). This MQO accounts for adverse weather conditions, safety concerns, and equipment problems. A loss of 5% of the samples in this study would represent a minimal loss in statistical power to address the study objectives. Corrective action for this MQO is to revisit sites and measure missing variables within the index period, if possible. In certain cases, the LQAO may require that additional variables be re-measured if synoptic data are required (e.g., resampling water chemistry if toxicity samples are required).

7.3.2.2. Sorting Completeness

There are two MQOs for completeness of sorting activities**: sorting efficiency** and **processing efficiency**.

Sorting efficiency measures how complete the sorting of a sample is, and it is evaluated by resorting the residue of sample aliquots to ensure that no benthic macroinvertebrates remain. Sorted residue is checked by a person different from the original sorter for any remaining organisms, which are then added to the final, sorted sample. If a second sorting technician is not available and a taxonomist performs sorting activities, the same taxonomist may re-sort the remnant for evaluating sorting accuracy. The second sorter, or taxonomist, will check the sorted residue for 10% of the original processing time. Sorting efficiency is calculated as follows:

$$\frac{\textit{Total number of organisms in initial sort}}{\textit{Total number of organisms after resort}}$$

The frequency of sorting efficiency evaluation shall be 100%, and shall be equal to or greater than 95%. Corrective action for this MQO is to train and supervise sorters, and to continue sorting residue until the MQO is achieved (that is, ≤5% of the total number organisms are discovered in the sorted residue).

Processing efficiency is the ability of a taxonomy lab to sort all samples to completion. Processing efficiency is measured as the ability of a lab to obtain adequate numbers of organisms (i.e. ≥600) from all samples or, if <600 organisms are in a sample, that 100% of sample volume has been sorted. Processing efficiency is calculated as follows:

$$\frac{\textit{Total number of completely sorted samples}}{\textit{Total number of samples}}$$

The number of completely sorted samples include all samples containing ≥600 organisms, or samples for which 100% of the material has been sorted. The frequency of processing efficiency evaluation shall be 100%, and shall be equal to or greater than 99%. Corrective action for this MQO is to locate missing samples and document failures.

7.3.2.3. Taxonomic Identification Completeness

The MQO for completeness of taxonomic identifications is greater than or equal to 99% of all samples submitted to the taxonomist. This MQO accounts for loss of samples during shipping and processing. Corrective action for this MQO is to locate missing samples and document failures.

Example lab bench sheets for sorting and identification are provided in Appendix C.

7.4. Sensitivity

7.4.1. Chemical Data

Different indicators of the sensitivity of an analytical method to measure a target parameter are often used including instrument detection limits (IDLs), method detection limits (MDLs), and reporting limits (RLs). Each of these indicators is described below:

The IDL is the lowest concentration of analyte that an analytical instrument can detect that is statistically different from the response obtained from the background instrumental noise. The IDL indicates the absolute sensitivity of the analytical technique or instrument. It is established by adding the analyte to reagent blank water or solvent to give a concentration within a few times the estimated IDL and by calculating the standard deviation for seven or more replicate measurements. The IDL should be determined at least on a quarterly basis for all analyses, or more frequently as specified by laboratory SOPs. For some analytical methods, IDL is dynamically determined through analysis of the background noise during each analytical run.

The MDL is the lowest concentration of analyte in distilled water, solvent, or another appropriate clean matrix that a method can detect reliably and that is statistically different from a blank carried through the complete method, including extraction and pretreatment of the sample. The MDL is specified based on replicate analyses of seven or more measurements with a specified confidence level and defined as three times the standard deviation of replicate analyses of a sample that is 1 to 5 times the estimated detection limit for the analyte of concern. The MDL should be determined at a minimum on an annual basis.

The RL, or practical quantification limit (PQL), is the lowest level at which measurements become quantitatively meaningful and which are achievable on a routine day-to-day basis. The RL is defined as approximately three to four times the MDL or ten times the IDL, or may be defined as the concentration for the minimum calibration point (expressed in concentration units equivalent to those for field samples). Analytical measurements above the MDL but below the RL should be reported as measured, but may be qualified by the laboratory as estimated or detected but not quantified (DNQ).

For the RMC, RL is the measurement of primary interest, consistent with SWAMP Quality Assurance Project Plan (SWAMP QAT, 2008). Target RLs for this study are listed in Appendix B. In some cases, analytical laboratories may not be able to achieve SWAMP targets due to possible interferences present in media sampled.

7.4.2. Biological Data

Sensitivity represents the reporting level that can be expected for each measurement. For field sampling, sensitivity should be to the nearest second for latitude and longitude. For taxonomic identification, taxonomists shall use Level I of the standard taxonomic effort (STE) established by the Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT). SAFIT is a regional, professional, not for profit organization of bioassessment taxonomists. The STE can be found at http://www.safit.org/ste.html.

7.5. Precision

7.5.1. Chemical Data

Precision is used to measure the degree of mutual agreement among individual measurements of the same property under prescribed similar conditions. Overall precision usually refers to the degree of agreement for the entire sampling, operational, and analysis system. It is derived from reanalysis of individual samples (laboratory replicates) or multiple collocated samples (field replicates) analyzed on equivalent instruments and expressed as the relative percent difference (RPD) or relative standard deviation (RSD). Analytical precision can be determined from duplicate analyses of field samples, laboratory matrix spikes, and/or reference material samples. The analytical precision of duplicate measurements of samples or spikes will serve as the overall precision for the Program.

Analytical precision is expressed as the RPD for duplicate measurements.

RPD = [X1 - X2] / [(X1 + X2) / 2]

Where: X1 = the first sample result
X2 = the duplicate sample result.

In cases where more than one replicate is measured from a single sample or taken from a given site (on a scale presumed to be homogenous), rather than deriving RPDs for each pairwise combination, RSD can instead be calculated:

RSD = [stdev (X,,X2 ,..XN)] / [average (X,, X2 , ..XN)]

Where: X1 = the first sample result
XN = each successive sample result

If the laboratory-reported RPD (or RSD) exceeds the target for over 30% of the parameters in an analysis, the analysis is rerun. If after rerunning the analysis, RPD (or RSD) for a substantial number of analytes still exceeds the target, the problem is further investigated to identify whether potential problems originate in field sampling or laboratory handling and analysis. Additional corrective actions including flagging of data or reanalysis of samples are taken where possible and as needed.

In cases where there is insufficient field sample to analyze both lab duplicates and matrix spike duplicates, a duplicate of the unspiked sample is generally preferred, due to the possibility of spiking too high, resulting in precision measurement for a concentration range not found in typical samples. Analyzing a laboratory replicate for a field sample different from that used for matrix spikes can alleviate a problem of insufficient sample material. In extreme cases where there is sufficient material for only a single analysis of each sample from the Program, other samples such as blank spikes, reference materials, or samples from another project may be used to evaluate analytical precision, again with caveats on the relevance of evaluations for samples with much higher concentrations.

7.5.2.Biological Data

Although conventional approaches to quality assurance assess precision using replicate measurements, biological data require a different approach. Replicate field samples are of little use to assessing precision because there is no reasonable expectation that replicates will produce identical data. Several classic papers in benthic ecology has shown that even within very small spatial scales (e.g., <1 m), habitats and benthic communities can vary significantly (e.g., Needham and Usinger 1956, Chutter 1972). This variability in community structure can affect assessment indices, such as IBIs. Therefore, it is not possible to determine whether differences in BMI communities are attributable to natural variability or sampling error. Unlike replicates of water chemistry samples, replicate biological samples do not provide a valid estimate of precision in the sampling method.

7.5.2.1. Estimates of variability

Field replicates can be evaluated to assess the intrinsic variability arising from small scale spatial and temporal heterogeneity. These evaluations will be reported as **standard deviations** and **coefficients of variation** for quantitative data (e.g., species richness, IBI, Coleoptera richness, EPT richness, predator taxa, % collector individuals, % intolerant individuals, % non-insect taxa, and % tolerant taxa).

7.5.2.2. Random Error Rate

Random errors are defined as misidentifications that are made inconsistently within a taxon, and decrease the precision of bioassessments. They are usually indicative of sub-optimal working conditions for the taxonomist, rather than the lack of taxonomic expertise.

Random errors occur in two ways: 1) the original lab mistakenly identifies a single taxon as multiple taxa; and 2) the original lab mistakenly identifies multiple taxa as a single taxon The first precision DQO for taxonomic identification is the number of random errors in identifications determined by a re-identification of samples by expert taxonomists at a reference laboratory. The frequency of re-identification shall be at least 10% of all samples or one sample per lab per project, whichever is greater. It is expected that the same reference lab and samples used for quality assurance checks of taxonomic identification accuracy will be used to assess identification precision. The error rates shall be calculated as follows:

[(# of taxa identified as multiple taxa by original lab) + (# taxa identified by original lab consisting of multiple taxa)]/(# of taxa identified by the reference lab).

This MQO is calculated for an entire batch of samples submitted for quality assurance check, and not for individual samples. Examples of calculations of this MQO are provided in Appendix D.

All random errors are corrected before data are submitted to the database. An error rate <10% is considered acceptable. If a higher error rate is observed, an additional 10% of all samples shall be submitted for external re-identification. This quality control check will be repeated until a sample lot has acceptable error rates or all samples have been checked by the reference lab.

Additional corrective actions for this MQO include training and supervision of the taxonomist, and an internal re-identification of samples not submitted for external review.

7.5.2.3. Systemic Error Rate

The second precision DQO will be assessed shall be **systemic errors**, which occurs when a specific taxon is consistently misidentified. Systemic errors are the result of errors that are made consistently, and are usually indicative of a taxonomist lacking up-to-date knowledge of particular taxa.

Systemic errors are calculated as the number of common taxa (i.e., those occurring at least 5 times in a batch of samples submitted for quality assurance checks) consistently misidentified as the incorrect taxon (i.e., all individuals were given the same, but incorrect, identification), as a proportion of all the common taxa identified in a batch.

(# of common taxa consistently misidentified)/(# of common taxa identified by the reference lab).

This MQO is calculated for an entire batch of samples submitted for quality assurance check, and not for individual samples. Examples of calculations of this MQO are provided in Appendix D.

All systemic errors are corrected before data are submitted to the database. An error rate <10% is considered acceptable. If a higher error rate is observed, an additional 10% of all samples shall be submitted for external re-identification. This quality control check will be repeated until a sample lot has acceptable error rates or all samples have been checked by the reference lab.

The original lab is expected to correct systemic errors in all samples prior to submitting data.

Additional corrective actions for this MQO include training and supervision of the taxonomist, and an internal re-identification of all samples containing the erroneously identified taxa.

7.5.2.4. Taxonomic Resolution Error Rate

Taxonomic resolution errors occur when the original lab does not identify taxa to the correct taxonomic level. Poor taxonomic resolution reduces precision of bioassessments. Taxonomic resolution errors may occur in two ways: (1) **Low resolution errors**, where the lab may leave the identification at too coarse a level when a more fine determination is possible; and (2) **High resolution errors**, where the lab makes an identification at a finer level than the condition of the specimens or the STE will support.

Error rates for low resolution errors and high resolution errors are calculated separately, and added to estimate the overall error rate for taxonomic resolution.

The low resolution error rate is calculated as follows:

$$\frac{\textit{\# of individuals with lower than appropriate resolution}}{\textit{Total \# of individuals}}$$

The high resolution error rate is calculated as follows:

$$\frac{\textit{\# of individuals with higher than appropriate resolution}}{\textit{Total \# of individuals}}$$

The total taxonomic resolution error rate is the sum of the high and low resolution error rates:

Low resolution error rate + High resolution error rate

Examples of calculations of this MQO are provided in Appendix D.

All taxonomic resolution errors are corrected before data are submitted to the database. A total error rate <10% is considered acceptable. If a higher error rate is observed, an additional 10% of all samples shall be submitted for external re-identification. This quality control check will be repeated until a sample lot has acceptable error rates or all samples have been checked by the reference lab.

This quality control check will be repeated until a sample lot has acceptable error rates or all samples have been checked by the reference lab.

The original lab is expected to correct taxonomic resolution errors in all samples prior to submitting data.

Additional corrective actions for this MQO include training and supervision of the taxonomist, and an internal re-identification of all samples containing the erroneously identified taxa.

7.6. Accuracy

7.6.1. Chemical Data

Accuracy describes the degree of agreement between a measurement (or the average of measurements of the same quantity) and an acceptable reference or true value. The "true" values of the parameters measured in the Program are unknown and the overall accuracy (including representativeness) cannot be assessed. However, accuracy of certain portions of a measurement process can be evaluated. For the Study, analytical accuracy, characterized through the use of reference samples and laboratory matrix spikes in the laboratory operation, is considered acceptable for the overall accuracy of the Program. Accuracy is expressed as percent recovery for reference materials:

% Recovery = MV / EV

Where: MV = the measured value
EV = the true expected (reference) value.

For matrix spikes, recovery is calculated from the original sample result, the expected value (EV = native + spike concentration), and the measured value with the spike (MV):

% Recovery = (MV-N) x 100% (EV-N)

Where: MV = the measured value
EV = the true expected (reference) value
N = the native, unspiked result

Surrogate standards are also spiked into samples for some analytical methods and used to correct for losses in the analytical process. Although recoveries on surrogates are to be reported, control limits for surrogates are method and laboratory specific, and no project specific recovery targets for surrogates are specified, so long as overall recovery targets for accuracy (with matrix spikes and reference materials) are achieved. Where applicable, data will be reported as surrogate-corrected values.

Recovery targets for RMC analytes are shown in Appendix A. If a laboratory's reported recovery falls outside of this range for over 30% of reported parameters in analysis of reference materials, the problems need to be identified, corrected, and the instrument re-calibrated, and samples in that batch rerun if possible. If the recovery for a matrix spike/duplicate falls outside of target range, possible causes must be investigated, and the analysis needs to be rerun where possible. If the spike continues to fall outside of the target range, the analysis will be rerun if sufficient material is available, and/or other corrective actions such as data flagging may be taken in consultation with CIMC.

No individual analyte value shall exceed the target limits more than once in consecutive analyses without appropriate documentation and consultation with the CIMC and/or CQAO. Additional leeway may be granted for analytes with reference but not certified values, or for those with 95% confidence intervals already outside the recovery targets. Due to the inherent variability in analyses near the method detection limit, control limit criteria for relative accuracy only apply to analytes with true values that are greater than three (3) times the MDL established by the laboratory.

In cases where Program field samples have insufficient material, the laboratory may instead spike a similar blank matrix (e.g., sand for sediment) or samples from other projects with similar expected concentrations. Spikes should be at least double the native concentrations in samples to allow quantitative assessment, but less than 100 times higher. If spiking concentrations are found too high in the first analyzed batch, additions in later analysis batches must be reduced. If expected native concentrations are unknown, spikes should be made at approximately 100 times the MDL or 10 times the quantification limit, and adjusted upward in later batches as needed.

7.6.2.Biological Data

7.6.2.1. Sampling Accuracy

Sampling accuracy measures how close field measurements are to the true value. For bioassessment sampling, it is not possible to assess accuracy because the true value is not known. However, the accuracy of several components of field sampling can be assessed, as described below.

There is no direct way to assess the accuracy of other components of physical habitat assessments that accompany bioassessment because true values are typically not known. Instead, data quality is assured through **assessments** (described in Section 20) conducted by the Project QAO at least once per crew per sampling season. According to his or her professional judgment, the LQAO may require additional assessments or trainings of crews whose performance does not comply with established protocols.

7.6.2.2. Sorting Accuracy

Sorting accuracy shall also be assessed as **recount accuracy**. Recount accuracy is evaluated by an independent recount of the number of organisms in a sample. The frequency of recount accuracy shall be at least 10% of all samples or one sample per lab per project (whichever is greater) each year. Recount accuracy shall be conducted at a designated reference laboratory. For the RMC, the designated reference laboratory is the Aquatic Bioassessment Lab (ABL).Recount accuracy is calculated as follows:

$$\frac{\textit{Number of identified organisms in the smaller of the two counts}}{\textit{Number of identified organisms in the larger of the two counts}}$$

Recount accuracy shall be equal to or greater than 95%. Examples of calculations of this MQO are provided in Appendix D. Corrective action for this MQO is to train and supervise sorters.

7.6.2.3. Taxonomic Identification Accuracy

Taxonomic identification accuracy shall be assessed through the independent **re-identification** of samples by expert taxonomists at a reference laboratory. The frequency of re-identification shall be at least 10% of all samples or one sample per lab per project (whichever is greater) each year. It is expected that the same lab and samples used to assess sorting accuracy will be used to assess identification accuracy. The designated reference laboratory is the Aquatic Bioassessment Lab (ABL) of the California Department of Fish and Game.

Identification accuracy shall be assessed as error rate using the following three calculations:

Taxa count error rate:

$$\frac{|(\#\ \text{Taxa in Final ID} - \#\ \text{Taxa in Initial ID})|}{\#\ \text{Taxa in Final ID}}$$

Taxa ID error rate:

$$\frac{\#\ \text{Taxa misidentified}}{\#\ \text{Taxa in Final ID}}$$

Individual ID error rate:

$$\frac{\#\ \text{Individuals misidentified}}{\#\ \text{Individuals}}$$

These three DQOs were selected because each provides different sensitivities to different types of errors.

Taxa count error rate measures the accuracy of richness estimates provided by the original lab. Richness metrics are the basis of many metrics used in IBIS, as well as RIVPACS-type O/E scores, and this MQO is a broad-stroke measure of the impact of taxonomic identification errors on bioassessment indices. This MQO is robust to errors that do not affect richness (e.g., multiple errors that balance each other out, or do not affect all the individuals within a taxon).

Taxonomic ID error rate provides greater sensitivity than taxa count error rate by measuring the number of misidentified taxa as a portion of the total number of taxa in a sample. Thus, errors that do not affect total richness can be assessed by this MQO. However, it does not differentiate between errors affecting common taxa and those affecting rare taxa.

Individual ID error rate is a measure of the number of incorrectly identified individuals in a sample, and is the most sensitive of these three MQOs. Unlike taxa count error rate and taxa ID error rate, it is based on the number of misidentified individuals, and is therefore more sensitive to errors affecting common taxa than to those affecting rare taxa.

The re-identification error rate will be less than 10% by any of these measures.

Example lab benchsheets for sorting and identification are provided in Appendix C. Examples of calculations of these MQOs are provided in Appendix D. Corrective action for these MQOs is to train and supervise taxonomists, and to update data for analysis.

This quality control check will be repeated until a sample lot has acceptable error rates or all samples have been checked by the reference lab. Identifications determined by the reference lab shall be used to substitute identifications made by the original lab. In the case that the original lab disputes the identifications made by reference labs, specimens may be sent to designated third lab or outside experts. If the reference lab encounters labeling errors (e.g., labels for two taxa are switched), the errors are noted in the QA report, but the reference lab can, at their discretion, contact the original lab to verify the error, and proceed with the QA check with correct labeling.

7.7. Contamination

Collected samples may inadvertently be contaminated with target analytes at many points in the sampling and analytical process, from the materials shipped for field sampling, to the air supply in the analytical laboratory. Blank samples evaluated at multiple points in the process chain help assure that pollutants measured in samples actually originated from the target matrix in the sampled environment and are not artifacts of the collection or analytical process.

Method blanks (also called laboratory reagent blanks, extraction blanks, procedural blanks, or preparation blanks) are used to assess laboratory contamination during all stages of sample preparation and analysis. The method blank will be processed through the entire analytical procedure in a manner identical to the samples. Method blanks should be less than the MDL or not exceed a concentration of 10% of the lowest reported sample concentration. A method blank concentration greater than two times the MDL or 10% of the lowest reported sample concentration will require corrective action to identify and eliminate the source(s) of contamination before proceeding with sample analysis. If eliminating the blank contamination is not possible, all impacted analytes in the analytical batch shall be flagged. In addition, a detailed description of the likely contamination source(s) and the steps taken to eliminate/minimize the contaminants shall be included in narrative of the data report. If supporting data is presented demonstrating sufficient precision in blank measurement that the 99% confidence interval around the average blank value is less than MDL or 10% of the lowest measured sample concentration, then the average blank value may be subtracted.

Equipment blanks are generated by the personnel responsible for cleaning sampling equipment. Equipment blanks must be analyzed before the equipment is shipped to the sampling site. In order to accommodate any necessary corrective action, equipment blank results should be available well in advance of the sampling event. To ensure that sampling equipment is contaminant-free, water known to be low in the target analyte(s) must be processed though the equipment as during sample collection. The specific type of water used for blanks is selected based on the information contained in the relevant sampling or analysis methods. The water must be collected in an appropriate sample container, preserved, and analyzed for the target analytes (in other words, treated as an actual sample). The inclusion of field blanks is dependent on the requirements specified in the relevant MQO tables, or in the sampling method or SOP. Typically, equipment blanks are collected when new equipment, equipment that has been cleaned after use at a contaminated site, or equipment that is not dedicated for surface water sampling is used. An equipment blank must be prepared for dissolved metals in water samples whenever a new lot of filters is used.

A field blank is collected to assess potential sample contamination levels that occur during field sampling activities. Field blanks are taken to the field, transferred to the appropriate container, preserved (if required by the method), and treated the same as the corresponding sample type during the course of a sampling event. The inclusion of field blanks is dependent on the requirements specified in the relevant MQO tables or in the sampling method or SOP. Field blanks for other media and analytes should be conducted upon initiation of sampling. If field blank performance is acceptable, further collection and analysis of field blanks should be performed on an as-needed basis.

8. (A8) Special Training Needs / Certification

8.1. Specialized Training or Certification

All field crew will be required to take training in sampling procedures described in both BMI and Algae Bioassessment SOPs (see Section 11). It is strongly recommended that crews contain no fewer than three members because the RMC measures several indicators at each site (i.e., BMI and benthic algae communities, physical habitat and water chemistry). Inadequate staffing of field crews is one of the most common sources of data errors, and may result in costly corrective actions or data deficiencies. Bioassessment training is offered several times each year by the California Department of Fish and Game (CDFG). Crew chiefs are responsible for ensuring the safety of the crew and must use his or her discretion to end sampling if conditions become unsafe.

Analytical laboratories are to be certified for the analyses conducted at each laboratory by ELAP, NELAP, or an equivalent accreditation program as approved by the PM.

Biological laboratory analysis requires years of experience and mentoring by a qualified taxonomist. It is strongly recommended that all benthic macroinvertebrates taxonomists become a member of the Southwest Association of Freshwater Invertebrate Taxonomists (www.SAFIT.org). Membership in organizations like SAFIT offers several benefits to project participants, such as opportunities for continuing education, taxonomic workshops, reviews of current literature, and intercalibration exercises. Taxonomists are expected to participate in at least one taxonomic workshop focusing on benthic macroinvertebrates per year. Similar requirements for training will be applied to RMC contracted algal taxonomists when laboratory protocols and training workshops become available.

All agencies, contractors, and participating laboratories must maintain rigorous field and laboratory training programs based on written, oral and performance-based guidelines. Training and performance are also evaluated on an ongoing basis based, in part, on the QA parameters defined in this plan. Standard Operating Procedures (SOPs) for field, laboratory, and data management tasks have been developed and shall be updated on a regular basis in order to maintain procedural consistency. The maintenance of an SOP Manual will provide project personnel with a reference guide for training new personnel as well as a standardized information source that personnel can access.

To ensure consistent and comparable field techniques, this project shall include presurvey field training and *in-situ* field assessments. The presurvey training will focus on sampling methods and field logistics including compositing and netting patterns. *In-situ* assessments will consist of equipment checks, good sampling practices, record-keeping, and health and safety. Assessments are conducted annually, once for each crew, although more frequent assessments may be conducted at the LQAO's discretion.

8.2. Training and Certification Documents

All training materials, handouts, class rosters, and certification records related to the RMC will be kept at office of the Creek Status Monitoring Coordinator. All laboratories contracted through this Program are required to maintain their own training documents and certification records, and to make these available to RMC representatives as requested.

9. (A9) Documents and Records

The PM will also ensure that all field measurements and laboratory analytical data are submitted to the Water Board no later than January 15 of each year, reporting on all data collected during the foregoing October 1 through September 30 period. Electronic Status & Trends Data Reports shall be in a format compatible with the SWAMP database. In order to accomplish this, key parts of the information management system employed by the RMC will be standardized throughout the central and local levels implementing the field operations, laboratory analyses, and data management process. A discussion of some of the key parts of the documentation process is shown below.

9.1. Field Documentation

9.1.1. Sampling Plans, COCs, and Sampling Reports

PMLs will be responsible for development and submission of field sampling plans and sampling reports to the PM. Field sampling crews will collect records for sample collection, and will be responsible for maintaining these records in an accessible manner. Samples sent to analytical laboratories will include standard Chain of Custody (COC) procedures (see SOP FS-9, Sample Collection, Handling, and Chain of Custody Procedures) and forms; field crews will maintain a copy of originating COCs at their individual Stormwater Program headquarters. Analytical laboratories will collect records for sample receipt and storage, analyses, and reporting. All records, except lab records, generated by this Program will be stored at the office of the PML for the local program conducting the monitoring. All laboratory records pertinent to this Program will be maintained either at the office of the CIMC or LIMC per the reference IMS.

9.1.2. Data Sheets

All field data gathered by this Program will be recorded on standardized SWAMP field data entry forms, as described in more detail in Element 19 Data Management and RMC SOP FS-10, Completion and Processing of Field Datasheets.

9.1.3. Field Logbooks

In addition to completing field data sheets, sampling personnel may record relevant information in bound logbooks. All information should be recorded in permanent ink. Any changes made to recorded information will be made using single strike-through and will be initialed and dated by the person making the change.

9.1.4. Photographic Documentation

Photographic documentation is an important part of sampling procedures. An associated photo log will be maintained documenting sites and subjects associated with photos. If an option, the date function on the camera shall be turned on. A copy of all photographs should be provided to the LIMC, preferably on CD-ROM, at the conclusion of sampling efforts and maintained for project duration.

9.2. Laboratory Documentation

The RMC Creek Status Monitoring Program requires specific actions to be taken by contract laboratories, including requirements for data deliverables, quality control, and on-site archival of project-specific information. Each of these aspects is described below.

9.2.1. Data Reporting Format

Each laboratory will deliver data in electronic formats to one RMC recipient at both the central and local level, the CIMC and LIMC, respectively. Each will be responsible for storage and safekeeping of these records at their respective level. Each will maintain at least two back-up copies on compact disc or off-site storage. In addition, each laboratory will deliver hardcopy data to the LIMC for use in data QA and for long-term storage.

The analytical laboratory will report the analytical data to the CIMC and LIMC via an analytical report consisting of, at a minimum:

1. Letter of transmittal
2. Chain of custody information
3. Analytical results for field and quality control samples
4. Case narrative
5. Copies of all raw data.

The LQAO or CQAO will review the data deliverables provided by the laboratory for review of QA/QC. In addition to the laboratory's standard reporting format, all results meeting data quality objectives and results having satisfactory explanations for deviations from objectives shall be reported in tabular format on electronic media, in a format consistent with RMC templates and standard business rules (see relevant SOPs, Data Management). The specific format and any needed templates for this electronic data deliverable (EDD) are to be agreed upon by the CIMC and each LPM prior to onset of any sampling activities related to that laboratory.

As they become available, and after internal laboratory QA/QC review, draft data produced from laboratory analyses are sent in electronic format. These draft data are not for distribution or application in any manner, other than for the initial review by RMC staff. Upon completion of their preliminary review of the draft data, RMC staff will provide any concerns/comments (if any) in writing to the respective laboratory and the Program Manager. RMC staff will notify the lab if it approves of this draft data in its current format. If there are any concerns regarding the draft data, the concerns must be addressed in writing by the analytical lab. After the concerns are addressed and corrective actions taken (such as reviewing for transcription errors, reanalysis, and data flagging), data will be resubmitted as draft data for re-review. After RMC staff concerns have been addressed, they will notify the laboratory and approve the data as final.

Documentation for analytical data is kept on file at the laboratories, or may be submitted with analytical results. These may be reviewed during external audits of the Program, as needed. These records include the analyst's comments on the condition of the sample and progress of the analysis, raw data, instrument printouts, and results of calibration and QC checks. Paper or electronic copies of all analytical data, field data forms and field notebooks, raw and condensed data for analysis performed on-site, and field instrument calibration notebooks are kept as part of the Program archives for a minimum period of eight years.

9.2.2. Other Laboratory QA/QC Documentation

All laboratories will have the latest version of the RMC QAPP in electronic format. In addition, the following documents and information from the laboratories will be current, and they will be available to all laboratory personnel participating in the processing of RMC samples:

1. Laboratory QA plan: Clearly defines policies and protocols specific to a particular laboratory, including personnel responsibilities, laboratory acceptance criteria, and corrective actions to be applied to the affected analytical batches, qualification of data, and procedures for determining the acceptability of results.

2. Laboratory SOPs: Contain instructions for performing routine laboratory procedures, describing exactly how a method is implemented in the laboratory for a particular analytical procedure. Where published standard methods allow alternatives at various steps in the process, those approaches chosen by the laboratory in their implementation (either in general or in specific analytical batches) are to be noted in the data report, and any deviations from the standard method are to be noted and described.

3. Instrument performance information: Contains information on instrument baseline noise, calibration standard response, analytical precision and bias data, detection limits, scheduled maintenance, etc.

4. Control charts: Control charts are developed and maintained throughout the Program for all appropriate analyses and measurements for purposes of determining sources of an analytical problem or in monitoring an unstable process subject to drift. Control charts serve as internal evaluations of laboratory procedures and methodology and are helpful in identifying and correcting systematic error sources. Control limits for the laboratory quality control samples are ±3 standard deviations from the certified or theoretical concentration for any given analyte.

Records of all quality control data, maintained in a bound notebook at each workstation, are signed and dated by the analyst. Quality control data include documentation of standard calibrations, instrument maintenance and tests, and analyses of CRMs. Control charts of the data are generated by the analysts monthly or for analyses done infrequently, with each analysis batch. The laboratory quality assurance specialist will review all QA/QC records with each data submission, and will provide QA/QC reports to the LIMC with each batch of submitted field sample data.

9.3. Program Management Documentation

The CIMC and LIMCs are responsible for managing key parts of the RMC information management systems. These efforts are described below.

9.3.1. QAPP

All original QAPPs will be held by LIMC. This QAPP and its revisions will be distributed to all parties involved with the Program, including PMLs and Water Board representative(s). Copies will also be sent to the each participating analytical laboratory's Project Manager for internal distribution.

Associated with each update to the QAPP, the PM will notify PMLs and Water Board representative of the updated QAPP, with a cover memo compiling changes made. After appropriate distributions are made to affected parties, these approved updates will be filed and maintained by the CQAO for the Program. Upon revision, the replaced QAPPs will be discarded.

9.3.2. Program Information Archival

The PM will oversee the actions of all personnel with records retention responsibilities, and will arbitrate any issues relative to records retention and any decisions to discard records. Each analytical laboratory will archive all analytical records generated for this Program. Each LIMC will be responsible for archiving all other records associated with implementation of the Program within their jurisdiction. The RMC Program Manager will be responsible for archiving all management-level records.

Persons responsible for maintaining records for this Program are shown in Table 9-1.

Table 9-1 - Document and Record Retention, Archival, and Disposition

Type	Retention	Archival	Disposition
Field Datasheets	8	LIMC	Maintain indefinitely
Chain of Custody Forms	8	LIMC	Maintain indefinitely
Calibration Logs	8	LIMC	Maintain indefinitely
Raw Analytical Data	8	LIMC, CIMC	Recycling
Lab QC Records	8	LIMC, CIMC	Recycling
Electronic data deliverables	8	LIMC, CIMC	Maintain indefinitely
Reports	8	PM	Maintain indefinitely
Field Audits	8	LQAO, CQAO	Maintain indefinitely

The PM will oversee the actions of all personnel with records retention responsibilities, and will arbitrate any issues relative to records retention and any decisions to discard records. As discussed previously, each analytical laboratory will archive all analytical records generated for this Program. Each PML will be responsible for archiving all other records associated with implementation of the RMC within their jurisdiction. The PM will be responsible for archiving all management-level records.

The PM will also ensure that all field measurements and laboratory analytical data are compiled in a format compatible with the SWAMP protocols. In order to accomplish this, individual LIMCs will submit field measurement data in electronic templates designed and distributed by the CIMC. All field operation records will be entered into electronic formats and maintained in a dedicated directory managed by each individual LIMC. Each file will also have at least two back-up copies on compact disc or off-site storage.

10. (B1) Sampling Process Design

The RMC Creek Status Monitoring Program includes both probabilistic and targeted creek status monitoring designs to comply with the MRP C.8.c[2] and C.8.e provisions. A summary of the probabilistic and targeted creek status monitoring designs is presented below. Both sample designs are discussed in greater detail in the RMC Creek Status and Long-Term Trends Monitoring Plan (RMC Monitoring Plan) (BASMAA 2011).

10.1. Probabilistic Design

The probabilistic survey design utilizes the Generalized Random Tessellation Stratified (GRTS) approach developed by the United States Environmental Protection Service (USEPA) and the University of Oregon (Stevens and Olson 2004). Sample sites will be selected using the GRTS approach from a sample frame that consists of a stream network geographic information system (GIS) data set within the RMC boundary. The RMC sampling frame includes non-tidally influenced perennial and non-perennial creeks within five management units that are located in the San Francisco Bay Area. The management units represent the area within five counties (Alameda, Contra Costa, Santa Clara, San Mateo and Solano) that occur within the Water Board Region 2 boundary, with the exception of Contra Costa, which also includes the eastern portion of the county that is a part of Water Board Region 5. These areas together represent the sample frame universe for the probabilistic design (Figure 10-1). These management units represent areas managed by storm water programs associated with the RMC.

Sample sites are stratified by management unit and weighed by land use (i.e., urban versus non-urban). The stratification was done to ensure that a predetermined number of sites will be sampled in each management unit corresponding to requirements described in Table 8.1 of the MRP. The sampling frame was weighed so approximately 80% of sites would occur in urban land use and 20% of sites in non-urban land use. Urban land use was defined as the area occurring within Census 2000 Urban Area and/or within city boundaries within the five counties (Figure 10-1). The exception was Solano County, where urban area was defined as only the area within Cities of Vallejo, Suisun City and Fairfield. The number and frequency of sample sites for each management unit is described in RMC Monitoring Plan.

10.2. Targeted Monitoring Design

The targeted monitoring stations and timing of monitoring will be selected with the intent of meeting permit performance standards. The study reaches, sampling stations within each reach, and seasonality of sampling will all be selected using the directed sampling design principle.[3]

[2] The MRP states that Provision C.8.c status monitoring is intended to answer the following questions: "Are water quality objectives, both numeric and narrative, being met in local receiving waters, including creeks, rivers and tributaries?"; "Are conditions in local receiving waters supportive of or likely to be supportive of beneficial uses?".

[3] The sampling design principles used can be defined as follows: Systematic - A deterministic approach in which points are selected deliberately at fixed intervals of area, length, or time; Directed - A deterministic approach in which points are selected deliberately based on knowledge of their attributes of interest as related to the environmental site being monitored. This principle is also known as "judgmental," "authoritative," "targeted," or "knowledge-based." Random (stratified) - A probabilistic approach in which points are deliberately selected at random at random from a given population of "eligible" points that all have the same chance of being selected. Points are often grouped, or "stratified" by specific attributes of interest. Non-deliberate - none of the above; points are selected anecdotally, or opportunistically, or as dictated by given constraint, or in response to spills, etc.

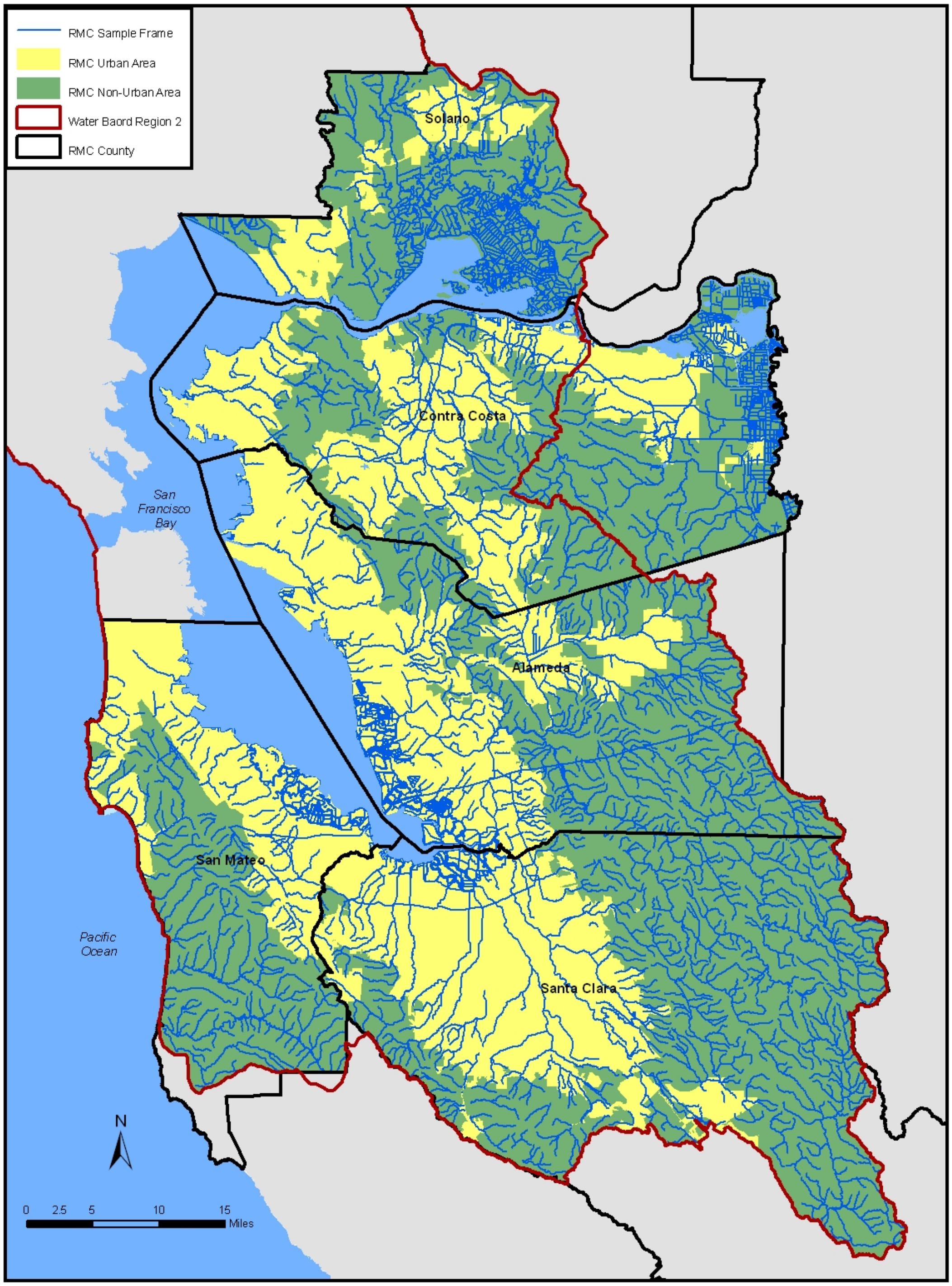


Figure 10-1. The RMC Sample Frame Universe

The total number of site visits will vary depending on the status monitoring parameter (MRP Table 8.1). Stations will be visited at a frequency of one to two times per year, depending on Status Monitoring Parameter type. The planned interval between visits is seasonal. Individual monitoring aspects are described in more detail in the following.

Each SW Program will be responsible for developing sampling and analysis plans in association with conduct of specific field monitoring efforts.

10.3. Sampling Uncertainty

There are multiple sources of potential sampling uncertainty associated with the Creek Status Monitoring Project, including: (1) measurement error; (2) natural (inherent) variability; (3) sample misrepresentation (or poor representativeness); and (4) sampling bias (statistical meaning). Measures incorporated to address these areas of uncertainty are discussed below:

(1) Measurement error combines all sources of error related to the entire sampling and analysis process (i.e., to the measurement system). All aspects of dealing with uncertainty due to measurement error have been described elsewhere within this QAPP.

(2) Natural (inherent) variability occurs in any environment monitored, and is often much wider than the measurement error. Prior work conducted by the Stormwater Programs and others in the field of stormwater management have demonstrated the high degree of variability in environmental media, which will be taken into consideration when interpreting results of the various lines of inquiry.

(3) Sample misrepresentation happens at the level of an individual sample or field measurement where an individual sample collected is a poor representative for overall conditions encountered. To address this situation, the RMC will be developing and implementing a number of QA-related measures, including development of Standard Operating Procedures (SOPs) and auditing of field crews to ensure their proper implementation.

(4) Sampling bias relates to the sampling design employed and whether the appropriate statistical design is employed to allow for appropriate understanding of environmental conditions. To a large degree, the sampling design required by the MRP for Creek Status Monitoring is judgmental, which will therefore incorporate an unknown degree of sampling bias into the Program. There are small measures that have been built into the sampling design to combat this effect (e.g., homogenization of sediments for chemistry and toxicity analyses), but overall this bias will need to be taken into consideration when interpreting results of the various investigations.

11. (B2) Sampling Methods

The RMC Creek Status Monitoring Program targeted sampling involves the collection of samples for a variety of analytes in water, sediment, tissue, and biota. Collections are conducted by multiple organizations (Stormwater Programs) using a variety of sampling protocols, depending on the media and parameter monitored. A brief summary of relevant methods is presented below, with detailed descriptions provided in associated SOPs (Table 11-1).

Table 11-1. List of Relevant SOPs Governing Methods Employed for RMC Creek Status Monitoring Program.

SOP #	SOP	Source
FS-1	BMI and Algae Bioassessments, and Physical Habitat Measurements	RMC
FS-2	Water Quality Sampling for Chemical Analysis, Pathogen Indicators, and Toxicity	RMC
FS-3	Field Measurements, Manual	RMC
FS-4	Field Measurements, Continuous General Water Quality	RMC
FS-5	Temperature, Automated, Digital Logger	RMC
FS-6	Collection of Bedded Sediment Samples for Chemical Analysis and Toxicity	RMC
FS-7	Field Equipment Cleaning Procedures	RMC
FS-8	Field Equipment Decontamination Procedures	RMC
FS-9	Sample Container, Handling, and Chain of Custody Procedures	RMC
FS-10	Completion and Processing of Field Datasheets	RMC
FS-11	Site and Sample Naming Convention	RMC
FS-12	Site Evaluation Guidance	RMC
N/A	Unified Stream Assessment: A User's Manual, v2.0	CWP (2005)

11.1. Biological Sampling

Biological sampling methods applied by the RMC are summarized in FS-1 BMI and Algae Bioassessments and Physcial Habitat Assessments. BMI and algae samples are collected at 11evenly spaced transects at each monitoring site using the Reachwide Benthos (RWB) method. Sampling positions within each transect is alternated between the left, center and right positions along each transect (25%, 50% and 75% of the wetted width, respectively). BMI samples are collected using a D-shaped kick net and algae samples are collected using three different methods corresponding to type of substrate found at the sample location. The 11 subsamples for both BMI and algae are composited into a single "reachwide" sample. One composited BMI sample, and four algae samples (subsampled from composite sample) consisting of soft-bodied algae, diatoms, chlorophyll a, and ash-free dry mass) are collected from each site.

Physical habitat assessments (PHAB) incorporate quantitative and qualitative measurements taken at each of the 11 transects and 10 inter-transects. RMC will collect PHAB measurements following procedures defined in the BASIC level of effort (Ode 2007), with the following exceptions as defined in the FULL level of effort (as prescribed in the MRP): stream depth and pebble count + CPOM, cobble embeddedness, discharge measurements and in-stream habitat score. In addition, the percent algal cover (measured during point intercept with pebble count), will be measured at each transect and inter-transect.

11.2. Automated Measurements of General Water Quality and Temperature

The RMC will implement standard methods associated with continuous measurement of water quality and temperature that are identified in RMC SOPs FS-4 and FS-5, respectively. Methods associated with the continuous water quality monitoring include procedures for the maintenance, calibration, deployment, post-deployment and data evaluation of multi-probe instrument (sonde) YSI 6600 series or equivalent. Methods used for automated temperature monitoring include accuracy checks, deployment and data evaluation for temperature data loggers. Automated monitoring equipment will be record measurements using internal power source (i.e., batteries). Deployment sites will be carefully considered to ensure data collected will meet monitoring objectives and equipment is properly installed to reduce potential for theft and vandalism. Field staff will conduct proper checks of equipment to ensure data meets MQOs for precision and accuracy.

11.3. Water Sampling

The RMC will implement standard methods associated with water quality sampling and toxicity testing that is identified in RMC SOPs FS-2. Field Crews will collect water samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest. The samples will be collected in the field into pre-cleaned sample bottles of a material appropriate to the analysis to be conducted. Pre-cleaned sampling equipment is used for each site, whenever possible and/or when necessary. Appropriate sampling technique and measurement equipment may vary depending on the location, sample type, sampling objective, and weather. Water chemistry and bacteriological samples, as required, are collected at the same location. Water samples are best collected before any other work is done at the site. If other work (i.e., sediment sample collection, flow measurement or biological/habitat sample collection or assessment) is done prior to the collection of water samples, it might be difficult to collect representative samples for water chemistry and bacteriology from the disturbed stream. Care must be taken, though, to not disturb sediment collection sites when taking water samples.

11.3.1. Summary of Typical Procedure for Collection of Water Samples for Analyzing Trace Metals, Organics, Conventional Constituents, and for Toxicity Testing

All samples collected for analysis of trace metals, organics, conventional constituents, and for toxicity testing in water will be collected using clean techniques that minimize sample contamination. Sampling methods will generally conform to EPA "clean" sampling methodology described in Method 1669: Sampling Ambient Water for Trace Metals (USEPA 1996). Samples will generally be collected from shore in wadeable waters, in most cases by using a near-surface grab sample, as peristaltic pump and Teflon tubing setups are not required for MRP parameters. Grab samples will be collected into appropriate pre-cleaned containers and aliquoted into glass, polyethylene, or Teflon sample containers appropriate for the analyses to be performed (see Sample Handling Requirements Tables in Section B3, Element 12), or will be collected directly into the sample containers, if appropriate. After collection, field-collected samples will be stored at between 0 and 6°C until arrival at the contract laboratory.

11.4. Sediment Sampling

The RMC will implement standard methods associated with the collection of bedded sediment sampling and toxicity testing that is identified in RMC SOPs FS-6. RMC sampling personnel will collect sediment samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest. The samples will be collected in the field into previously cleaned and tested (if necessary) sample bottles of a material appropriate to the analysis to be conducted. Pre-cleaned sampling equipment is used for each site, whenever possible and/or when necessary. Appropriate sampling technique and measuring equipment may vary depending on the location, sample type, sampling objective, and weather.

Bed sediment samples are collected after any water samples have been collected. Care must be taken not to sample sediments that have been disturbed in any manner by field personnel collecting water or other samples. Sediment samples are collected into a composite container, where they are thoroughly homogenized in the field, and then aliquoted into separate jars for chemical or biological analysis. Sediment samples for metals and organics are submitted to the respective analytical laboratories in separate glass jars, which have been pre-cleaned according to laboratory protocol.

Many of the chemical constituents of concern are adsorbed onto fine particles. One of the major objectives in selecting a sample site, and in actually collecting the sample while on site, is to obtain recently deposited fine sediment, to the extent possible. Samplers should avoid hard clay, bank deposits, gravel, and disturbed and/or filled areas. Any sediment that resists being scooped is probably not recently deposited fine sediment material. In following this guidance, the collection of sediment is purposefully being biased for fine materials, which must be discussed thoroughly in any subsequent interpretive reporting of the data, in regards to representativeness of the collected sample to the environment from which it was collected. Quiescent areas are conducive to the settling of finer materials. Choose a sampling site with lower hydrologic energy, such as the inner (depositional) side of bends or eddies where the water movement may be slower.

11.5. Field Preparation

Samples will be prepared in the field as needed to conform to USEPA and/or SWAMP requirements, to ensure sample integrity from time of sample collection to delivery at the analytical laboratory. Detailed information on sample containers, required preservation, holding times, and sample volumes is shown in Table 12-1 of Element 12.

11.6. Sampling Containers

The RMC will implement standard methods associated with sample container, handling and chain of custody procedures that is identified in RMC SOPs FS-9. Collection of pathogens in water requires the use of sterilized sample containers. Containers will be provided by contracted laboratories pre-sterilized. Individual laboratories will be responsible for the integrity of containers provided. No other containers required for collection of RMC Creek Status Monitoring samples will require sterile containers.

All sampling containers used for the RMC sampling for water quality and sediment quality analysis will be provided pre-cleaned by contracted analytical laboratories. The individual laboratories will be responsible for ensuring integrity of the containers. Should sampling containers lose their integrity during the sampling process, then they will be discarded and replaced with a pre-cleaned container. A list of sampling containers required for RMC implementation is compiled in SOP FS-9, Sample Container, Handling, and Chain of Custody Procedures.

11.7. Sample ID Numbers

Every sample must have a unique sample number so that the analytical results from each sample can be differentiated from every other sample. This information should follow the sample through the COC, analytical, and interpretation and reporting processes. As described in SOP FS-11, Site and Sample Naming Convention, samples collected under the probabilistic design will adopt a naming convention that is consistent with the SWAMP Perennial Streams Assessment and the Stormwater Monitoring Coalition. RMC sampling sites associated with targeted monitoring design will adopt the Region 2 SWAMP site naming convention.

11.8. Sample Equipment Cleaning

Cleaning techniques required for sampling equipment will vary depending on the media sampled and analyte measured. Cleaning techniques to be used are described in SOP FS-7, Equipment Cleaning Procedures, and individual SOPs associated with the relevant type of sampling to be conducted.

11.9. WASTE DISPOSAL

Proper disposal of all waste is an important component of field activities. At no time will any waste be disposed of improperly. The proper methods of waste disposal are outlined below:

11.9.1. Routine Garbage

Regular garbage (paper towels, paper cups, etc.) is collected by sampling personnel in garbage bags or similar. It can then be disposed of properly at appropriate intervals.

11.9.2. Detergent Washes

Any detergents used or detergent wash water should be collected in the field in a water-tight container and disposed of appropriately.

11.9.3. Chemicals

Solvents, acids, and formalin are hazardous materials and should be disposed of by following all appropriate regulations. They should always be collected when sampling and never be disposed in the field.

11.10. Responsibility and Corrective Actions

If monitoring equipment fails, sampling personnel will report the problem in the comments section of their field notes and will not record data values for the variables in question. Actions will be taken to replace or repair broken equipment prior to the next field use. Under no condition will data be entered into the SWAMP database that were known to be collected with faulty equipment.

12. (B3) Sample Handling and Custody

Each RMC Stormwater Program Project Manager will be responsible for overall quality assurance associated with field sampling conducted within their jurisdiction. As such, Project Managers are responsible for identifying and ensuring appropriate qualifications and training for all sampling personnel.

One member of each sampling team will be identified as "Team Lead", and will be responsible for overall collection and custody of samples during field sampling. Field crews will keep a field log, which will consist of sampling forms for each sampling event. SOPs for Field Sample Collection, identified in Table 11-1 will be followed, and include instruction for field documentation. In the field log, the following items will be recorded: time of sample collection, sample identification numbers, results of any field measurements and the time that they were made, qualitative descriptions of relevant water and weather conditions at the time of sample collection, and a description of any unusual occurrences associated with the sampling event (especially those that could affect sample or data quality).

The field crews will have custody of samples during field sampling and chain-of-custody (COC) forms will accompany all samples to the analyzing laboratory. COC procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. A detailed description of COC procedures is included in SOP FS-9, Sample Container, Handling, and Chain of Custody Procedures. Each contracted analytical laboratory will maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times. Each analytical laboratory has a sample custodian who examines the samples for correct documentation, proper preservation and holding times. Each laboratory will follow sample custody procedures as outlined in its QA plans.

In general, all non-biological samples will be packed in wet ice during shipment, so that they will be kept at approximately 6º C. When used (e.g., analysis of trace metals), wet ice will be double bagged in Zip-top bags to prevent contamination via meltwater. Where appropriate, samples may be frozen to prevent biological degradation. If samples are to be shipped frozen on dry ice, then appropriate handling procedures will be followed, including ensuring use of appropriate packaging materials and appropriate training for shipping personnel.

BMI and algae samples collected for taxonomic identification will be fixed in the field and stored in a cool, dark place. Algae samples collected for chlorophyll a and ash free dry weight analysis will be placed on ice during transport and stored in a freezer at the laboratory, or placed on dry ice for extended periods until laboratory freezer space is available.

Additional detail on sample handling procedures is presented in Table 12-1 and in SOP FS-9.

12.1. Shipping Containers

All samples will be handled, prepared, transported, and stored in a manner so as to minimize bulk loss, analyte loss, contamination, or biological degradation. Sample containers will be clearly labeled with an indelible marker. All caps and lids will be checked for tightness prior to shipping. Ice chests will be sealed with packing tape before shipping. Samples will be placed in the ice chest with enough ice or frozen ice packs to completely fill the ice chest. COC forms will be placed in a zip-top bag and placed inside of the ice chest. Additional detail on sample handling is included in SOP FS-9, Sample Container, Handling, and Chain of Custody Procedures.

12.2. Commercial Vehicle Transport

Transport of samples to the contracted laboratories will be by commercial carriers. As required, pickup will be pre-arranged with the carrier and all required shipping forms will be completed prior to sample pickup by the commercial carrier.

12.3. Sample Hold Times

Information on sampling containers, preservation techniques, and hold times are shown in SOP FS-9, Sample Container, Handling, and Chain of Custody Procedures.

13. (B4) Method Selection

13.1. Method Reporting Limits

Target method reporting limits (MRLs), or Reporting Limits (RLs), applicable for RMC sampling are presented in Appendix E. It is understood that all targets may not be achievable by laboratories in each media, especially in most urbanized areas where interferences present may elevate MRLs.

13.2. In Situ Monitoring

In-situ monitoring will be conducted at selected stations for the RMC Creek Status Monitoring Program. The sampling stations may have aquatic plants, trash, and other materials that either float on the surface of the water or that may be below the water surface and this may cause fouling of the in-situ measuring instruments. RMC Sampling Personnel will protect these instruments, or instrument intakes, from fouling with a screen through which water can flow but the fouling materials cannot easily penetrate.

13.3. Continuous Monitoring

Sonde measurements for general water quality will be evaluated by comparing field measurements with pre and post deployment calibration measurements. The accuracy of sonde probe readings are checked against calibration standard solutions. Calibration of these probes to these standards must be performed prior to initial deployment, during interruptions in the deployment (if readings drift significantly or if batteries are changed) and after the sonde is retrieved. The post-run calibration allows the data collected to be checked for accuracy and flagged as not meeting measurement quality objectives if necessary.

13.4. Performance Based Measurement System

Multiple analytical laboratories will provide analytical services. Contracted laboratories used for the RMC sampling and analysis program will be encouraged to use a Performance Based Measurement System (PBMS). A performance-based approach permits the use of any scientifically appropriate method that demonstrates the ability to meet established method performance criteria (e.g., accuracy, sensitivity, bias, precision) and complies with specified data quality needs or requirements. Using PBMS the data quality needs, mandates, or limitations of the program or project are specified. These will serve as criteria for selecting measurement processes (i.e, methods), which will meet those needs in a cost-effective manner, rather than the use of a mandated method.

13.5. PBMS Methods Validation

Each analytical laboratory should adhere to its individual QA program for method validation techniques for specific methods. Individual QA plans should be maintained on-site and be made available to RMC representatives upon request. When using the PBMS for the RMC, the labs will have to follow all PBMS procedures related to obtaining quality data, but the labs are not required to submit the results to anyone except upon request. The results are to be kept on file by each individual lab.

13.6. Method Failures

The RMC Program Manager will be responsible for any corrective actions that may be needed in the event that methods fail to produce SWAMP-comparable data. If a method fails to provide SWAMP-comparable data for any reason, including analyte or matrix interferences, instrument failures, etc., then the involved samples will be analyzed again if possible. The laboratory in question's SOP for handling these types of problems will be followed. When a method fails to provide SWAMP-comparable data, then the laboratory's SOP for documenting method failures will be used to document the problem and what was done to rectify it.

Corrective actions for biological data are taken when an analysis is deemed suspect for some reason. These reasons include exceeding accuracy ranges and/or problems with sorting and identification. The corrective action will vary on a case-by-case basis, but at a minimum involves the following:

- A check of procedures.
- A review of documents and calculations to identify possible errors.
- Correction of errors based on discussions among taxonomists.
- A complete re-identification of the sample.

The field and laboratory coordinators shall have systems in place to document problems and make corrective actions. All corrective actions will be documented to the Project Director.

When specific MQOs associated with taxonomic analyses are not met, the following corrective actions are required (See Section 7 for additional details):

- Reasons for failure to complete sampling should be documented, and plans to ensure future success shall be made. When possible, efforts should be made to resample. For example, additional sites could be visited if there is time remaining within the index period. Incomplete site evaluations should either be resampled or a new site selected.

- If sorting efficiency or processing efficiency does not meet specified MQOs, then training and supervision of that sorter shall increase according to laboratory protocols. The corrected data shall be confirmed in the project database. Because 100% of samples are subjected to these MQOs, data do not need to be qualified. All organisms recovered during the sorting completeness check (i.e., sorting efficiency) are added to the final count and identified.

- If a sample does not meet the MQOs for taxonomic identifications (i.e., random or systemic error rates), then corrective actions shall include submitting additional sample lots (10% of all samples processed by a lab for a particular project) for further quality assurance checks by a reference lab. Additional lots shall be submitted until a lot passes quality assurance checks or until all samples have been submitted to a reference lab for quality assurance checks. The taxonomist should gain additional training for problematic taxa.

- If a sample does not meet MQOs for recount accuracy or poor accuracy in taxonomic identifications (i.e., excessive taxa count error rate, taxa ID error rate, individual ID error rate), then corrective actions shall include submitting additional sample lots (10% of all samples processed by a lab for each project) for further quality assurance checks by a reference lab. Additional lots shall be submitted until a lot passes quality assurance checks or until all samples have been submitted to a reference lab for quality assurance checks. The taxonomist should gain additional training for problematic taxa.

- All taxonomic errors, whether they are above or below the thresholds established in Table 27-1, Appendix B, shall be resolved through the following process:

- Reference labs will inform the original lab of errors. The original lab is responsible for correcting the data set with the revised taxonomic identification from the reference lab.
- If the original lab disputes the reference lab identification, then taxa can be sent to a third lab for verification. The original lab is responsible for correcting the data set with the revised taxonomic identification from the third lab.

- If a site is sampled more than 10 seconds (~ 300 m) from nominal coordinates, the data from this site shall be flagged in the project database. However, samples collected outside the nominal stratum or outside the index period shall be rejected.

13.7. Sample Disposal

After analysis of the RMC samples have been completed by the laboratory and results have been accepted by CIMC, they will be disposed by each laboratory of in compliance with all federal, state, and local regulations. The laboratory has standard procedures for disposing of its waste, including left over sample materials

13.8. Laboratory Sample Processing

Field samples sent to the laboratories will be processed within their recommended hold time (Table 12-1) using methods agreed upon method between CQAO and LPMs. Each sample may be assigned unique laboratory sample identification (ID) numbers for tracking processing and analyses of samples within the laboratory. This laboratory sample ID (if differing from the field team sample ID) must be included in the data submission, within a lookup table linking the field sample ID to that assigned by the lab.

Samples arriving at the laboratory are to be stored under conditions appropriate for the planned analytical procedure(s), unless they are processed for analysis immediately upon receipt. Samples to be analyzed should only be removed from storage when laboratory staff are ready to proceed.

13.9. Field Measurements

The RMC will implement standard methods associated with manual and continuous water quality measurements and water samples as described in RMC SOP FS-2. The RMC will implement standard methods described in FS-3, FS-4 and FS-5 to utilize water quality equipment and test kits to measure target analytes in water (Table 13-1).

Table 13-1. Field Measurements for RMC Analytes

Water Quality Analyte	Instrument Type	Model	Range and Units
Temperature (continuous)	Digital temperature logger	HOBO Water Temp Pro V2 (or equivalent)	-40º to 50º C
Temperature, DO, pH, Conductivity	Multi-parameter probe	YSI 6600 or 6920 (or equivalent)	See below, by parameter
Temperature	Multi-parameter probe	6560 sensor	-5º to 50º C
DO	Multi-parameter probe	6562 rapid pulse sensor	0 to 50 mg/L
pH	Multi-parameter probe	6561 sensor	0 to 14 units
Conductivity	Multi-parameter probe	6560 sensor	0 to 100 mS/cm
Chlorine, Free and Total, mid-range	Chemetrics Test Kit	Catalog No. K-2511	0 to 0.2 ppm (mg/L) Cl_2
Chlorine, Free and Total, high-range	Chemetrics Test Kit	Catalog No. K-2504	0 to 5 ppm (mg/L) Cl_2

14. (B5) Quality Control

Concentrations of pollutants in environmental samples are often low. Therefore, a quality-assurance program for the chemical analysis of samples requires stringent laboratory conditions and careful control over all aspects of the analyses. Each step in the analytical process is a potential source of contamination and must be consistently monitored to ensure that the final measurement is not adversely affected by any processing steps. Various aspects of the RMC quality control program are summarized below.

14.1. Laboratory Quality Control for Non-Biological Data

Laboratories providing analytical support to the RMC will have the appropriate facilities to store, prepare, and process samples in an ultra-clean environment, and will have appropriate instrumentation and staff to perform analyses and provide data of the required quality within the time period dictated by the Program. The laboratories are expected to satisfy the following:

1. Demonstrate capability through pertinent certification and satisfactory performance in inter-laboratory comparison exercises.
2. Provide qualification statements regarding their facility and personnel.
3. Maintain a program of scheduled maintenance of analytical balances, laboratory equipment and instrumentation.
4. Conduct routine checking of analytical balances using a set of standard reference weights (American Society of Testing and Materials Class 3, NIST Class S-1, or equivalents). Analytical balances are serviced at six-month intervals or when test weight values are not within the manufacturer's instrument specifications, whichever occurs first.
5. Conduct routine checking and recording the composition of fresh calibration standards against the previous lot. Acceptable comparisons are within 2% of the precious value.
6. Record all analytical data in bound (where possible) logbooks, with all entries in ink, or electronically.
7. Monitor and document the temperatures of cold storage areas and freezer units on a continuous basis.

8. Verify the efficiency of fume/exhaust hoods.
9. Have a source of reagent water meeting specifications described in Section 8.0 available in sufficient quantity to support analytical operations.
10. Label all containers used in the laboratory with date prepared, contents, initials of the individual who prepared the contents, and other information as appropriate.
11. Date and safely store all chemicals upon receipt. Proper disposal of chemicals when the expiration date has passed.
12. Have QAPP, SOPs, analytical methods manuals, and safety plans readily available to staff.
13. Have raw analytical data readily accessible so that they are available upon request.

In addition, laboratories involved in the RMC are required to demonstrate capability continuously through the following protocols:

1. Strict adherence to routine QA/QC procedures.
2. Routine analysis of CRMs, if available.
3. Regular participation in annual certification programs.
4. Satisfactory performance at least annually in the analysis of blind Performance Evaluation Samples and/or participation in inter-laboratory comparison exercises.

Laboratory QC samples must satisfy SWAMP measurement quality objectives (MQOs) and frequency requirements. MQOs are specified in Appendix A. Frequency requirements are provided on an analytical batch level. The RMC defines an analytical batch as 20 or fewer samples and associated quality control that are processed by the same instrument within a 24-hour period (unless otherwise specified by method). Details regarding sample preparation are method- or laboratory SOP-specific, and may consist of extraction, digestion, or other techniques.

14.2. Laboratory Quality Contol for Biological Data

Sorting efficiency is used to quantify the sorting accuracy of the laboratory. Once samples are sorted, a second technician will re-sort the remnants of sorted aliquots for 10% of the original processing time to recover organisms missed by the primary sorter and to assess sorting accuracy. The acceptable accuracy limit is 95%. If a second sorting technician is not available and a taxonomist performs sorting activities, the same taxonomist may re-sort the remnant for evaluating sorting accuracy.

Precision of sorting shall be assessed as processing efficiency. Processing efficiency is the ability to obtain adequate numbers of organisms (i.e. ≥600) from all samples, or to sort 100% of sample volume. Samples with fewer than 600 organisms removed shall be sorted until this number has been achieved, or there is no sample left to sort.

Recount accuracy is used to quantify the sorting accuracy of the laboratory. A subset of samples (10%, or one per lab per project each year, whichever is greater) that have been sorted and identified are sent to a reference laboratory. At the reference lab, the number of benthic macroinvertebrates is enumerated by new sorters or taxonomists. The acceptable recount accuracy limit is 95%.

Sample re-identification is used to quantify the identification accuracy of the laboratory. A subset of samples (10%, or one sample per lab per project each year, whichever is greater) analyzed by a second taxonomist at the reference lab will re-identify the sample to ensure that all organisms have been accurately identified and enumerated. The acceptable accuracy limits are shown in Table 4. Identification accuracy is calculated using the following metrics: Acceptable error rates for taxa count error, taxa ID error, and individual ID error are less than or equal to 10%.

Precision will also be assessed as bias through the re-identification process. Bias is defined as systemic errors, arising when a specific taxon is consistently misidentified. Only common taxa (i.e., those appearing at least 5 times in all the samples submitted for quality assurance checks) will count towards the calculation of systemic errors. Acceptable systemic error rates are ≤10% of all common taxa in a batch submitted for QA check.

Precision of identifications will also be assessed through the re-identification process. Random errors are inconsistent misidentifications in which different specimens of a single taxon are identified as belonging to multiple taxa or specimens of multiple taxa are identified as the same taxon. Acceptable random error rates are ≤10% of all taxa in a batch submitted for QA check.

Precision of identifications will also be assessed as taxonomic resolution errors. Taxonomic resolution errors occur when specimens are not identified to a taxonomic level supported by the condition of the specimen, or by the STE. Acceptable taxonomic resolution error rates are ≤10% of all individuals in a sample.

14.3. Calibration and Working Standards

All calibration standards must be traceable to a certified standard obtained from a recognized organization. If traceable standards are not available, procedures must be implemented to standardize the utilized calibration solutions (e.g., comparison to a certified reference material (CRM – see below). Standardization of calibration solutions must be thoroughly documented, and is only acceptable when pre-certified standard solutions are not available. Working standards are dilutions of stock standards prepared for daily use in the laboratory. Working standards are used to calibrate instruments or prepare matrix spikes, and may be prepared at several different dilutions from a common stock standard. Working standards are diluted with solutions that ensure the stability of the target analyte. Preparation of the working standard must be thoroughly documented such that each working standard is traceable back to its original stock standard. Finally, the concentration of all working standards must be verified by analysis prior to use in the laboratory.

14.4. Instrument Calibration

Prior to sample analysis, utilized instruments must be calibrated following the procedures outlined in the relevant analytical method or laboratory SOP. Each method or SOP must specify acceptance criteria that demonstrate instrument stability and an acceptable calibration. If instrument calibration does not meet the specified acceptance criteria, the analytical process is not in control and must be halted. The instrument must be successfully recalibrated before samples may be analyzed.

Calibration curves will be established for each analyte covering the range of expected sample concentrations. Only data that result from quantification within the demonstrated working calibration range may be reported unflagged by the laboratory. Quantification based upon extrapolation is not acceptable. Data reported outside of the calibration range must be flagged as "Detected not Quantified". Alternatively, if the instrumentation is linear over the concentration ranges to be measured in the samples, the use of a calibration blank and one single standard that is higher in concentration than the samples may be appropriate. Samples outside the calibration range will be diluted or concentrated, as appropriate, and reanalyzed.

14.5. Initial Calibration Verification

The initial calibration verification (ICV) is a mid-level standard analyzed immediately following the calibration curve. The source of the standards used to calibrate the instrument and the source of the standard used to perform the ICV must be independent of one another. This is usually achieved by the purchase of standards from separate vendors. Since the standards are obtained from independent sources and both are traceable, analyses of the ICV functions as a check on the accuracy of the standards used to calibrate the instrument. The ICV is not a requirement of all SOPs or methods, particularly if other checks on analytical accuracy are present in the sample batch.

14.6. Continuing Calibration Verification

Continuing calibration verification (CCV) standards are mid-level standards analyzed at specified intervals during the course of the analytical run. CCVs are used to monitor sensitivity changes in the instrument during analysis. In order to properly assess these sensitivity changes, the standards used to perform CCVs must be from the same set of working standards used to calibrate the instrument. Use of a second source standard is not necessary for CCV standards, since other QC samples are designed to assess the accuracy of the calibration standards. Analysis of CCVs using the calibration standards limits this QC sample to assessing only instrument sensitivity changes. The acceptance criterion and required frequency for CCVs are detailed in Appendix A, Measurement Quality Objectives. If a CCV falls outside the acceptance limits, the analytical system is not in control, and immediate corrective action must be taken.

Data obtained while the instrument is out of control is not reportable, and all samples analyzed during this period must be reanalyzed. If reanalysis is not an option, the original data must be flagged with the appropriate qualifier and reported. A narrative must be submitted listing the results that were generated while the instrument was out of control, in addition to corrective actions that were applied.

14.7. Laboratory Blanks

Laboratory blanks (also called extraction blanks, procedural blanks, or method blanks) are used to assess the background level of target analyte resulting from sample preparation and analysis. Laboratory blanks are carried through precisely the same procedures as the field samples. For both organic and inorganic analyses, a minimum of at least one laboratory blank must be prepared and analyzed in every analytical batch. Some methods may require more than one laboratory blank with each analytical run. Acceptance criteria for laboratory blanks are detailed in Appendix A, Measurement Quality Objectives. Blanks that are too high require corrective action to bring the concentrations down to acceptable levels. This may involve changing reagents, cleaning equipment, or even modifying the utilized methods or SOPs. Although acceptable laboratory blanks are important for obtaining results for low-level samples, improvements in analytical sensitivity have pushed detection limits down to the point where some amount of analyte will be detected in even the cleanest laboratory blanks. The magnitude of the blanks must be evaluated against the concentrations of the samples being analyzed and against Program objectives.

14.8. Reference Materials and Demonstration of Laboratory Accuracy

Evaluation of the accuracy of laboratory procedures is achieved through the preparation and analysis of reference materials with each analytical batch. Ideally, the reference materials selected are similar in matrix and concentration range to the samples being prepared and analyzed. The acceptance criteria for reference materials are listed in Appendix A, Measurement Quality Objectives. The accuracy of an analytical method can be assessed using CRMs only when certified values are provided for the target analytes. When possible, reference materials that have certified values for the target analytes should be used. This is not always possible, and often times certified reference values are not available for all target analytes. Many reference materials have both certified and non-certified (or reference) values listed on the certificate of analysis. Certified reference values are clearly distinguished from the non-certified reference values on the certificate of analysis.

14.9. Reference Materials vs. Certified Reference Materials

The distinction between a reference material and a certified reference material does not involve how the two are prepared, rather with the way that the reference values were established. Certified values are determined through replicate analyses using two independent measurement techniques for verification. The certifying agency may also provide "non-certified or "reference" values for other target analytes. Such values are determined using a single measurement technique that may introduce bias. When available, it is preferable to use reference materials that have certified values for all target analytes. This is not always an option, and therefore it is acceptable to use materials that have reference values for these analytes. Note: Standard Reference Materials (SRMs) are essentially the same as CRMs. The term "Standard Reference Material" has been trademarked by the National Institute of Standards and Technology (NIST), and is therefore used only for reference materials distributed by NIST.

14.10. Laboratory Control Samples

While reference materials are not available for all analytes, a way of assessing the accuracy of an analytical method is still required. Laboratory control samples (LCSs) provide an alternate method of assessing accuracy. An LCS is a specimen of known composition prepared using contaminant-free reagent water or an inert solid spiked with the target analyte at the midpoint of the calibration curve or at the level of concern. The LCS must be analyzed using the same preparation, reagents, and analytical methods employed for regular samples. If an LCS needs to be substituted for a reference material, the acceptance criteria are the same as those for the analysis of reference materials. These are detailed in Appendix A, Measurement Quality Objectives.

14.11. Prioritizing Certified Reference Materials, Reference Materials, and Laboratory Control Samples

Certified reference materials, reference materials, and laboratory control samples all provide a method to assess the accuracy at the mid-range of the analytical process. However, this does not mean that they can be used interchangeably in all situations. When available, RMC Creek Status Monitoring requires the analysis of one certified reference material per analytical batch. Certified values are not always available for all target analytes. If no certified reference material exists, reference values may be used. If no reference material exists for the target analyte, an LCS must be prepared and analyzed with the sample batch as a means of assessing accuracy. The hierarchy is as follows: analysis of a CRM is favored over the analysis of a reference material, and analysis of a reference material is preferable to the analysis of an LCS. Substitution of an LCS is not acceptable if a certified reference material or reference material is available.

14.12. Matrix Spikes

A matrix spike (MS) is prepared by adding a known concentration of the target analyte to a field sample, which is then subjected to the entire analytical procedure. Matrix spikes are analyzed in order to assess the magnitude of matrix interference and bias present. Because matrix spikes are analyzed in pairs, the second spike is called the matrix spike duplicate (MSD). The MSD provides information regarding the precision of the matrix effects. Both the MS and MSD are split from the same original field sample. In order to properly assess the degree of matrix interference and potential bias, the spiking level should be approximately 2-5x the ambient concentration of the spiked sample. To establish spiking levels prior to sample analysis, laboratories should review any relevant historical data. In many instances, the laboratory will be spiking samples blind and will not meet a spiking level of 2-5x the ambient concentration. In addition to the recoveries, the relative percent difference (RPD) between the MS and MSD is calculated to evaluate how matrix affects precision. The MQO for the RPD between the MS and MSD is the same regardless of the method of calculation. These are detailed in Appendix A: *Measurement Quality Objectives*. Recovery data for matrix spikes provides a basis for determining the prevalence of matrix effects in the samples collected and analyzed for SWAMP. If the percent recovery for any analyte in the MS or MSD is outside of the limits specified in Appendix A, Measurement Quality Objectives, the chromatograms (in the case of trace organic analyses) and raw data quantitation reports should be reviewed. Data should be scrutinized for evidence of sensitivity shifts (indicated by the results of the CCVs) or other potential problems with the analytical process. If associated QC samples (reference materials or LCSs) are in control, matrix effects may be the source of the problem. If the standard used to spike the samples is different from the standard used to calibrate the instrument, it must be checked for accuracy prior to attributing poor recoveries to matrix effects.

14.13. Laboratory Duplicates

In order to evaluate the precision of an analytical process, a field sample is selected and prepared in duplicate. Specific requirements pertaining to the analysis of laboratory duplicates vary depending on the type of analysis. The acceptance criteria for laboratory duplicates are specified in Appendix A, Measurement Quality Objectives.

14.14. Laboratory Duplicates vs. Matrix Spike Duplicates

Although the laboratory duplicate and matrix spike duplicate both provide information regarding precision, they are unique measurements. Laboratory duplicates provide information regarding the precision of laboratory procedures. The matrix spike duplicate provides information regarding how the matrix of the sample affects both the precision and bias associated with the results. It also determines whether or not the matrix affects the results in a reproducible manner. Because the two concepts cannot be used interchangeably, it is unacceptable to analyze only an MS/MSD when a laboratory duplicate is required.

14.15. Replicate Analyses

The RMC will adopt the same terminology as SWAMP in defining replicate samples, wherein replicate analyses are distinguished from duplicate analyses based simply on the number of involved analyses. Duplicate analyses refer to two sample preparations, while replicate analyses refer to three or more. Analysis of replicate samples is not explicitly required.

14.16. Surrogates

Surrogate compounds accompany organic measurements in order to estimate target analyte losses during sample extraction and analysis. The selected surrogate compounds behave similarly to the target analytes, and therefore any loss of the surrogate compound during preparation and analysis is presumed to coincide with a similar loss of the target analyte. Surrogate compounds must be added to field and QC samples prior to extraction, or according to the utilized method or SOP. Surrogate recovery data is to be carefully monitored. If possible, isotopically labeled analogs of the analytes are to be used as surrogates.

14.17. Internal Standards

To optimize gas chromatography mass spectrometry (GC-MS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) analyses, internal standards (also referred to as “injection internal standards”) may be added to field and QC sample extracts prior to injection. Use of internal standards is particularly important for analysis of complex extracts subject to retention time shifts relative to the analysis of standards. The internal standards can also be used to detect and correct for problems in the GC injection port or other parts of the instrument. The analyst must monitor internal standard retention times and recoveries to determine if instrument maintenance or repair or changes in analytical procedures are indicated. Corrective action is initiated based on the judgment of the analyst. Instrument problems that affect the data or result in reanalysis must be documented properly in logbooks and internal data reports, and used by the laboratory personnel to take appropriate corrective action. Performance criteria for internal standards are established by the method or laboratory SOP.

14.18. Dual-Column Confirmation

Due to the high probability of false positives from single-column analyses, dual column confirmation should be applied to all gas chromatography and liquid chromatography methods that do not provide definitive identifications. It should not be restricted to instruments with electron capture detection (ECD).

14.19. Dilution of Samples

Final reported results must be corrected for dilution carried out during the process of analysis. In order to evaluate the QC analyses associated with an analytical batch, corresponding batch QC samples must be analyzed at the same dilution factor. For example, the results used to calculate the results of matrix spikes must be derived from results for the native sample, matrix spike, and matrix spike duplicate analyzed at the same dilution. Results derived from samples analyzed at different dilution factors must not be used to calculate QC results.

14.20. Laboratory Corrective Action

Failures in laboratory measurement systems include, but are not limited to: instrument malfunction, calibration failure, sample container breakage, contamination, and QC sample failure. If the failure can be corrected, the analyst must document it and its associated corrective actions in the laboratory record and complete the analysis. If the failure is not resolved, it is conveyed to the respective supervisor who should determine if the analytical failure compromised associated results. The nature and disposition of the problem must be documented in the data report that is sent to the RMC Program Manager. SWAMP comparable corrective actions are detailed in Appendix C.

14.21. Field Quality Control

Field QC results must meet the MQOs and frequency requirements specified in Appendix A, Measurement Quality Objectives, where frequency requirements are provided on a sample batch level. RMC defines a sample batch as 20 or fewer field samples prepared and analyzed with a common set of QC samples. Specific field quality control samples may also be required by the method or SOP selected for sample collection and analysis. If RMC MQOs conflict with those prescribed in the utilized method or SOP, the more rigorous of the objectives must be met.

14.22. Travel Blanks

Travel blanks are used to determine if there is any cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. One volatile organic analysis (VOA) sample vial with reagent water known to be free of volatile contaminants is transported to the site with the empty sample containers. The list of volatile organic compounds (VOCs) includes methyl tert-butyl ether (MTBE); and benzene, toluene, ethylbenzene, and xylenes (BTEX). This vial must be handled like a sample (but never opened) and returned to the laboratory with the other samples. Travel blanks are not required (unless explicitly required by the utilized method or SOP), but are encouraged as possible and appropriate. At the current time, there are no analyses of volatile constituents associated with RMC Creek Status Monitoring.

14.23. Equipment Blanks

Equipment blanks are generated by the personnel responsible for cleaning sampling equipment. Equipment blanks must be analyzed before the equipment is shipped to the sampling site. In order to accommodate any necessary corrective action, equipment blank results should be available well in advance of the sampling event. To ensure that sampling equipment is contaminant-free, water known to be low in the target analyte(s) must be processed though the equipment as during sample collection. The specific type of water used for blanks is selected based on the information contained in the relevant sampling or analysis methods. The water must be collected in an appropriate sample container, preserved, and analyzed for the target analytes (in other words, treated as an actual sample). The inclusion of field blanks is dependent on the requirements specified in the relevant MQO tables, or in the sampling method or SOP. Typically, equipment blanks are collected when new equipment, equipment that has been cleaned after use at a contaminated site, or equipment that is not dedicated for surface water sampling is used. An equipment blank must be prepared for dissolved metals in water samples whenever a new lot of filters is used.

14.24. Field Blanks

A field blank is collected to assess potential sample contamination levels that occur during field sampling activities. Field blanks are taken to the field, transferred to the appropriate container, preserved (if required by the method), and treated the same as the corresponding sample type during the course of a sampling event. The inclusion of field blanks is dependent on the requirements specified in the relevant MQO tables or in the sampling method or SOP. Field blanks for other media and analytes should be conducted upon initiation of sampling. If field blank performance is acceptable, further collection and analysis of field blanks should be performed on an as-needed basis. Acceptable levels for field blanks are specified in Appendix A, Measurement Quality Objectives. The water used for field blanks must be free of target analyte(s) and appropriate for the analysis being conducted.

14.25. Field Duplicates

Field samples collected in duplicate provide precision information as it pertains to the sampling process. The duplicate sample must be collected in the same manner and as close in time as possible to the original sample. This effort is to attempt to examine field homogeneity as well as sample handling, within the limits and constraints of the situation.

Bioassessment field duplicates help quantify intrinsic variability associated with sampling activities. Bioassessment field duplicates are comprised of a second sample taken at 10% of all sampling sites. There are no specific criteria for field duplicate variability, but these data are evaluated in the data analysis/assessment process for small-scale spatial variability.

14.26. Field Corrective Action

The field organization is responsible for responding to failures in their sampling and field measurement systems. If monitoring equipment fails, personnel are to record the problem according to their documentation protocols. Failing equipment must be replaced or repaired prior to subsequent sampling events. It is the combined responsibility of all members of the field organization to determine if the performance requirements of the specific sampling method have been met, and to collect additional samples if necessary. Associated data is entered into the SWAMP Information Management System (IMS) and flagged accordingly. Specific field corrective actions are detailed in Appendix C.

14.27. Collection of Background Samples

Background samples provide a comparison between the concentrations or levels of the target parameters in the Program's environmental samples with samples from a nearby location that is known or believed to be uncontaminated (i.e., to contain the target parameters at "natural" concentrations or levels. This is necessary in order to differentiate between the project on-site contribution and the off-site natural contribution to the parameter's concentrations or levels. Background samples will not be required for measurements and analyses covered within this QAPP.

14.28. Field Sampling Representativeness

Field sampling accuracy is ensured by evaluating if the sample event occurred at the nominal coordinates, within the index period, and within the nominal stratum. Site location shall be measured by global positioning system and must be within 10 seconds (~300 m) of the nominal latitude and longitude. All samples must be collected within the established index period and within the nominal stratum.

15. (B6) Instrument/Equipment Testing, Inspection and Maintenance

15.1. RMC Field Equipment

Field measurement equipment will be checked for operation in accordance with manufacturer's specifications. This includes battery checks and routine replacement and/or cleaning of parts as specified by the manufacturer. All equipment will be inspected for damage when first employed and again when returned from use. Maintenance logs will be kept and each piece of equipment will have its own log that documents the dates and description of any problems, the action(s) taken to correct problem(s), maintenance procedures, system checks, follow-up maintenance dates, and the person responsible for maintaining the equipment. A list of anticipated field measurement equipment to be used for RMC monitoring is shown in Table 15-1. The RMC will implement standard methods associated with calibration and equipment maintenance as described in RMS SOPs FS-3, FS-4, and FS-5.

15.1. Laboratory Equipment

All laboratories providing analytical support for chemical or biological analyses will have the appropriate facilities to store, prepare, and process samples. Moreover, appropriate instrumentation and staff to provide data of the required quality within the schedule required by the program are also required. Laboratory operations must include the following procedures:

- A program of scheduled maintenance of analytical balances, microscopes, laboratory equipment, and instrumentation.
- Routine checking of analytical balances using a set of standard reference weights (American Society of Testing and Materials (ASTM) Class 3, NIST Class S-1, or equivalents).
- Checking and recording the composition of fresh calibration standards against the previous lot, wherever possible. Acceptable comparisons are < 2% of the previous value.
- Recording all analytical data in bound (where possible) logbooks, with all entries in ink, or electronic format.
- Monitoring and documenting the temperatures of cold storage areas and freezer units once per week.
- Verifying the efficiency of fume hoods.
- Having a source of reagent water meeting ASTM Type I specifications (ASTM, 1984) available in sufficient quantity to support analytical operations. The conductivity of the reagent water will not exceed 18 megaohms at 25°C. Alternately, the resistivity of the reagent water will exceed 10 mmhos/cm.
- Labeling all containers used in the laboratory with date prepared, contents, initials of the individual who prepared the contents, and other information, as appropriate.
- Dating and safely storing all chemicals upon receipt. Proper disposal of chemicals when the expiration date has passed.
- Having QAPP, SOPs, analytical methods manuals, and safety plans readily available to staff.
- Having raw analytical data, such as chromatograms, accessible so that they are available upon request.

Laboratories will maintain appropriate equipment per the requirements of individual laboratory SOPs and will be able to provide information documenting their ability to conduct the analyses with the required level of data quality. Such information might include results from interlaboratory comparison studies, control charts and summary data of internal QA/QC checks, and results from certified reference material analyses.

Table 15-1. Testing, Inspection and Maintenance of Sampling Equipment and Analytical Instruments

Instrument / Equipment	Test / Maintenance	Frequency of Checking	Responsible Person
YSI Multi-parameter probe (or similar)	Operation and battery life	Before and after each use	Local Program Field Lead
Digital Temperature Logger	Operation and battery life	Before and after each use	Local Program Field Lead

16. (B7) Instrument/Equipment Calibration and Frequency

16.1. Field Measurements

Equipment used for RMC Creek Status Monitoring shall be calibrated at frequencies as shown in Table 16-1. The RMC will implement standard methods associated with calibration and equipment maintenance as described in RMS SOPs FS-3, FS-4, and FS-5.

Table 16-1. Field Instrument Calibration and Quality Checks Frequency for RMC Water Quality Measurement Equipment

Analyte	Instrument Kind	Instrument Name or Type	Standard Material	Frequency of Calibration &Accuracy Checks
Temperature	Digital thermometer	Not specified	NIST-certified thermometer	Annually
Temperature	Digital temperature logger	HOBO Water Temp Pro V2 (or equivalent)	NIST-certified thermometer	Annually
DO, pH, Temperature, Conductivity	Multi-parameter probe	YSI 6600 V2 (or equivalent)	As appropriate for each probe	Before each monitoring event

16.2. Laboratory Analyses

16.2.1. In-house Analyses

There are no in-house laboratory-based analyses planned for this project.

16.2.2. Contract Laboratory Analyses

The procedures for and frequency of calibration will vary depending on the chemical parameters being determined. Equipment is maintained and checked according to the standard procedures specified in each laboratory's instrument operation instruction manual.

Upon initiation of an analytical run, after each major equipment disruption, and whenever on-going calibration checks do not meet recommended DQOs (see Appendix A), analytical systems will be calibrated with a full range of analytical standards. Immediately after this procedure, the initial calibration must be verified through the analysis of a standard obtained from a different source than the standards used to calibrate the instrumentation and prepared in an independent manner and ideally having certified concentrations of target analytes of a CRM or certified solution. Frequently, calibration standards are included as part of an analytical run, interspersed with actual samples.

Calibration curves will be established for each analyte and batch analysis from a calibration blank and a minimum of three analytical standards of increasing concentration, covering the range of expected sample concentrations. Only those data resulting from quantification within the demonstrated working calibration range may be reported by the laboratory. Alternatively, if the instrumentation is linear over the concentration ranges to be measured in the samples, the use of a calibration blank and one single standard that is higher in concentration than the samples may be appropriate. Samples outside the calibration range will be diluted or concentrated, as appropriate, and reanalyzed.

The calibration standards will be prepared from reference materials available from the EPA repository, or from available commercial sources. The source, lot number, identification, and purity of each reference material will be recorded. Neat compounds will be prepared weight/volume using a calibrated analytical balance and Class A volumetric flasks. Reference solutions will be diluted using Class A volumetric glassware. Individual stock standards for each analyte will be prepared. Combination working standards will be prepared by volumetric dilution of the stock standards. The calibration standards will be stored at -20º C. Newly prepared standards will be compared with existing standards prior to their use. All solvents used will be commercially available, distilled in glass, and judged suitable for analysis of selected chemicals. Stock standards and intermediate standards are prepared on an annual basis and working standards are prepared every three months.

Sampling and analytical logbooks will be kept to record inspections, calibrations, standard identification numbers, the results of calibrations, and corrective action taken. Equipment logs will document instrument usage, maintenance, repair and performance checks. Daily calibration data will be stored with the raw sample data.

16.3. Biological Measurements

There are no SWAMP requirements for instrument/equipment calibration and frequency for bacteria. The guidance provided in Standard Methods (20th edition) section 9020 will be followed.

17. (B8) Inspection/Acceptance for Supplies and Consumables

Each sampling event conducted for the RMC Creek Status Monitoring Program will require use of appropriate consumables to reduce likelihood of sample contamination (e.g., solvents for field cleaning sampling equipment, trace metal clean sample containers for mercury analysis). Field Leads will be responsible for ensuring that all supplies are appropriate prior to their use. Inspection requirements for sampling consumables and supplies are summarized in Table 17-1.

Table 17-1. Inspection / Acceptance Testing Requirements for Consumables and Supplies

Project-related Supplies	Inspection / Testing Specifications	Acceptance Criteria	Frequency	Responsible Person Sampling Containers
Chemetrics test kits	Visual	Appropriateness; no evident contamination or damage; reagents within expiration date	Each purchase	Local Program Field Lead
Sampling supplies	Visual	Appropriateness; no evident contamination or damage; within expiration date	Each purchase	Local Program Field Lead

18. (B9) Non Direct Measurements, Existing Data

No data from external sources are planned to be used with this project.

19. (B10) Data Management

As previously discussed, RMC Creek Status Monitoring Program data management will conform to protocols dictated by relevant SOPs (Table 11-1). A summary of specific data management aspects is provided below.

19.1. Field Data Management

SOP number DM-1, Field Measurements Data Management, is the SOP that will be used for managing field data for the RMC Creek Status Monitoring Program. This SOP describes standardized record-keeping and tracking practices, and the document control system. It thus provides a standardized approach for data management from field to final use and storage for all field data. The SOP identifies all data handling equipment/procedures that should be used to process, compile, analyze, and transmit field data reliably and accurately. The SOP describes how field measurements will be formatted, entered, and uploaded into the SWAMP Information Management System. The RMC will use these protocols to produce SWAMP-comparable field measurement data for inclusion in the SWAMP database. The SOP describes the SWAMP documentation for producing field data sheets, and these protocols will be followed so that SWAMP-comparable data will be produced. Each LIMC will be responsible for field measurement data management for their individual SW Program.

19.2. Continuous Monitoring Data Management

SOP number DM-2, Continuous Monitoring Data Management, is the SOP that will be used for managing continuous monitoring analytical data with the proposed project. This SOP describes standardized record-keeping and tracking practices, and the document control system. It thus provides a standardized approach for data management from field to final use and storage for all continuous monitoring data. The SOP identifies all data handling equipment/procedures that should be used to process, compile, analyze, and transmit continuous monitoring analytical data reliably and accurately. The SOP describes how continuous monitoring data will be formatted, entered, and uploaded into the SWAMP Information Management System. The RMC will use these protocols to produce SWAMP-comparable continuous monitoring data for inclusion in the SWAMP database. The SOP describes the SWAMP documentation for producing continuous monitoring data sheets and these protocols will be followed so that SWAMP-comparable data will be produced. Each LIMC will be responsible for continuous monitoring data management.

19.3. Laboratory Data Management

SOP number DM-3, Laboratory Data Management, is the SOP that will be used for managing laboratory analytical data with the proposed project. This SOP describes standardized record-keeping and tracking practices, and the document control system. It thus provides a standardized approach for data management from field to final use and storage for all laboratory data. The SOP identifies all data handling equipment/procedures that should be used to process, compile, analyze, and transmit laboratory analytical data reliably and accurately. The SOP describes how laboratory analytical data will be formatted, entered, and uploaded into the SWAMP Information Management System. We will use the Excel template for laboratories that is provided by the SWAMP Data Management Team for formatting laboratory data in a manner that can easily be loaded into the SWAMP Database. The SOP describes documentation for using SWAMP's standardized list of analytes and these protocols will be followed so that SWAMP-comparable data will be produced. This SOP describes how the RMC will manage data involving analysis of chemicals and bacteria as well as for toxicity analyses. The SOP references the chemical and biological analytical template as well as the toxicity analytical template. Each LIMC will be responsible for laboratory analytical data management.

The above-mentioned SOPs reference the SWAMP station template that will be used to generate SWAMP-comparable data. These SOPs reference the SWAMP file and batch naming convention that will be used for all data management so that the data will be comparable for loading into the SWAMP Information Management System. These SOPs also reference the need for data comparability, and by following these guidelines, the SWAMP Information Management System requirements for specified fields for database comparability will be followed.

20. (C1) Assessments and Response Actions

20.1. Readiness Reviews

PMLs, or their designee, will review all field equipment, instruments, containers, and paperwork to ensure that everything is ready prior to each sampling event (see SOP R-1, Reports to RMC Program Managers). All sampling personnel will be given a brief review of the goals and objectives of the sampling event and the sampling procedures and equipment that will be used to achieve them. It is important that all field equipment be clean and ready to use when it is needed. Therefore, prior to using all sampling and/or field measurement equipment, each piece of equipment will be checked to make sure that it is in proper working order. Equipment maintenance records will be checked to ensure that all field instruments have been properly maintained and that they are ready for use. Adequate supplies of all preservatives, bottles, labels, waterproof pens, etc. will be checked before each field event to make sure that there are sufficient supplies to successfully support each sampling event, and, as applicable, are within their expiration dates. It is important to make sure that all field activities and measurements are properly recorded in the field. Therefore, prior to starting each field event, necessary paperwork such as logbooks, chain of custody record forms, etc. will be checked to ensure that sufficient amounts are available during the field event. In the event that a problem is discovered during a readiness review it will be noted in the field log book and corrected before the field crew is deployed. The actions taken to correct the problem will also be documented with the problem in the field log book. This information will be communicated by the PML to the LQAO prior to conducting relevant sampling. The LQAO will track corrective actions taken, and as appropriate, communicate this information to other Stormwater Programs for whom it may be relevant.

20.2. Field Activity Audits

The responsible LQAO will be responsible for conducting all field activity audits within their jurisdiction (see SOP R-1, Reports to RMC Program Managers). Any problems that are noted will be documented along with recommendations for correcting the problem. Field activity audits will be conducted on a rotating basis during the Program's various field sampling activities. The CQAO will determine the appropriate frequency of audits based upon the complexity of sampling and findings of previous audits. At a minimum, these audits will be conducted on a biennial basis.

Field activity audits will assess the sample collection methodologies, field measurement procedures, and record keeping of the field crew in order to ensure that the activities are being conducted as planned and as documented in this QAPP. In the event that a problem is discovered during a field audit, it will be corrected as soon as possible so that all subsequent samples and field measurements collected are valid. The problems and the actions taken to correct them will become a part of the field audit report. Any field sampling team member has authority to stop any sampling or field measurement activity that could potentially compromise data quality.

20.3. Post Sampling Event Reviews

PMLs, or their designee, will be responsible for post sampling event reviews (see SOP R-1, Reports to RMC Program Managers). Any problems that are noted will be documented along with recommendations for correcting the problem. Post sampling event reviews will be conducted following each sampling event in order to ensure that all information is complete and any deviations from planned methodologies are documented. Post sampling event reviews will include field sampling activities and field measurement documentation in order to help ensure that all information is complete. The reports for each post sampling event will be used to identify areas that may be improved prior to the next sampling event. A combined post sampling event report, identifying any deficiencies and corrective actions taken, will be an integral part of the final report on this proposed project.

20.4. Laboratory Data Reviews

The LQAO or CQAO (incorporate info from IMS, R&R) will be responsible for reviewing the laboratory's data for completeness and accuracy. The data will also be checked to make sure that the appropriate methods were used and that all required QC data was provided with the sample analytical results. Laboratory data reviews will be conducted following receipt of each data package from a laboratory in order to ensure that all information is complete and any deviations from planned methodologies are either corrected or the reasons for change are documented. Any laboratory data that is discovered to be incorrect or missing will immediately be reported to the both the laboratory and LQAO/CQAO. The laboratory's QA manual details the procedures that will be followed by laboratory personnel to correct any invalid or missing data. The RMC PM and LQAO/CQAO have the authority to request re-testing if a review of any of the laboratory data is found to be invalid or if it would compromise the quality of the data and resulting conclusions from the proposed project.

Table 20-1. Type and Frequency of QA Reviews for RMC Creek Status Monitoring Program

Type of Review	Frequency	Person(s) Responsible for Report Preparation	Report Recipients
Readiness Review	Prior to each sampling event	PML	MCC
Field Activity Audit	Minimum biennial per field crew	LQAO	MCC
Post-sampling Reviews	Following each sampling event	PML	MCC
Laboratory Data Review	Per lab report	LQAO	CQAO

21. (C2) Reports to Management

21.1. Post Sampling Event Reports

PMLs will be responsible for submitting Post Sampling Event Reports to the PM at the conclusion of each monitoring component in a particular season. This report will follow that outlined in the SOP R-1, Reports to RMC Program Managers.

21.2. Water Quality Standard Exceedance Reports

When data collected through the RMC indicate that stormwater runoff or dry weather discharges are or may be causing or contributing to exceedance(s) of applicable water quality standards, the associated Stormwater Program shall notify the Water Board within no more than 30 days of such a determination and submit a follow-up report in accordance with MRP Provision C.1 requirements. This shall not apply to continuing or recurring exceedances of water quality standards previously reported to the Water Board or to exceedances of pollutants that are to be addressed pursuant to Provisions C.8 through C.14 of the MRP. Reports will follow the format outlined in the SOP R-2, Reports to RWQCB.

21.3. Status and Trend Electronic Data Reporting

Stormwater Programs shall submit an Electronic Status & Trends Data Report no later than January 15 of each year, reporting on all data collected during the foregoing October 1 through September 30 period. Electronic Status & Trends Data Reports shall be in a format compatible with the SWAMP database. Water Quality Objective exceedances shall be highlighted in the Report. Reports will follow the format outlined in the SOP R-2, Reports to RWQCB. Electronic data shall also be submitted during the same timeframe to SFEI for entry into the California Environmental Data Exchange Network (CEDEN).

21.4. Urban Creeks Monitoring Report

The RMC Program Manager shall submit a comprehensive Urban Creeks Monitoring Report to the Water Board no later than March 15 of each year, reporting on all data collected during the foregoing October 1 through September 30 period, with the initial report due March 15, 2013. Each Urban Creeks Monitoring Report shall contain summaries of information as identified in MRP Provision C.8.g.iii. Integrated Monitoring Report (see below). Reports will follow the format outlined in the SOP R-2, Reports to RWQCB.

21.1. Integrated Monitoring Report

No later than March 15, 2014, the RMC Program Manager shall prepare and submit an Integrated Monitoring Report to the Water Board on behalf of all participating Stormwater Programs, so that all monitoring conducted during the Permit term is reported. This report shall be in lieu of the Annual Urban Creeks Monitoring Report due on March 15, 2014. The report shall include, but not be limited to, a comprehensive analysis of all data collected pursuant to MRP Provision C.8, and may include other pertinent studies. The report shall include methods, data calculations, load estimates, and source estimates for each monitoring parameter. The report shall include a budget summary for each monitoring requirement and recommendations for future monitoring. Reports will follow the format outlined in the SOP R-2, Reports to RWQCB.

This information is additionally summarized in Table 21-1 below.

Table 21-1. Reports to Management

Type of Report	Frequency (daily; weekly; monthly; quarterly; annually; etc.)	Projected Delivery Dates(s)	Person(s) Responsible for Report Preparation	Report Recipients
Post Sampling Event Review	Event-based	Vary	PML	MCC
WQ Exceedance	Trigger-based	Vary	PML	PM
S&T Electronic Data	Annually	January 15	CIMC	WB, SFEI
Urban Creeks Monitoring	Annually	March 15	RP	WB
Integrated Monitoring	End of permit	March 15, 2014	RP	WB

22. (D1) Data Review, Verification, and Validation

Defining data review, verification, and validation procedures helps to ensure that Program data will be reviewed in an objective and consistent manner. Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly. LIMCs will be responsible for initial data review for field forms and field measurements; CIMC will be responsible for doing so for data reported by analytical laboratories. This includes checking that all technical criteria have been met, documenting any problems that are observed and, if possible, ensuring that deficiencies noted in the data are corrected. This review process is summarized below and detailed in SOP DM-4, Verification and Validation of Data.

In-house examination of the data produced from the proposed Program will be conducted to check for typical types of errors. This includes checking to make sure that the data have been recorded, transmitted, and processed correctly. The kinds of checks that will be made will include checking for data entry errors, transcription errors, transformation errors, calculation errors, and errors of data omission.

Data generated by Program activities will be reviewed against method quality objectives (MQOs) that were developed and documented in Element 7. This will ensure that the data will be of acceptable quality and that it will be SWAMP-comparable with respect to minimum expected MQOs.

QA/QC requirements were developed and documented in Elements 14, 15, 16, and 17 and the data will be checked against this information. Checks will include evaluation of field and laboratory duplicate results, field and laboratory blank data, matrix spike recovery data, and laboratory control sample data pertinent to each method and analytical data set. This will ensure that the data will be SWAMP-comparable with respect to quality assurance and quality control procedures.

Field data consists of all information obtained during sample collection and field measurements, including that documented in field log books and/or recording equipment, photographs, and chain of custody forms. Checks of field data will be made to ensure that it is complete, consistent, and meets the data management requirements that were developed and documented in Element 19.

Lab data consists of all information obtained during sample analysis. Initial review of laboratory data will be performed by the laboratory QA/QC Officer in accordance with the lab's internal data review procedures. However, upon receipt of laboratory data, the CIMC will perform independent checks to ensure that it is complete, consistent, and meets the data management requirements that were developed and documented in Element 19. This review will include evaluation of field and laboratory QC data and also making sure that the data are reported in compliance with procedures developed and documented in Elements 12, 13, and 14.

Data verification is the process of evaluating the completeness, correctness, and conformance / compliance of a specific data set against the method, procedural, or contractural specifications. The RMC will conduct data verification, as described in Element 14 on Quality Control, in order to ensure that it is SWAMP-comparable with respect to completeness, correctness, and conformance with minimum requirements. LIMCs will be responsible for data verification at the local level, and CIMC will do so for laboratory data.

Data validation is an analyte- and sample-specific process that evaluates the information after the verification process (i.e., determination of method, procedural, or contractual compliance) to determine analytical quality and any limitations. The CIMC will conduct data validation in order to ensure that the data is SWAMP-comparable with respect to its end use as described in Element 5.2 (Decisions or Outcomes).

Data will be separated into three categories for use with making decisions based upon it. These categories are: (1) data that meets all acceptance requirements, (2) data that has been determined to be unacceptable for use, and (3) data that may be conditionally used and that is flagged as per US EPA specifications.

23. (D2) Verification and Validation Methods

Defining the methods for data verification and validation helps to ensure that Program data are evaluated objectively and consistently. For the proposed Program many of these methods have been described in Element 22. Additional information is provided below.

All data records for the proposed Program will be checked visually and will be recorded as checked by the checker's initials as well as with the dates on which the records were checked. CIMC will conduct all of these reviews. CIMC staff will perform an independent re-check of at least 10% of these records as the validation methodology.

All of the laboratory's data will be checked as part of the verification methodology process. Each contract laboratory's Project Analyst will conduct reviews of all laboratory data for verification of their accuracy. CIMC staff will perform independent re-checks of at least 10% of them as the validation methodology.

Any data that is discovered to be incorrect or missing during the verification or validation process will immediately be reported to the PM. If errors involve laboratory data then this information will also be reported to the laboratory's CQAO. Each laboratory's QA manual details the procedures that will be followed by laboratory personnel to correct any invalid or missing data. LIMCs will be responsible for reporting and correcting any errors that are found in the data during the verification and validation process.

If there are any data quality problems identified, the CQAO will try to identify whether the problem is a result of project design issues, sampling issues, analytical methodology issues, or QA/QC issues (from laboratory or non-laboratory sources). If the source of the problems can be traced to one or more of these basic activities then the person or people in charge of the areas where the issues lie will be contacted and efforts will be made to immediately resolve the problem. If the issues are too broad or severe to be easily corrected then the appropriate people involved will be assembled to discuss and try to resolve the issue(s) as a group. The CQAO has the final authority to resolve any issues that may be identified during the verification and validation process.

During the process of verification and validation the methods that will be used are described in the RMC SOP DM-3.

24. (D3) Reconciliation with User Requirements

The purpose of the RMC Creek Status Monitoring Program is to obtain chemical, bacterial, and biological data from San Francisco Bay Area tributaries in compliance with the MRP permit conditions. RMC status and trends monitoring in local creeks/rivers is intended to answer the following core management questions: (1) Are conditions in local creeks supportive of or likely to be supportive of beneficial uses?; (2) Are conditions in local creeks getting better or worse over time?

Information from field data reports (including field activities, post sampling events, corrective actions, and audits), laboratory data reviews (including errors involving data entry, transcriptions, omissions, and calculations and laboratory audit reports), reviews of data versus Measurement Quality Objectives (MQOs), reviews against Quality Assurance and Quality Control (QA/QC) requirements, data verification reports, data validation reports, independent data checking reports, and error handling reports will be used to determine whether or not the Program's objectives have been met. Data from monitoring measurements will not be statistically analyzed. Descriptions of the data will be made with no extrapolation to more general cases.

Data from all monitoring measurements will be summarized in tables. In addition, data used for trend analysis will be represented graphically, when appropriate. Additional data may also be represented graphically when it is deemed helpful for interpretation purposes.

RMC data is collected from a wide variety of sites with differing stream type, land use conditions, and other factors. As the Bay Area in general is highly urbanized, there is a good likelihood that matrix interfences within the runoff may affect ability of some analyses to achieve data quality objectives (e.g. elevated MRLs relative to SWAMP recommendations).

The proposed Program will provide SWAMP-comparable data for the selected analytes described in Element 6. Electronic data shall also be submitted during the same timeframe to SFEI for entry into the California Environmental Data Exchange Network (CEDEN).

The above evaluations will provide a comprehensive assessment of how well the Program meets its objectives. No other evaluations will be used. The RMC Program Manager will be responsible for reporting project reconciliation. This will include measurements of how well the project objectives were met and the degree to which the data is SWAMP-comparable.

25. References

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USEPA Office of Solid Waste and Emergency Response, 1994a. *Using Toxicity Tests in Ecological Risk Assessment*. ECO Update Publication 9345.0-05I. Vol 2, No. 1.

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26. Appendix A. Measurement Quality Objectives for RMC Analytes

Table 26-1. Measurement Quality Objectives* - Conventional Analytes in Water

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Continuing Calibration Verification	Per 10 analytical runs	80-120% recovery
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent (chlorophyll: n/a)	80-120% recovery RPD<25% for duplicates
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent (chlorophyll: per method)	RPD<25% (n/a if native concentration of either sample<RL)
Internal Standard	Accompanying every analytical run as method appropriate	Per method
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	10% of total Project sample count	RPD<25% (n/a if native concentration of either sample<RL)
Field Blank, Travel Blank, Field, Travel, Eqpt Blanks	Field Blanks required for DOC only at a rate of 5% of total Project sample count	<RL for target analyte

*Unless method specifies more stringent requirements

Table 26-2. Measurement Quality Objectives* – Conventional Analytes in Water – Solids

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	10% of total Project sample count	RPD<25% (n/a if native concentration of either sample<RL)
Field Blank, Equipment Field, Eqpt Blanks	Not required for RMC analytes	<RL for target analyte

*Unless method specifies more stringent requirements

Table 26-3. Measurement Quality Objectives* – Conventional Analytes in Water - Pathogens

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration	Check temperatures in incubators twice daily with a minimum of 4 hours between each reading	Per analytical method or manufacturer's specifications
Filter Sterility Check	Perform one filter sterility check each day samples are analyzed	No growth on filter
Laboratory Blank	Per batch of bottles or reagents	No growth on filter
Filtration Blank	Per 20 samples or per analytical batch, whichever is more frequent	No growth on filter
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery
Positive Control	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery
Negative Control	Per 20 samples or per analytical batch, whichever is more frequent	No growth on filter
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count (coliforms: one per 25 tube dilution tests)	Coliforms: within 95% confidence interval as defined by IDEXX Laboratories)
Field Blank, Travel Blank, Field, Travel, Eqpt Blanks	Not required for RMC analytes	Blanks<RL for target analyte

*Unless method specifies more stringent requirements

Table 26-4. Measurement Quality Objectives* - Conventional Analytes in Sediments

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Continuing Calibration Verification	Per 10 analytical runs (as applicable)	80-120% recovery
Laboratory Blank	TOC only: one per analytical batch (n/a for others)	<RL or <30% of lowest sample
Reference Material	TOC only: one per 20 samples or per analytical batch, whichever is more frequent (n/a for others)	80-120% recovery
Matrix Spike	n/a	n/a
Matrix Spike Duplicate	n/a	n/a
Laboratory Duplicate	One per analytical batch	RPD<25% (n/a if native concentration of either sample<RL)
Surrogate or Internal Standard	n/a	n/a
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count	RPD<25% (n/a if native concentration of either sample<RL)
Field Blank, Travel Blank, Field, Travel, Eqpt Blanks	Not required for RMC analytes	<RL or <30% of lowest sample

*Unless method specifies more stringent requirements

Table 26-5. Measurement Quality Objectives* – Inorganic Analytes in Water (Bioassessment Sites)

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Continuing Calibration Verification	Per 10 analytical runs	80-120% recovery
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg)
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg)
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg); RPD<25%
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)
Internal Standard	Accompanying every analytical run when method appropriate	60-125% recovery
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	10% of total Project sample count	RPD<25% (n/a if native concentration of either sample<RL), unless otherwise specified by method
Field Blank, Equipment Field, Eqpt Blanks	5% equipment (filter) blanks for orthophosphate	Blanks<RL for target analyte

*Unless method specifies more stringent requirements

Table 26-6. Measurement Quality Objectives* – Inorganic Analytes in Sediment

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Continuing Calibration Verification	Per 10 analytical runs	80-120% recovery
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg)
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg)
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	75-125% recovery (70-130% for MMHg); RPD<25%
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)
Internal Standard	Accompanying every analytical run when method appropriate	60-125% recovery
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count	RPD<25% (n/a if native concentration of either sample<RL), unless otherwise specified by method
Field Blank, Equipment Field, Eqpt Blanks	Not required for RMC analytes	Blanks<RL for target analyte

*Unless method specifies more stringent requirements

Table 26-7. Measurement Quality Objectives* – Synthetic Organic Compounds in Water, Sediment and Tissue

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Continuing Calibration Verification	Per 10 analytical runs	Water: 85-115% recovery Sediment: 85-115% recovery Tissue: 75-125%
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analytes
Reference Material	Method Validation: as many as required to assess accuracy and precision of method before routine analysis of samples; Routine Accuracy Assessment: per 20 samples or per analytical batch (preferably blind)	70-130% recovery if certified; otherwise, 50-150% recovery
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	50-150% recovery, or based on 3x the standard deviation of laboratory's actual method recoveries
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25%
Laboratory Duplicate	Per method	Water: RPD<25% (n/a if native concentration of either sample<RL) Sediment: Per method Tissue: Per method
Surrogate or Internal Standard	Per method	Per method
Field Quality Control	**Frequency of Analysis**	**Measurement Quality Objective**
Field Duplicate	5% of total Project sample count	Per method
Field Blank, Travel Field, Field, Travel, EqptBlanks	Not required for RMC analytes	<RL for target analytes

* Unless method specifies more stringent requirements. ELISA results must be assessed against kit requirements

Table 26-8. Measurement Quality Objectives* - Toxicity Testing (General)

Negative Controls	Frequency of Analysis	Control Limits
Laboratory Control Water	Laboratory Control Water consistent with Section 7 of the appropriate EPA method must be tested with each analytical batch.	Laboratory Control Water must meet all test acceptability criteria (Please refer to Section 7 of the EPA manuals) for the species of interest.
Conductivity Control Water	A conductivity control must be tested with each analytical batch when the conductivity of any freshwater ambient sample approaches the species' tolerance for conductivity per method.	Follow EPA guidance on interpreting data.
Additional Control Water	Additional method blanks are required whenever manipulations are performed on one or more of the ambient samples within each analytical batch (e.g. pH adjustments, continuous aeration, etc.).	No statistical difference between the laboratory control water and each additional control water within an analytical batch.
Sediment Control	Sediment Control consistent with those described in Section 7 of the EPA manual must be tested with each analytical batch of sediment toxicity tests.	Sediment Control must meet all data acceptability criteria (Please refer to Section 7 of the EPA manuals) for the species of interest.
Positive Controls	**Frequency of Analysis**	**Control Limits**
Reference Toxicant Tests	Reference Toxicant Tests must be conducted monthly for species that are raised within a laboratory. Reference Toxicant Test must be conducted per analytical batch for species from commercial supplier settings. Reference Toxicant Tests must be conducted concurrently for test species or broodstocks that are field collected.	Last plotted data point must be within 2 SD of the cumulative mean (n=20). (Reference toxicant tests that fall outside of recommended control chart limits are evaluated to determine the validity of associated effluent and receiving water tests. An out of control reference toxicant test result does not necessarily invalidate associated test results. More frequent and/or concurrent reference toxicant testing may be advantageous if recent problems have been identified in testing.)
Field Quality Control	**Frequency of Analysis**	**Control Limits**
Field Duplicate	5% of total project sample count	According to method
Field Blanks	Not required for RMC analytes	No statistical difference between the laboratory control water (or sediment control) and the field blank within an analytical batch
Equipment Blanks	Not required for RMC analytes	No statistical difference between the Laboratory Control Water and the Equipment Blank within an analytical batch

*Unless method specifies more stringent requirements.

The measurement quality objectives for water quality parameters (pH, dissolved oxygen, conductivity, temperature, unionized ammonia, salinity, alkalinity and hardness) are detailed in the Field Measurement and Conventional Analytes tables of this Appendix. In special cases where the criteria listed in the following tables cannot be met, EPA minimum criteria may be followed. The affected data should be qualified accordingly.Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

Deviations from the summary of recommended test conditions must be evaluated on a project specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result depending on the degree of the departure and the objective of the test. The reviewer should consider the degree of the deviation and the potential or observed impact of the deviation on the test result before rejecting or accepting a test result is valid. For example, if dissolved oxygen is measured below 4.0 mg/L in one test chamber, the reviewer should consider whether any observed mortality in that test chamber corresponded with the drop in dissolved oxygen.

Table 26-9. Measurement Quality Objectives - 96-Hour *Selenastrum capricornutum* Chronic Aquatic Toxicity Test

Method Recommendation	
EPA/821/R-02/013 (Test Method 1003.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements	
Parameter	*Criteria*
Test Acceptability Criteria*	Mean cell density of at least 1 X 10^6 cells/mL in the controls and variability (CV%) among control replicates less than or equal to 20% (non-EDTA: Mean cell density of at least 1 X 106 cells/mL in the controls; and variability (CV%) among control replicates less than or equal to 20% (required)
Data Qualification	
Test Conditions	*Required*
Test Type	Static non-renewal
Age at Test Initiation	4 - 7 days
Replication at Test Initiation	10,000 cells/mL (recommended)
Organisms/Replicate	>4
Food Source	n/a
Renewal Frequency	None
Test Duration	96 h
Endpoints	Growth
Test Conditions	*Recommended***
Temperature Range	25 ± 1 °C (+/- 3 °C required)
Light Intensity	86 ± 8.6 µE/m^2/s OR 400 ± 40 ft-c
Photoperiod	Continuous Illumination (“cool white” fluorescent lighting)
Test Chamber Size	125 mL or 250 mL
Replicate Volume	50 mL or 100 mL
Feeding Regime	None
Nutrient Media	Media prepared in accordance with EPA protocols
EDTA Addition	EDTA required per method
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols
Minimum Sample Volume	1 L for one-time grab sample
Sensitivity	*Performance Criteria*
Minimum Significant Difference	<29% MSD If the percent minimum significant difference (PMSD) measured for the test exceeds the upper

	criterion and toxicity is found at the permitted receiving water concentration (RWC) based upon the value of the effect concentration estimate (NOEC or LOEC), then the test shall be accepted, unless other test review steps raise serious doubts about its validity. If toxicity is not found at the permitted RWC based upon the value of the effect concentration estimate (NOEC or LOEC) and the PMSD measured for the test exceeds the upper PMSD bound, then the test shall not be accepted, and a new test must be conducted promptly on a newly collected sample.
Water Chemistry	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	One pH and one temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement and per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.6 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are <100 or >2000 µS/cm
Sample Handling/Collection	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<3000 µS/cm
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 48 hours@ 0 - 6 °C; dark

*Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

**Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table 26-10. Measurement Quality Objectives - 7-Day *Pimephales promelas* Acute and Chronic Toxicity Tests

Method Recommendation	
EPA/821/R-02/013 (Test Method 1000.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements	
Parameter	*Criteria*
Test Acceptability Criteria*	80% or greater survival in controls and an average dry weight per surviving organism in control chambers equals or exceeds 0.25 mg
Data Qualification	
Test Conditions	*Required*
Test Type	Static renewal (required)
Age at Test Initiation	Newly-hatched larvae <24hoursold. If shipped, <48hours old with a 24-hour age range
Replication at Test Initiation	4 (minimum)
Organisms/Replicate	10 (minimum)
Food Source	Newly-hatched *Artemia* nauplii (<24hoursold)
Renewal Frequency	Daily
Test Duration	7 days
Endpoints	Survival and biomass
Test Conditions	*Recommended***
Temperature Range	25 ± 1.0 °C (+/- 3 °C required)
Light Intensity	10 – 20 µE/m^2/s or 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	>500 mL or per method specific requirements
Replicate Volume	>250 mL or per method specific requirements
Feeding Regime	< 2 times per day
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols
Minimum Sample Volume	7 L for one-time grab sample
Sensitivity	*Performance Criteria*
Minimum Significant Difference	<30% MSD If the percent minimum significant difference (PMSD) measured for the test exceeds the upper criterion and toxicity is found at the permitted receiving water concentration (RWC) based upon the value of the effect concentration estimate (NOEC or LOEC), then the test shall be accepted, unless other test review steps raise serious doubts about its validity. If toxicity is not found at the permitted RWC based upon the value of the effect concentration estimate (NOEC or LOEC) and

	the PMSD measured for the test exceeds the upper PMSD bound, then the test shall not be accepted, and a new test must be conducted promptly on a newly collected sample.
Water Chemistry	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample (recommended)
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	One DO and one pH measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement and per sample and per dilution (one DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.6 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Per method - recommend including appropriate controls when sample conductivities are below 100 or above 2500 µS/cm
Sample Handling/Collection	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<3000 µS/cm
Relevant Media	Water column
Sample Container Type	Amber glass or plastic (per method)
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

*Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

**Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table 26-11. Measurement Quality Objectives –*Ceriodaphnia dubia* Acute and Chronic Aquatic Toxicity Tests

Method Recommendation	
EPA/821/R-02/013 (Test Method 1002.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements	
Parameter	*Criteria*
Test Acceptability Criteria*	80% or greater survival of al control organisms and an average of 15 or more young per surviving female. 60% of the surviving control females must produce three broods.
Data Qualification	
Test Conditions	*Required*
Test Type	Static renewal (required)
Age at Test Initiation	<24 hours old and all released within an 8-h period
Replication at Test Initiation	>10
Organisms/Replicate	One (assigned using blocking by known parentage)
Food Source	YCT and *Selenastrum* or comparable food
Renewal Frequency	Daily
Test Duration	<8 days
Endpoints	Survival and reproduction
Test Conditions	*Recommended***
Temperature Range	25 ± 1.5 °C (+/- 3 °C required)
Light Intensity	10 – 20 µE/m^2/s OR 50 – 100 ft-c
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	20 - 40 mL
Replicate Volume	>15 mL
Feeding Regime	Daily
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols
Minimum Sample Volume	2 L for one-time grab sample
Sensitivity	*Performance Criteria*
Minimum Significant Difference	<47% MSD If the percent minimum significant difference (PMSD) measured for the test exceeds the upper criterion and toxicity is found at the permitted receiving water concentration (RWC) based upon the value of the effect concentration estimate (NOEC or LOEC), then the test shall be accepted, unless other test review steps raise serious doubts about its validity. If toxicity is not found at the permitted RWC based upon the value of the effect concentration estimate (NOEC or LOEC) and

	the PMSD measured for the test exceeds the upper PMSD bound, then the test shall not be accepted, and a new test must be conducted promptly on a newly collected sample.
Water Chemistry	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	Two DO , one pH and one temperature per 24-h period in one sample per concentration and in the control
Final Water Chemistry	One DO, pH, and temperature measurement per sample and per dilution (One DO per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.0 - 8.6 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are <100 or >2000 µS/cm
Sample Handling/Collection	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	2500 µS/cm
Relevant Media	Water column
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

*Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

**Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table 26-12. Measurement Quality Objectives - 10-Day *Hyalella azteca* Acute Aquatic Toxicity Test

Method Recommendation	
EPA/821/R-02/013 (Test Method 1002.0) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements	
Parameter	*Criteria*
Test Acceptability Criteria*	90% or greater survival in controls
Data Qualification	
Test Conditions	*Required*
Test Type	Static renewal
Age at Test Initiation	7 – 14 days old
Replication at Test Initiation	5
Organisms/Replicate	10
Food Source	YCT
Renewal Frequency	80% renewal on Day 5
Test Duration	10 days
Endpoints	Survival
Test Conditions	*Recommended***
Temperature Range	23 ± 1.0 °C
Light Intensity	500 - 1000 lux
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	300 mL
Replicate Volume	100 mL water
Feeding Regime	1.5 mL YCT every other day
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols
Minimum Sample Volume	1L
Sensitivity	*Performance Criteria*
Minimum Significant Difference	No MSD available
Water Chemistry	
Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample and per dilution

Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	Temperature
Final Water Chemistry	One DO, EC, pH, and temperature measurement and per sample and per dilution (DO, EC, pH per renewal)
Test Parameter	*Recommended Criteria*
Initial DO Range	4.7 - 8.92 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are below or above levels in method
Sample Handling/Collection	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<15 ppt
Relevant Media	Water
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field; 0 - 6 °C refrigeration in laboratory; dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	<48 hours@ 0 - 6 °C; dark

*Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

**Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table 26-13. Measurement Quality Objectives - 10-Day *Hyalella azteca* Acute Sediment Toxicity Test

Method Recommendation	
EPA/600/R-99/064 (Test Method 100.1) or validated and SWAMP-approved alternative method	
Data Acceptability Requirements	
Parameter	*Criteria*
Test Acceptability Criteria*	Mean control survival of >80%
Data Qualification	
Test Conditions	*Required*
Test Type	Whole sediment toxicity test with renewal of overlying water
Age at Test Initiation	7 – 14 days old
Replication at Test Initiation	8
Organisms/Replicate	10
Food Source	YCT
Renewal Frequency	Twice daily
Test Duration	10 days
Endpoints	Survival
Test Conditions	*Recommended***
Temperature Range	23 ± 1.0 °C
Light Intensity	500 - 1000 lux
Photoperiod	16 hours of ambient laboratory light, 8 hours dark
Test Chamber Size	300 mL
Replicate Volume	Sediment volume 100 mL; Overlying water volume 175 mL
Feeding Regime	Daily
Laboratory Control Water	Moderately hard water prepared in accordance with EPA protocols
Sediment Control	Control sediment as listed in method (Control sediment should follow EPA requirements for formulated sediments)
Minimum Sample Volume	6 L for one-time grab sample
Sensitivity	*Performance Criteria*
Minimum Significant Difference	No MSD available
Water Chemistry	

Test Parameter	*Required Frequency*
Initial Water Chemistry	One DO, SC, pH, and temperature measurement per sample
Initial Unionized Ammonia	One measurement per sample
Initial Hardness and Alkalinity	One measurement per sample
Daily Water Chemistry	One DO and one temperature measurement per sample
Final Water Chemistry	One DO, pH, and temperature measurement per sample
Test Parameter	*Recommended Criteria*
Initial DO Range	4.7 - 8.92 mg/L
Initial pH Range	6.0 - 9.0
Conductivity Controls	Include appropriate controls when sample conductivities are below or above levels listed in method
Sample Handling/Collection	
Test Parameter	*Recommended Conditions*
Species' Conductivity Tolerance	<15 ppt
Relevant Media	Sediment
Sample Container Type	Amber glass
Sample Preservation	Wet or blue ice in field, 0 - 6 °C refrigeration in laboratory, dark at all times
Sample Receipt Temperature	0 - 6 °C
Holding Time	< 14 days (recommended) or <8 weeks (required) @ 0 - 6 °C; dark; Do not freeze

*Test data are reviewed to verify that the test acceptability criteria (TAC) requirements for a valid test have been met. Any test not meeting the minimum test acceptability criteria is considered invalid. All invalid tests must be repeated with the newly collected sample.

**Deviations from the summary of recommended test conditions must be evaluated on a project-specific basis to determine the validity of test results. Deviations from recommended conditions may or may not invalidate a test result, depending on the degree of the departure and the objective of the test.

Table 26-14. Measurement Quality Objectives* - Field Measurements**

Water Quality Parameter	Recommended Device	Units	Resolution	Target Reporting Limit	"Electronic Specs" Accuracy**
Depth	Stadia Rod/Staff Gauge	m	0.01	0.02	n/a
Dissolved Oxygen	Polarographic or Luminescence Quenching	mg/L	0.1	0.2	± 0.2
pH	Electrode	None	0.1	n/a	± 0.2
Specific Conductivity	Conductivity Cell	µS/cm	1	2	± 2
Temperature	Thermistor or Bulb	°C	0.1 or 0.5	n/a	± 0.1
Turbidity	Portable Turbidimeter or Optical Probe	NTU	1	5	± 1
Velocity	Flow Meter	ft/s	0.05	0.1	Follow manufacturer's instructions

* Unless method specifies more stringent requirements

** This table may not include all field analyses. Please refer to method or manufacturer instructions for guidance

27. Appendix B. Benthic macroinvertebrate MQOs and Data Production Process

Table 27-1. Measurement Quality Objectives for Biological Measurements

Analyte	Completeness	Accuracy	Precision	Sensitivity	Representativeness
Sampling	• ≥95% successful collection at all sites for probabilistic designs	• NA	• Record coefficient of variation of biological measures for duplicate samples (no MQO), frequency of 10% or at least one per project each year.	• 1.0 seconds or 1/10,000th of a degree Lat/Long	• Probabilistic sites are evaluated in order within each panel and management unit. • ≤10 seconds of nominal Lat/Long (300 m radius)
Sorting	• Sorting efficiency ≥95%, 100 % frequency (internal) • Processing efficiency ≥99%, 100% frequency	• Recount accuracy ≥95%. 10% frequency (external reference lab)	• At least three grids or 25% of the total sample volume must be sorted.	• N/A	• ≥ 3 grids or ≥ 25% of the total sample volume is sorted
Taxonomic ID	• ≥99% successful analysis of all sorted samples	• Taxa count error ≤10%. 10% frequency (external reference lab) • Taxa ID error ≤10%. 10% frequency (external reference lab) • Individual ID error ≤10%. 10% frequency (external reference lab)	• Random errors ≤ 10% of taxa, 10% frequency (ref lab) • Systemic errors ≤ 10% of common taxa. 10% frequency (external reference lab) • Taxonomic resolution error rate ≤10%.	• SAFIT Level 1	• All sorted organisms are identified

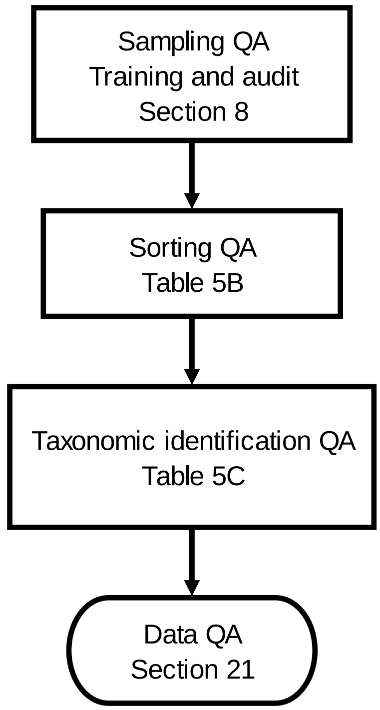

Figure 27-1. Overall Data Production Process Diagram

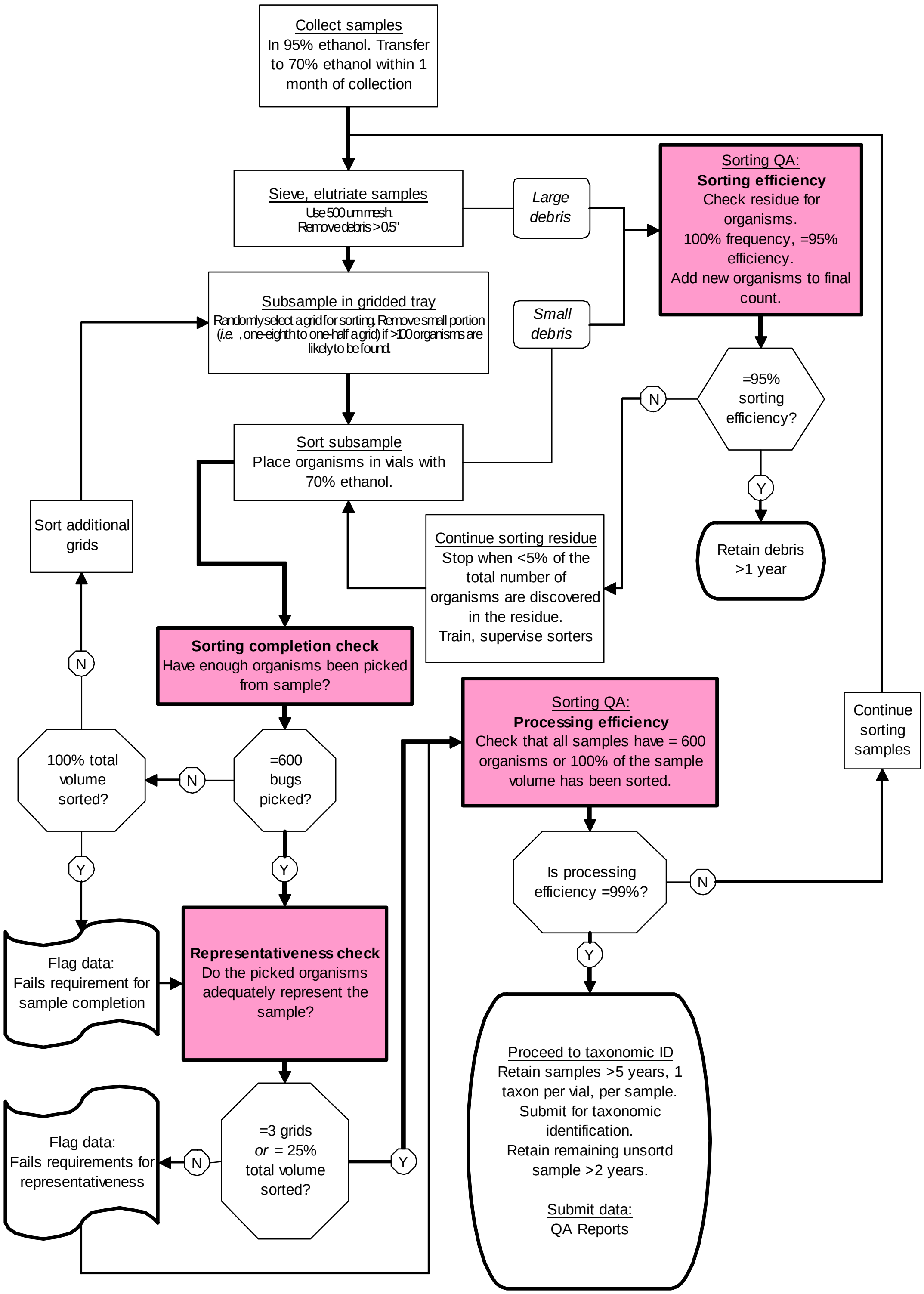

Figure 27-2. Sorting Process Diagram for Sorting

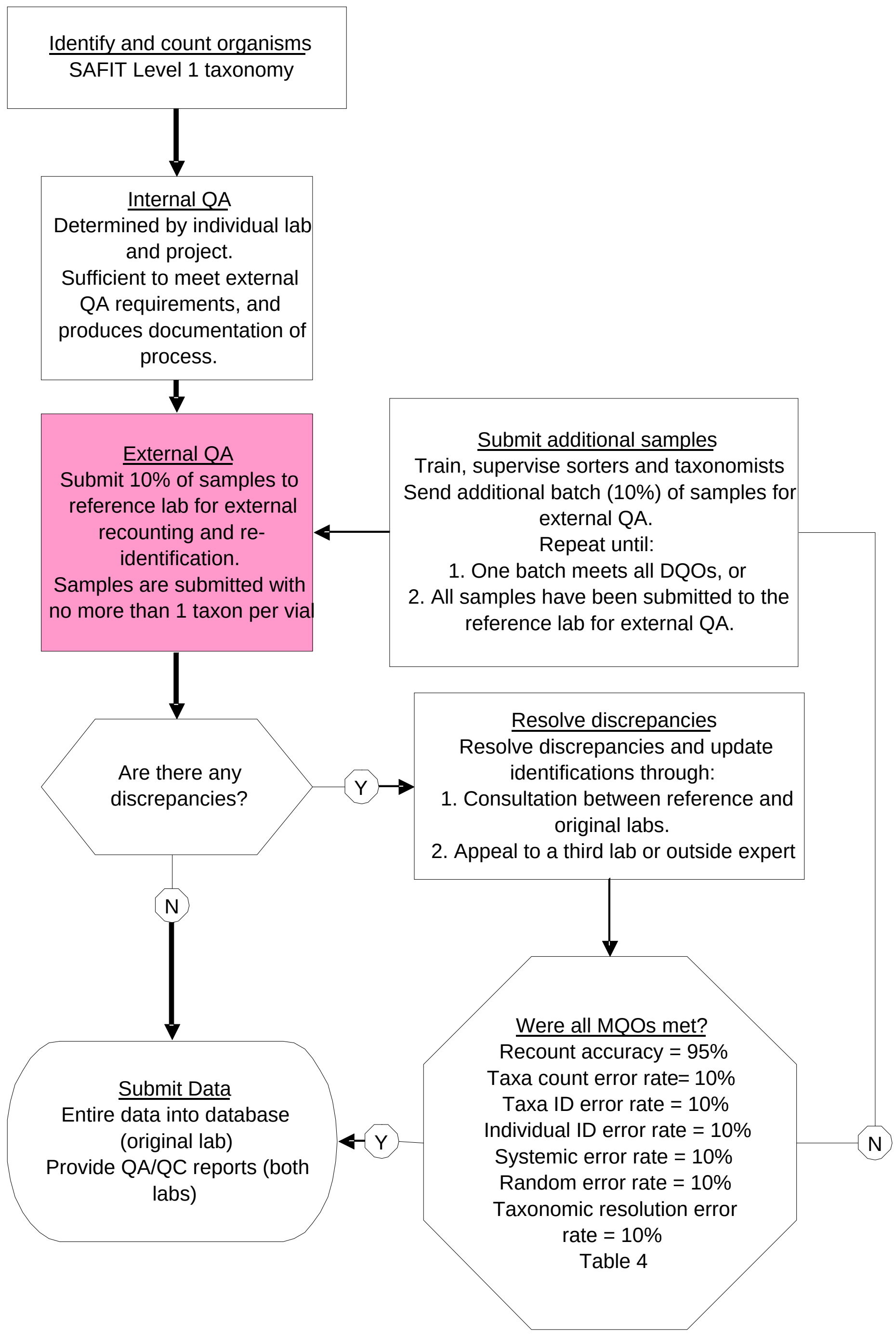

Figure 27-3. Taxonomic Identification Process Diagram

28. Appendix C. BMI Subsampling Worksheet and Sorting Sheet

BENTHIC MACROINVERTEBRATE SUBSAMPLING WORKSHEET

Project Name: ______________________Project Code: _____________ Object Code: __________

Lab Sample ID #:	Date:	Technician Name:	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
random grid #																				
half /whole grid																				
# per grid																				
cumulative #																				

Lab Sample ID #:	Date:	Technician Name:	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
random grid #																				
half /whole grid																				
# per grid																				
cumulative #																				

Lab Sample ID #:	Date:	Technician Name:	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
random grid #																				
half /whole grid																				
# per grid																				
cumulative #																				

Grids Picked: Total Grids: Count:	QC #: QC%:	Total Count:	Time: QC Initials:

Benthic Macroinvertebrate

Sorting Worksheet

Project Code:	**Project Name:**	
Technician Name:	**Object Code:**	**Project Date:**

	Lab Sample ID #	**Lab Sample ID #**	**Lab Sample ID #**	**Lab Sample ID #**	**Lab Sample ID #**
Taxon:	***#bugs***	***#bugs***	***#bugs***	***#bugs***	***#bugs***
Annelida(Hirudinea)					
Annelida(Oligochaeta)					
Annelida(Polychaeta)					
Chelicerata(Hydracarina)					
Coleoptera					
Crustacea(Amphipoda)					
Crustacea(Isopoda)					
Crustacea(Mysidacea)					
Crustacea(Ostracoda)					
Decapoda					
Diptera					
Diptera(Chironomidae)					
Ephemeroptera					
Hydra					
Hemiptera					
Lepidoptera					
Megaloptera					
Mollusca(Gastropoda)					
Mollusca(Pelecypoda)					
Nemertea					
Odonata					
Plecoptera					
Platyhelminthes					
Tardigrada					
Trichoptera					
Total Bugs Sorted:					
***Total Bugs Discarded:**					
Total:					
Bugs Picked:					
Time:					
Date:					

***Discards include exuvia, small (<0.5 mm), fragmented, decomposed, non-aquatic/benthic**

29. Appendix D. Example of MQO Calculations for Biological Data

Below are results from two hypothetical samples submitted to a reference lab as a batch for quality assurance checks. Calculations of the MQOs described in Section 7 are provided. Relevant MQOs are summarized in Table 29-1.

Table 29-1. Summary of MQOs for Biological Data

Sample-based MQO	Objective
Recount accuracy	≥95%
Taxa count error rate	≤10%
Taxa ID error rate	≤10%
Individual ID error rate	≤10%
Taxonomic resolution error rate	≤10%
Batch-based MQO	
Random error rate	≤10%
Systemic error rate	≤10%

Table 29-2 shows the results from Sample 1. Sample 1 contains several errors in counting as well as identification. For example, in Vial 1, *Diphetor hageni* is incorrectly identified as *Fallceon quilleri*, and the vial contains two specimens instead of one. Vial 6 and Vial 10 both show errors of taxonomic resolution, in which the original lab made an inappropriate determination than the specimens (and, in fact, the STE) could support.

Table 29-2. Results from Sample 1

Vial #	Original ID	Original count	Reference ID	Reference count	ID error	Count error
1	*Fallceon quilleri*	1	*Diphetor hageni*	2	Yes	Yes
2	*Baetis*	129	*Baetis*	129	No	No
3	*Hydroptila*	12	*Hydroptila*	12	No	No
4	*Hydropsyche*	67	*Hydropsyche*	67	No	No
			Prostoma	1	Yes	Yes
5	*Simulium*	46	*Simulium*	45	No	Yes
6	*Caloparyphus*	20	*Caloparyphus / Euparyphus*	20	Yes	No
7	*Sperchon*	5	*Sperchon*	5	No	No
8	*Argia*	12	*Argia*	12	No	No
9	*Hyalella*	3	*Hyalella*	3	No	No
10	*Corbicula fluminea*	6	*Corbicula*	6	Yes	No

Table 29-3 summarizes the count of individuals and taxa for Sample 1. These numbers are used in the calculation of several MQOs.

Table 29-3. Summary of Sample 1

	Original	Reference
Total richness	10	11
Total # individuals	301	302

Table 29-4 shows the calculation of MQOs for Sample 1. Although most objectives were met, the Taxa ID error rate exceeded the MQO because four of the 11 taxa (36.4%) were identified incorrectly.

Table 29-4. MQOs for Sample 1.

Sample-based MQOs	Calculation	Result	Meets objective?
Recount accuracy	=301/302*100	99.7%	Yes (≥95%)
Taxa count error rate	=|(11-10)|/11*100	9.1%	Yes (≤10%)
Taxa ID error rate	*Diphetor hageni* *Prostoma* *Caloparyphus/Euparyphus* *Corbicula* =4/11*100	36.4%	No (>10%)
Individual ID error rate	2 *Diphetor hageni* 1 *Prostoma* 20 *Caloparyphus/Euparyphus* 6 *Corbicula* =29/302*100	9.6%	Yes (≤10%)
High taxonomic resolution error rate	6 *Corbicula* 20 *Caloparyphus/Euparyphus* =26/302*100	8.6%	NA
Low taxonomic resolution error rate	None	0%	NA
Taxonomic resolution error rate	8.6% + 0%	8.6%	Yes (≤10%)

Table 29-5 shows the results from the second sample included in the QA batch. Table 29-6 shows its summary, and Table 29-7 shows the MQO calculations.

Table 29-5. Results for Sample 2.

Vial #	Original ID	Original count	Reference ID	Reference count	ID error	Count error
1	*Fallceon quilleri*	13	*Fallceon quilleri*	12	No	Yes
2	*Caenis*	2	*Caenis*	2	No	No
3	*Cheumatopsyche*	1	*Cheumatopsyche*	1	No	No
4	*Hydroptila*	1	*Hydroptila*	1	No	No
5	*Simulium*	128	*Simulium*	127	No	No
			Cheumatopsyche	1	Yes	No
6	Chironomidae	29	Chironomidae	28	No	Yes
			Mycetophilidae	1	Yes	No
7	*Trichocorixa*	1	*Trichocorixa*	1	No	No
8	Corixidae	2	Corixidae	2	No	No
9	*Sperchon*	2	*Sperchon*	2	No	No
10	*Argia*	24	*Argia*	22	No	Yes
11	Oligochaeta	35	Oligochaeta	9	No	Yes
12	Ostracoda	1	Ostracoda	1	No	No
13	*Hyalella*	41	*Hyalella*	41	No	No
14	*Corbicula fluminea*	6	*Corbicula*	6	Yes	No
15	*Pisidium*	11	*Pisidium*	11	No	No
16	*Turbellaria*	2	*Turbellaria*	2	No	No

Table 29-6. Summary of Sample 2

	Original	Reference
Total richness	16	17
Total # individuals	299	270

Table 29-7. MQOs for Sample 2

Sample-based MQOs	Calculation	Result	Meets objective?
Recount accuracy	=270/299*100	90.3%	No (≤95%)
Taxa count error rate	=|(17-16)|/17*100	5.9%	Yes (≤10%)
Taxa ID error rate	*Cheumatopsyche* Mycetophilidae *Corbicula* =3/17*100	17.6%	No (≥10%)
Individual ID error rate	1 *Cheumatopsyche* 1 Mycetophilidae 6 *Corbicula* =8/270*100	3.0%	Yes (≤10%)
High taxonomic resolution error rate	6 *Corbicula* =6/270*100	2.2%	NA
Low taxonomic resolution error rate	None	0%	NA
Taxonomic resolution error rate	=2.2% + 0%	2.2%	Yes (≤10%)

Sample 2 shows several additional errors. For example, the original lab counted a higher number of Oligochaeta than the reference lab found, presumably because the original lab counted organism fragments as individual specimens. However, this discrepancy was not so large as to cause a failure of the recount accuracy MQO.

Table 29-8 shows the summary of the entire QA batch, and Table D9 shows the calculation of batch-based MQOs. Table 29-9 shows that random and systemic error rates exceeded objectives.

Table 29-8. Summary of batch

	Original	Reference
Total richness	19	22
Total number of common taxa	13	13
Total # individuals	600	572

Table 29-9. Batch-based MQOs

MQO	Calculation	Result	Meets objective?
Random error rate	*Hydropsyche* identified as *Hydropsyche* and *Prostoma* (Sample 1, Vial 4) *Simulium* identified as *Simulium* and *Cheumatopsyche* (Sample 2, Vial 5 *Cheumatopsyche* identified as *Cheumatopsyche* and *Simulium* (Sample 2, Vials 3 and 5) Mycetophilidae identified as Chironomidae (Sample 2, Vial 6) =4/22*100	18.2%	No (≥10%)
Systemic error rate	*Caloparyphus/Euparyphus* identified as *Caloparyphus* *Corbicula* identified as *Corbicula fluminea* =2/13*100	15.4%	No (≥10%)

Note that some identification errors did not count towards the systemic error rate because the taxa appeared fewer than 5 times in the batch (e.g., *Diphetor hageni* identified as *Fallceon quilleri* in Sample 1 Vial 1, or *Prostoma* identified as *Hydropsyche* in Sample 1 Vial 4). Furthermore, some identification errors did not count towards the systemic error rate because the error was not made consistently (e.g., *Cheumatopsyche* identified as *Simulium* in Sample 2 Vial 5, but as *Cheumatopsyche* in Sample 2 Vial 3).

Sample 1 failed to meet one MQO, and Sample 2 failed to meet two. The batch failed both applicable. MQOs. Therefore, the original lab would be required to submit an additional two samples for quality assurance checks

30. Appendix E. RMC Target Method Reporting Limits

Table 30-1. Target MRLs for RMC Creek Status Monitoring Water Quality Parameters, Laboratory Analyses.

Analyte	MRL (mg/L)
Ammonia (as N)	0.1
Chloride	1
Total Kjeldahl Nitrogen	0.5
Nitrate (as N)	0.05
Nitrite (as N)	0.03
Organic Carbon (Dissolved)	0.6
Orthophosphate (as P)	0.01
Silica	1
Total Phosphorus (as P)	0.01
SSC	3

Table 30-2. Target MRLs for RMC Creek Status Monitoring Water Quality Parameters, Field Measurements.

Analyte	Units	MRL	Resolution
Chlorine, Free	mg/L	0.5	0.01
Chlorine, Total	mg/L	0.5	0.01
Temperature	º C	N/A	0.1
Dissolved Oxygen	mg/L	0.2	0.1
pH	pH units	N/A	0.1
Conductivity	mS/cm	2	1

Table 30-3. Target MRLs for RMC Creek Status Monitoring Pathogen Indicators.

Analyte	MRL (MPN/100 mL)
Pathogens – *E. coli*	2
Pathogens –Fecal Coliform	2

Table 30-4. Target MRLs for RMC Creek Status Monitoring Conventional Sediment Quality Parameters.

Analyte	MRL
Sediment Total Organic Carbon	0.01%
%Moisture	n/a
%Lipids	n/a

Table 30-5. Target MRLs for MRC Creek Status Monitoring Inorganic Sediment Quality Parameters.

Analyte	MRL (mg/kg)
Arsenic	0.3
Cadmium	0.01
Chromium	0.1
Copper	0.01
Lead	0.01
Mercury	0.03
Nickel	0.02
Zinc	0.1

Table 30-6. Target MRLs for RMC Creek Status Monitoring Organochlorine Pesticides in Sediment

Analyte	Sediment (ng/g)
cis-Chlordane	2
trans-Chlordane	2
DDD (o,p')	2
DDD (p,p')	2
DDE (o,p')	2
DDE (p,p')	2
DDT (o,p')	3
DDT (p,p')	5
Dieldrin	2
Endrin	2
Heptachlor epoxide	1
Lindane (gamma-HCH)	1

Table 30-7. Target MRLs for RMC Creek Status Monitoring PAHs in Sediment

Analyte	MRL (ng/g)
Acenaphthene	20
Acenaphthylene	20
Anthracene	20
Benz(a) anthracene	20
Benzo(a) pyrene	20
Benzo(b) fluoranthene	20
Benzo(e) pyrene	20
Benzo(g,h,i) perylene	20
Benzo(k) fluoranthene	20
Biphenyl	20
Chrysene	20
Dibenz(a,h) anthracene	20
Dibenzo-thiophene	20
2,6-Dimethyl-naphthalene	20

Analyte	MRL (ng/g)
Fluoranthene	20
Fluorene	20
Indeno(1,2,3-c,d) pyrene	20
1-Methyl-naphthalene	20
2-Methyl-naphthalene	20
1-Methyl-phenanthrene	20
Naphthalene	20
Perylene	20
Phenanthrene	20
Pyrene	20

Table 30-8. Target MRLs for RMC Creek Status Monitoring Pyrethroids in Sediment

Analyte	Sediment (ng/g)
Bifenthrin	0.33
Cyfluthrin	0.33
Total Cypermethrin	0.33
Total Deltamethrin	0.33
Total Esfenvalerate/ Fenvalerate	0.33
Total Lambda-cyhalothrin	0.33
Total cis-Permethrin	0.33
trans-Permethrin	0.33

Table 30-9. Size Distribution Categories and Target MRLs for CW4CB Analyte Grain Size in Soils / Sediment

Wentworth Size Category	Size	MRL
Clay	<0.0039 mm	1%
Silt	0.0039 mm to <0.0625 mm	1%
Sand, very fine	0.0625 mm to <0.125 mm	1%
Sand, fine	0.125 mm to <0.250 mm	1%
Sand, medium	0.250 mm to <0.5 mm	1%
Sand, coarse	0.5 mm to < 1.0 mm	1%
Sand, very coarse	1.0 mm to < 2 mm	1%
Gravel	2 mm and larger	1%

Table 30-10. Effort Level for Biological Assessments

Analyte	Method	MDL
Benthic macroinvertebrate sampling, identification and enumeration	Ode 2007	SAFIT Standard Taxonomic Effort Level 1
Benthic algae sampling, identification and enumeration	Fetscher et al. (2010)	TBD

31. Appendix F. Corrective Actions

Table 31-1. Corrective Action – Laboratory Analysis of Conventional Analytes (Water)

Laboratory Quality Control	Corrective Action
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last calibration verification must be reanalyzed.
Laboratory Blank	The sample analysis must be halted, the source of the contamination investigated, the samples along with a new laboratory blank prepared and/or re-extracted, and the sample batch and fresh laboratory blank reanalyzed. If reanalysis is not possible due to sample volume, flag associated samples as estimated.
Reference Material	Affected samples and associated quality control must be reanalyzed following instrument recalibration.
Matrix Spike	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, the matrix spike result must be qualified.
Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	As method requires. The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the project coordinator, who in turn will follow the process detailed in the method.

Table 31-2. Corrective Action - Conventional Analytes (Total Solids, Suspended Sediment Concentration, and Percent Lipids)

Laboratory Quality Control	Corrective Action
Calibration Standard	n/a
Initial/Continuing Calibration Verification	n/a
Laboratory Blank	Please refer to method requirements.
Reference Material	Please refer to method requirements.
Matrix Spike	n/a
Matrix Spike Duplicate	n/a
Laboratory Duplicate*	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows. A matrix spike duplicate may not be analyzed in place of a laboratory duplicate.
Internal Standard	n/a
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.
Field Blank, Travel Blank, Equipment Blank	n/a

*Not applicable to suspended sediment concentration analyses

Table 31-3. Corrective Action - Inorganic Chemistry

Laboratory Quality Control	Corrective Action
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated if necessary. If deemed appropriate, all samples after the last acceptable continuing calibration verification may be reanalyzed.
Laboratory Blank	The sample analysis must be halted, the source of the contamination investigated, the samples along with a new laboratory blank prepared and/or re-extracted, and the sample batch and fresh laboratory blank reanalyzed. If reanalysis is not possible due to sample volume, flag associated samples as estimated.
Reference Material	If deemed appropriate, affected samples and associated quality control may be reanalyzed following instrument recalibration.
Matrix Spike	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, the matrix spike result must be qualified.
Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	As method requires. The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.
Field Blank, Equipment Blank	n/a

Table 31-4. Corrective Action - Organic Chemistry

Laboratory Quality Control	Corrective Action
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last acceptable continuing calibration verification must be reanalyzed.
Laboratory Blank	The sample analysis must be halted, the source of the contamination investigated, the samples along with a new laboratory blank prepared and/or re-extracted, and the sample batch and fresh laboratory blank reanalyzed. If reanalysis is not possible due to sample volume, flag associated samples as estimated.
Reference Material	Affected samples and associated quality control must be reanalyzed following instrument recalibration.
Matrix Spike	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, the matrix spike result must be qualified.
Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	Analyze as appropriate per method. Troubleshoot as appropriate. If, after trouble-shooting, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Surrogate	Analyze as appropriate per method. All affected results should be qualified. The analytical method or quality assurance project plan must detail procedures for updating surrogate measurement quality objectives.
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the project coordinator, who in turn will follow the process detailed in the method.
Field Blank, Travel Blank, Equipment Blank	n/a

Table 31-5. Corrective Action - Toxicity Testing

Negative Controls	Corrective Action
Laboratory Control Water	If tested with in-house cultures, affected samples and associated quality control must be retested within 24 hours of test failure. If commercial cultures are used, they must be ordered within 16 hours of test failure for earliest possible receipt, and retests must be initiated within 8 hours of receipt. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.
Conductivity Control Water	Affected samples and associated quality control must be qualified.
Additional Control Water	A water sample that has similar qualities to the test sample may be used as an additional control based on the objectives of the study. Results that show statistical differences from the laboratory control should be qualified. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence. This is not applicable for TIE method blanks.
Laboratory Control Sediment	Affected samples and associated quality control must be re-tested within 24 hours of test failure if tested with in-house cultures. If commercial cultures are used, they must be ordered within 16 hours of test failure for earliest possible receipt, and re-tests must be initiated within 8 hours of receipt. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.
Additional Control Sediment	A sediment sample that has similar qualities to the test sample may be used as an additional control based on the objectives of the study. Results that show statistical differences from the laboratory control should be qualified. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.
Positive Controls	**Corrective Action**
Reference Toxicant Tests	If LC50 exceeds +/- two standard deviations of the running mean of the last 20 reference toxicant tests, the test should be qualified or repeated.
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix, results that do not meet SWAMP criteria should be qualified. All field duplicate results that do not meet SWAMP criteria should be communicated to the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.
Field Blanks	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data and notify the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.
Equipment Blanks	If contamination of the equipment blanks and associated samples is known or suspected, the laboratory should qualify the affected data and notify the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.

Table 31-6. Corrective Action - Field Measurements

Field Quality Control	Corrective Action
Depth, Dissolved Oxygen, pH, Salinity, Specific Conductance, Temperature, Turbidity, Velocity	The instrument should be recalibrated following its manufacturer's cleaning and maintenance procedures. If measurements continue to fail measurement quality objectives, affected data should not be reported and the instrument should be returned to the manufacturer for maintenance. All troubleshooting and corrective actions should be recorded in the calibration and field data logbooks.

B3

BASMAA

Regional Monitoring Coalition

Creek Status Monitoring Program
Standard Operating Procedures

Prepared for:

The Bay Area Stormwater Management Agencies Association (BASMAA)

Prepared by:

EOA, Inc.
on behalf of the Santa Clara Urban Runoff Pollution Prevention Program and the San Mateo Countywide Water Pollution Prevention Program

Applied Marine Sciences
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Chapter: Standard Operating Procedure **Page**

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP.

This compilation of standard operating procedures (SOPs) is part of the RMC's regional coordination effort. SOPs are provided to support effective implementation of the various monitoring activities specified for creek status monitoring in MRP Table 8.1.

The purpose of this SOP compilation is to provide RMC participants with a common basis for application of consistent monitoring protocols across jurisdictional boundaries. These protocols form part of the RMC's quality assurance program, to help ensure validity of resulting data and comparability with the state of California's Surface Water Ambient Monitoring Program (SWAMP) protocols.

These SOPs complement the comprehensive Quality Assurance Project Plan (QAPP) developed by the RMC to address the Table 8.1 requirements, covering procedures for bioassessment monitoring as well as various other means of water quality monitoring.

List of Acronyms

ASTM	American Society for Testing and Materials
BASMAA	Bay Area Stormwater Management Agencies Association
CCCWP	Contra Costa Clean Water Program
CEDEN	California Environmental Data Exchange Network
CIMCC	Central Information Management Coordinator
CQAO	Central Quality Assurance Officer
CWA	Clean Water Act
CWP	Clean Water Program of Alameda County
DMT	Data Management Team
DOC	Dissolved Organic Carbon
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EPA	Environmental Protection Agency (U.S.)
FC	Field Crew
FSURMP	Fairfield-Suisun Urban Runoff Management Program
IATA	International Air Transport Association
IDL	Instrument Detection Limits
IDW	Investigation-Derived Waste
IMC	Information Management Coordinator
LIMC	Local Information Management Coordinator
LPM	Laboratory Project Manager
LQAO	Local Quality Assurance Officer
MCC	Creek Status Monitoring Coordinator
MDL	Method Detection Limit
MPC	Monitoring and Pollutants of Concern Committee
MQO	Measurement Quality Objective
MRP	Municipal Regional Permit
NPDES	National Pollutant Discharge Elimination System
OC	Organochlorine
OERR	Office of Emergency and Remedial Response
PAH	Polycyclic Aromatic Hydrocarbon
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PM	Program Manager
PML	Stormwater Program Local Project Managers
PPE	Personal Protective Equipment
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Method Reporting Limit
RMC	Regional Monitoring Coalition
RMP	Regional Monitoring Program for Water Quality in the San Francisco Estuary
RP	Report Preparer
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SMSTOPPP	San Mateo Countywide Stormwater Pollution Prevention Program
SOP	Standard Operating Procedure
SSC	Suspended Sediment Concentration
SWAMP	California Surface Water Ambient Monitoring Program
TOC	Total Organic Carbon
TMDL	Total Maximum Daily Load
USA	Unified Stream Assessment
VSFCD	Vallejo Sanitation and Flood Control District

STANDARD OPERATING PROCEDURES for BMI and Algae Bioassessments and Physical Habitat Assessments (SOP FS-1)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This standard operating procedure (SOP) is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment

SOP Background and Application

This document is intended to summarize how the RMC will apply existing Surface Water Ambient Monitoring Plan (SWAMP) SOPs for benthic macroinvertebrate and algae bioassessments to specifically meet monitoring requirements identified in the MRP. These SOPs also document field procedures for bioassessments, including physical habitat assessments, but do not include the laboratory SOPs for the processing and identification of benthic macroinvertebrates or algae organisms. However, measurement quality objectives (MQOs) for BMIs have been documented in the Quality Assurance Project Plan (QAPP) for bioassessment data collection in Southern California (SCCWRP 2009). A statewide SWAMP QAPP and laboratory SOPs for BMIs and laboratory SOPs for algae bioassessment data are currently under development.

References to Existing SOPs

This SOP is based on information provided in two separate SOPs developed by SWAMP:

Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California, February 2007 (Ode 2007)

Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California, May 2010 (Fetscher et al. 2010)

Relevant QA/QC protocols are also referenced in the associated RMC QAPPs for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

Proper gloves must be worn to both prevent contamination of the sample and to protect sampling personnel from environmental hazards. The user should wear at least one layer of gloves, but two layers help protect against leaks. All gloves must be powderfree. Disposable polyethylene, nitrile, or non-talc latex gloves are acceptable for many types of sampling; however, samples for low level metals and mercury analysis can only be collected and handled using polyethylene gloves as the outer layer.

CAUTIONS

When conducting sampling in areas of unknown water quality, especially in waters that are suspected to contain hazardous substances, bacteria, or viruses, it is preferable that at least one layer of gloves be of shoulder length, to limit skin contact with the source water.

Proper eye, hand and body protection should be worn at all times when working with preservatives to fix biological samples. Glutaraldehyde should never be transported into the field and during fixation of samples, be used only under a laboratory fume hood. Formalin should be properly sealed and stored during field sampling and fixation of samples should occur in a well-ventilated area. Refer to Appendices D and E in Fetcher et al. (2010) for detailed SOPs on the use of glutaraldehyde and formalin.

When using chemical cleaners, as required as part of the equipment cleaning and decontamination protocols (see SOP FS-7, Sampling Equipment Cleaning Procedures and SOP FS-8, Field Equipment Decontamination Procedures), always read the product label and adhere to all printed cautions and safety measures.

Methods/Procedures

Bioassessments conducted as part of the RMC Ambient Creek Status Monitoring Program will consist of the collection of benthic macroinvertebrate and algae samples. Physical habitat assessments will consist of the measurement of physical parameters related to BMI habitat, physical water quality and collection of water samples for analyses of nutrients and other constituents. Bioassessments will be conducted one time each year during spring index period (approximately April 15 – July 15), with the goal of assessing all sites within a two month period each year. To the extent practical, the RMC will conduct sampling approximately 30 days following any significant storm event that occurs during the index period or prior to the start of the index period.

TRAINING

All field crews will be required to be trained in sampling procedures described in both BMI and Algae Bioassessment SOPs. It is strongly recommended that crews contain no fewer than three members because the RMC measures several indicators at each site (i.e., BMI and benthic algae communities, physical habitat and water chemistry). Inadequate staffing of field crews is one of the most common sources of data errors, and may result in costly corrective actions or data deficiencies. Bioassessment training is offered several times each year by the California Department of Fish and Game

(CDFG). Crew chiefs are responsible for ensuring the safety of the crew and must use his or her discretion to terminate sampling if conditions become unsafe.

Laboratory analysis requires years of experience and mentoring by a qualified taxonomist. Although there are no current training requirements associated with laboratory personnel, it is strongly recommended that all benthic macroinvertebrates taxonomists become a member of the Southwest Association of Freshwater Invertebrate Taxonomists (www.SAFIT.org). Membership in organizations like SAFIT offers several benefits to project participants, such as opportunities for continuing education, taxonomic workshops, reviews of current literature, and intercalibration exercises. Taxonomists are expected to participate in at least one taxonomic workshop focusing on benthic macroinvertebrates per year. Similar requirements for training will be applied to RMC contracted algal taxonomists when laboratory protocols and training workshops become available.

SITE SELECTION

The RMC will be applying a probabilistic monitoring design to identify bioassessment sampling locations for the Ambient Creek Status Monitoring Program. Sample sites will be selected using the Generalized Random Tessellation Stratified (GRTS) approach from a sample frame that consists of a stream network geographic information system (GIS) data set within the RMC boundary. The RMC sampling frame includes non-tidally influenced perennial and non-perennial creeks within five management units representing areas managed by the storm water programs associated with the RMC. The sample frame was stratified by management unit to ensure that a predetermined number of sites would be sampled by each Program to meet requirements described in Table 8.1 of the MRP. In addition, the sampling frame was weighed so approximately 80% of sites would occur in urban land use and 20% of sites in non-urban land use.

All potential sites will be evaluated using the RMC Ambient Creek Status Monitoring Site Evaluation SOP (FS-12) to ensure site criteria defining “targeted, sampleable” are met. These criteria include site accessibility and stream characteristics that satisfy conditions that are applicable to the sampling protocols. Evaluations will be conducted in the field to ensure each site meets the criteria. It is recommended that sites are evaluated once during the fall season to conduct a field evaluation of site access issues and document flow status. In some cases, a second site evaluation may need to be conducted during the spring, prior to sampling events, to confirm site is sampleable (i.e., site has flowing water or is wadeable). During the site evaluations, the location of monitoring reach may be modified (within 300 meter length of stream) following criteria provided in FS-12.

MOBILIZATION

The field equipment to be mobilized by field personnel in advance of deployment is provided in each of the following SOPs:

- Benthic macroinvertebrate SOP: Section1, Table 2 (Ode 2007)
- Algae SOP: Appendix A (Fetcher et al. 2010)
- Site access materials (maps, directions, keys, permits)

Prior to field sampling, all sampling equipment must be decontaminated following procedures described in RMC SOP FS-12 Field Equipment Decontamination Procedures.

Check with contract labs to ensure field staff has proper sampling containers and is familiar with all sample storage and transportation requirements.

REACH DELINEATION

Once in the field, the first task will be to delineate the monitoring reach. The standard BMI and algae sampling layout consists of a 150 m reach (streams $\leq$ 10 m) or a 250 m reach (streams > 10 m). The reach length may be less than 150 m for sites where standard reach length is constrained by factors related to site access or potentially significant changes to water quality (e.g., storm drain outfall or tributary confluence).

The reach length is divided into 11 evenly spaced main transects, and 10 inter-transects (between each of the main transects), for a total of 21 transects per monitoring reach. Transects should be perpendicular to the flow direction. Each transect is marked with flagging. It is important to limit the amount of disturbance to the streambed while delineating the reach.

Fill out all pertinent information on field data sheets or field computer data entry form, including GPS coordinates, site information, reach length, and notable field conditions.

WATER CHEMISTRY

At the downstream end of the reach, general water quality will be measured following RMC SOP FS-3 Performing Manual Field Measurements. At the same locations water samples will be collected for analyses of nutrients, silica, chlorine (free and total), TOC and suspended sediment concentrations following RMC SOP FS-2 Manual Collection of Water Samples for Chemical Analysis.

COLLECT SAMPLES

BMI and algae samples are collected at 11 evenly spaced transects at each monitoring site using the Reachwide Benthos (RWB) method. Sampling positions within each transect is alternated between the left, center and right positions along each transect (25%, 50% and 75% of the wetted width, respectively). BMI samples are collected using a D-shaped kick net and algae samples are collected using three different methods corresponding to type of substrate found at the sample location. The 11 subsamples for both BMI and algae are composited into a single “reachwide” sample. One composited BMI sample, and four algae samples (subsampled from composite sample) consisting of soft-bodied algae, diatoms, chlorophyll a, and ash-free dry mass) are collected from each site.

After collection, biological samples are preserved in the field, with the exception of soft algae samples. BMI samples are preserved by adding 95% ethanol to each sample container. Diatom samples are preserved with 10% formalin in a well-ventilated area. The soft algae samples are properly stored and transported to laboratory (within 4 day holding time) where they are preserved using Glutaraldehye under an operating fume hood. Chlorophyll a and AFDM samples are stored and transported on ice to laboratory.

PHYSICAL HABITAT ASSESSMENT

Physical habitat assessments (PHAB) incorporate quantitative and qualitative measurements taken at each of the 11 transects and 10 inter-transects. RMC will collect PHAB measurements following procedures defined in the BASIC level of effort (Ode 2007), with the following exceptions as defined in the FULL level of effort (as prescribed in the MRP): stream depth and pebble count + CPOM, cobble embeddedness, discharge measurements and in-stream habitat score. In addition, the percent algal cover (measured during point intercept with pebble count), will be measured at each transect.

DEMOBILIZATION

Before leaving the sampling site, field personnel should perform the following tasks:

- Review datasheets to ensure they are complete and legible,
- Preserve samples as described in SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures,
- Ensure that all containers are capped tightly and stored in an upright position to prevent leaking. Algae samples should be placed in cooler on doublebagged cubed ice (per SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures),
- All flagging marking each transect are removed from sample reach,
- Verify that all sampling-related materials and equipment have been collected, and
- Clean sampling equipment as described in SOP FS-7, Sampling Equipment. Cleaning Procedures, and decontaminate equipment as described in SOP FS-8, Field Equipment Decontamination Procedures before sampling at a new site.

Chain of Custody Forms

Every set of samples delivered to a laboratory must contain a complete Chain of Custody (COC) Form that lists all samples collected, the date/time of collection for each sample, and the analyses to be performed on those samples, as well as any special instructions to the laboratory (see SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures). A separate COC is required for each laboratory, for every shipment of samples. Electronic COCs may also be emailed to analytical laboratories, but the COCs must be sent before the samples arrive at their destinations. The original COC sheet (not the copies) is included with the shipment to the laboratory (inserted into a zip-top bag for protection), and the sampling crew retains a copy.

Sample Delivery and Shipping

After collection, biological samples are submitted to the respective analytical laboratories in containers as identified in SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures. Samples should be delivered to the analytical laboratory as soon as possible after conclusion of sampling activities, but always sufficiently within sample hold time requirements (see SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures).

Samples being sent via a freight carrier require additional packing. Although care is taken in sealing the ice chest, leaks can occur. Leaking ice chests can cause samples to be returned or arrive at the lab beyond the holding time. Samples and ice should be bagged separately using zip-top bags, and then placed in a large trash bag inside the ice chest for shipping. Bubble wrap or other suitable protective packing material must be used to protect glass sample bottles. Ice should be double bagged to prevent melted ice water from leaking into the cooler. The large trash bag can be sealed by simply twisting the bag closed (while removing excess air) and taping the tail down. Prior to shipping, the drain plug of the ice chests should be taped shut, and packing tape should be used to secure the cooler lid.

Quality Assurance / Quality Control

Performance-based MQOs and protocols have been established for benthic macroinvertebrate bioassessments in the SMC Bioassessment QAPP (SCCWRP 2009), which can provide the necessary guidance for RMC laboratories to produce quality data. SWAMP is currently developing laboratory SOPs for BMI, taxonomic identification, which provide even greater detail on standard protocols provided in the Bioassessment QAPP.

The SWAMP bioassessment group is also currently developing guidelines for quality assurance and quality control for algae data, including the development of laboratory SOPs, on-line identification tools and a standard taxonomic level of effort (similar to what SAFIT develops for BMIs). It is anticipated that SWAMP will incorporate forthcoming tools and documentation into a statewide QAPP for benthic algae. The RMC will update this QAPP to include MQOs for algae as they become available.

There are no SWAMP data quality objectives for physical habitat data that is collected synoptically with benthic macroinvertebrate and algae data. Similar to algae, the RMC will update this QAPP to include MQOs for physical habitat as they become available. SWAMP is currently developing additional guidance to assist

Until a statewide SWAMP QAPP is developed that addresses both algae and physical habitat, the **RMC will place strong emphasis on training and oversight for both field and laboratory personnel to ensure highest data quality**. Field personnel are expected to participate in annual training workshops provided by the Department of Fish and Game. In addition, bioassessment teams will be assessed during annual field audits performed by SWAMP or equivalent.

References

Fetscher, A.E., L. Busse, and P. R. Ode. 2009. Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 002. (updated May 2010).

Ode, P.R., 2007. Standard Operating Procedures for Collecting Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001.

SCCWRP. 2009. Southern California Regional Watershed Monitoring Program Bioassessment Quality Assurance Project Plan. Version 1. June 25, 2009. Prepared by Southern California Coastal Water Research Project.

STANDARD OPERATING PROCEDURES
for
Manual Collection of Water Samples for Chemical Analysis, Bacteriological Analysis, and Toxicity Testing
(SOP FS-2)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment (re: water chemistry data)
General Water Quality
Chlorine
Toxicity – Water Column
Pathogen Indicators (bacteriological analysis)

SOP Background and Application

RMC participants intend to collect water quality samples using consistent protocols across jurisdictional boundaries, to the extent reasonable and feasible. These sample collection and handling protocols form part of the RMC field quality assurance program, to help ensure validity of resulting data and comparability with SWAMP protocols. This protocol describes the techniques used to collect water samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest.

References to Existing SOPs

This SOP is adapted from information provided in the following SOPs:

(1) For water sampling: **Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)**, version 1.0, released October 15, 2007 (SWAMP 2007). A pdf of the SOP is available for download at:
http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

Relevant QA/QC protocols are also referenced in the associated RMC QAPP for targeted parameters: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

Proper gloves must be worn to both prevent contamination of the sample and to protect sampling personnel from environmental hazards. The user should wear at least one layer of gloves, but two layers help protect against leaks. All gloves must be powder-free. Disposable polyethylene, nitrile, or non-talc latex gloves are acceptable for many types of sampling; however, samples for low level metals and mercury analysis can only be collected and handled using polyethylene gloves as the outer layer.

CAUTIONS

When conducting sampling in areas of unknown water quality, especially in waters that are suspected to contain hazardous substances, bacteria, or viruses, it is preferable that at least one layer of gloves be of shoulder length, to limit skin contact with the source water.

When using chemical cleaners, as required as part of the equipment cleaning and decontamination protocols (see SOP FS-7, Sampling Equipment Cleaning Procedures and SOP FS-8, Field Equipment Decontamination Procedures), always read the product label and adhere to all printed cautions and safety measures.

When using acid preservatives, as required for certain nutrient analytes (see SOP FS-9, Sample Container, Handling Cleaning Procedures), be extremely careful not to spill or splash acid. Wear gloves, long-sleeved clothing, and protective eyewear at all times when handling acid.

Methods / Procedures

These SOPs pertain to manual collection of water quality samples only.

MOBILIZATION

At least one week prior to sample collection, contact the laboratory to notify them of the planned activity, order the necessary sample containers and analyte-free blank water provided by lab performing the analyses for blanks, and coordinate sample preservation and analysis for analytes with short holding times. Discuss with the laboratory the planned analyses and required sample containers as specified in the QAPP and SOP FS-9, Sample Containers, Handling and COCs. Request that the lab provide most bacteriological sample bottles without the preservative sodium thiosulfate, but also request a few pre-preserved bacti sample bottles, in the event that chlorine is present in the sample stream at a particular site.

Following is a recommended list of equipment to be mobilized by field personnel in advance of sampling operations; field crews are able to modify this list to account for site- and event-specific conditions. This list assumes that sampling will be conducted via manual grab sampling technique.

- Sampling containers (with labels)
- Sample filtration device (if needed)
- Concentrated H_2SO_4 for nutrient sample preservation, or sample bottles with preservative added
- Cooler(s)
- Cube ice, with zip-top bags for double-bagging
- Zip-top bags for individual sample containers
- Sampling pole (if needed) with device to hold sample bottles
- Rope (if needed) with device to hold sample bottles
- Detergent (Micro™, Liqui-Nox™, or equivalent)
- Reagents (5% HCL, methanol, both reagent-grade)
- Aluminum foil
- Deionized water for rinsing of field equipment
- Analyte-free blank water provided by lab(s) performing the analyses
- Scrub brushes, minimum 2
- Sample gloves (powder-free PE or vinyl, including shoulder-length gloves)
- Dunnage material for protecting sample containers
- Transparent tape "(tear-by-hand") to cover labels
- Containers for collecting liquid waste
- Receptacle for collecting solid waste
- GPS
- Camera
- Cell phone
- Spare batteries for all electronics (GPS, cell phone, camera, etc.)
- Paperwork (sampling plan, SOPs, COCs, datasheets, maps, permits, etc. as required)

All equipment coming into contact with sample material should be pre-cleaned per protocols in SOP FS-7, Sampling Equipment Cleaning Procedures.

SAMPLE COLLECTION

Sample Container Labels

Label each sample container with the station ID, sample code, matrix type, analysis type, project ID, and date and time of collection. To the extent feasible, pre-label containers prior to sampling, as it is difficult to write on labels once they are wet. See SOP FS-11 for sample identification and labeling protocols.

Sample Location

Water samples are collected from a location in the stream where the stream visually appears to be completely mixed. Ideally this would be at the centroid of the flow (*Centroid* is defined as the midpoint of that portion of the stream width, which contains 50% of the total flow), but depth and flow do not always allow centroid collection. For stream samples, the sampling spot must be accessible for sampling physicochemical parameters, either by boat or wading. Sampling from a bridge or from the shoreline of any water body is the least acceptable method, but in some cases will be necessary.

Sample Collection Depth

- **Sub-Surface Grab Sample:** Samples are typically collected at 0.1 m (~4 inches) below the water surface. This permits containers to be opened, filled, and re-capped under water in most cases.
- **Surface Grab Sample:** Samples are collected at the surface when water depth is <0.1 m. Because there can be differences in water chemistry on the surface, compared to subsurface, surface samples should be noted on the field data sheet as collected at 0 m.

Sample Collection Methods

Grab samples for most constituents are collected simply by direct submersion of the sample container into the stream whenever possible. When feasible, the sample containers should be opened, filled and recapped below the water surface. Samples always should be collected upstream of sampling personnel and equipment, and with the sample container pointed upstream when the container is opened for sample collection. See additional procedures described below for "clean sampling techniques" that must be used for collection of trace metals samples.

Water samples are collected before any bed sediment (sediment) samples are collected, where water and sediment samples are taken in the same reach. Care must be taken not to sample water downstream of areas where sediments have been disturbed in any manner by field personnel.

If the centroid of the stream cannot be sampled by wading, sampling devices can be used to reach the sampling location. Such devices typically involve a means to extend the reach of the sampler, with the sample bottle attached to the end of the device for filling at the desired location. These methods do not allow opening of the sample container under water, so there is some potential for contamination when the container is opened prior to lowering the sample container into the stream.

When sampling from a stream bank, the sample container is attached to a device which is attached in turn to the end of an extendable sampling pole. When no other option is available, sites may be accessed by bridge and sampled with a sample container-suspending device, lowered into the stream at the end of a pole or rope. Extreme care must be taken to avoid contaminating the sample with debris from the rope and bridge. Care must also be taken to clean all sampling devices between stations, according to protocols specified in SOP FS-8, Field Equipment Decontamination Procedures.

An intermediate container may be used for sample collection for some constituents, provided the intermediate container material matches that required for the particular analysis to be performed. See SOP FS-9, Sample Containers, Handling, and COCs, for details. Exceptions include bacteriological samples, which must be collected directly into a sterile container; intermediate containers are therefore not often used (as they must be sterile). Trace metals samples collected via clean sampling techniques (see below) also typically do not involve use of an intermediate container.

Clean Sampling Technique
Samples to be analyzed for trace metals – including mercury – should be collected using "clean sampling techniques". The specially-cleaned sample bottles should be received from the container cleaning facility (usually the analytical laboratory) double-bagged in zip-top plastic bags.

The "clean hands" person touches only the sample container and the inner bag; these items have had no contact with the environment. The "dirty hands" person touches the outer bag, cooler, etc. The dirty hands person opens the outer bag, and the clean hands person opens the inner bag around the bottle. The clean hands person then removes the bottle from the inner bag. The clean hands person dips the bottle into the ambient water, with the cap on, to a depth of approximately 0.1 m (avoiding disturbing surface scum) when feasible, and fills the bottle to the top, placing the cap back on the bottle before being removed from the water. The lid is secured and the bottle is put back into the inner clean bag, which is sealed by the clean hands person. The dirty hands person then seals the outer bag, and places the double-bagged sample on ice in the cooler.

Sample Filtration
Per USEPA protocols, filtration of water samples for orthophosphate and trace metals (including mercury) analysis must be performed within 15 minutes of sample collection. As a practical matter, filtration for DOC should be performed along with filtration for orthophosphate. It is therefore necessary to use a **field** filtration system, such as a peristaltic pump with in-line filter, or a syringe filter, for sample filtration. Samples are pumped or drawn via syringe and filtered directly into the sample container. This minimizes contamination by excluding the intermediate sampling device.

Syringe Filtration Method
The syringe (60 cc size, pre-cleaned in the laboratory) and in-line filter are pre-packed in two ziplock bags. The syringe and filter are taken out of the bags using "Clean Hands/Dirty Hands" technique when filtering samples for metals analysis, as previously described. The sub-surface water sample is collected by 1) wading out into the centroid portion of the stream, or by leaning over the edge of the boat, and aspirating water into the syringe, filling and rinsing the syringe five times with ambient water; 2) attaching the filter onto the syringe and filling the syringe body; 3) rinsing the filter with a few milliliters of the sample; 4) rinsing the sample bottle five times with the filtered ambient water; and 5) extruding the sample through the syringe filter and completely filling each bottle. The bottles are taken out of and put back into their bags using "Clean Hands/Dirty Hands" when filtering samples for metals analysis.

Peristaltic Pump Method
The basic "Clean Hands/Dirty Hands" technique is also applied in the use of a peristaltic pump with an in-line filter cartridge for metals-in-water sample collection. Dirty Hands removes the plastic cover from the end of the pump tubing and inserts the tubing into the sampling container. Dirty Hands holds the tubing in place. The in-line cartridge filter is attached to the outlet end of the tubing.
Clean Hands takes the plastic cover off the other end of the tubing, and inserts that end into the sample stream. Dirty Hands turns on the pump and flushes I L of ambient water through the tubing to purge it for dissolved metals. Clean Hands removes the cap from

the sample bottle and uses the pump to fill it with ambient water. Clean Hands puts the cap back on the bottle and places it in the plastic bag.

Sample Preservation

Samples for certain constituents (principally nutrients; see SOP FS-9 for details) must be preserved with acid. Acidify samples in the field when possible. Preservative may be added to sample bottles in advance by laboratory. When field acidification is not possible, deliver samples to lab as soon as possible on day of collection, and instruct lab to acid-preserve samples immediately upon receipt.

Bacteriological Samples

Collect the bacteria grab samples by direct submersion as described above, being very careful not to touch the inside of the bottle or cap, and without rinsing the sample container.

Ask the lab to provide most bacti sample bottles *without the preservative* sodium thiosulfate, which is required only in the presence of excess chlorine. If there is reason to believe that excess chlorine may be present in the sample stream (from a wastewater treatment plant effluent or swimming pool discharge upstream, for example), a simple field test kit may be used to determine whether chlorine is present in the water prior to sample collection. If chlorine is found to be present, collect bacti samples in sample bottles that have the sodium thiosulfate preservative added.

If all the bacteria sample bottles contain sodium thiosulfate, remove the sodium thiosulfate by dumping it out of the container prior to sample collection into an appropriate waste container, unless the sample stream has tested positive for chlorine.

If using an extension pole, remove the bacteria bottle cap, turn the bottle upside down, and plunge it into the water, facing upstream. Collect a water sample approximately four inches (4") beneath the surface. Turn the bottle underwater into the current and away from you. In slow moving stream reaches, push the bottle underneath the surface and away from you in an upstream direction.

Note that bacteria samples must be delivered to the analytical laboratory within six (6) hours of collection, and the lab must begin the analysis within an additional two (2) hours following delivery (for a nominal maximum of eight (8) hours following collection), per USEPA rule – therefore prior coordination with the laboratory on sample delivery timing is important.

Toxicity Test Samples

Using the standard grab sample collection method described previously for water samples, fill (for a typical suite of water toxicity tests conducted) the required amount of 2.25-L (half gallon) amber glass bottles with water, put on ice, and cool to $\leq$6 °C. Prior to filling each bottle, rinse bottle with cap on three times in ambient water, being careful to avoid any surface scum. Label the containers as described above and notify the laboratory of the impending sample delivery, given the 36-hr holding time requirement. Sample collection must be coordinated with the laboratory at least one week in advance of the monitoring event to guarantee appropriate scheduling.

DEMOBILIZATION

Before leaving the sampling site, field personnel should perform the following tasks:

- Review datasheets to ensure they are complete and legible,
- Preserve samples as described in SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures,
- Ensure that all containers are capped tightly and stored in a cooler on double-bagged cubed ice (per SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures),
- Verify that all sampling-related materials and equipment have been collected, and
- Clean sampling equipment as described in SOP FS-7, Sampling Equipment Cleaning Procedures, and decontaminate equipment as described in SOP FS-8, Field Equipment Decontamination Procedures before sampling at a different site.

Sample Short-term Storage and Preservation

Properly store and preserve samples as soon as possible. Usually this is done immediately after sample collection by placing the filled containers on bagged, cube ice in an ice chest. Sufficient ice is needed to lower the sample temperature to $\leq$6°C within 45 minutes after time of collection. Sample temperature is maintained at $\leq$6 °C until delivered to the laboratory. Care is taken at all times during sample collection, handling and transport to prevent exposure of the sample to direct sunlight.

Chain of Custody Forms

Every set of samples delivered to a laboratory must contain a complete Chain of Custody (COC) Form that lists all samples collected, the date/time of collection for each sample, and the analyses to be performed on those samples, as well as any special instructions to the laboratory (see SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures). A separate COC is required for each laboratory, for every shipment of samples. Electronic COCs may also be emailed to analytical laboratories, but the COCs must be sent before the samples arrive at their destinations. The original COC sheet (not the copies) is included with the shipment to the laboratory (inserted into a zip-top bag for protection), and the sampling crew retains a copy.

Sample Delivery and Shipping

After collection, water samples are submitted to the respective analytical laboratories in containers as identified in SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures.

Samples should be delivered to the analytical laboratory as soon as possible after conclusion of sampling activities, but always sufficiently within sample hold time requirements (see SOP FS-9, Sample Containers, Handling, and Chain of Custody Procedures). Note the especially short (six hour) timeframe for delivery of bacteriological samples to the lab.

Samples being sent via a freight carrier require additional packing. Although care is taken in sealing the ice chest, leaks can occur. Leaking ice chests can cause samples to be returned or arrive at the lab beyond the holding time. Samples and ice should be bagged separately using zip-top bags, and then placed in a large trash bag inside the ice chest for shipping. Bubble wrap or other suitable protective packing material must be used to protect glass sample bottles. Ice should be double bagged to prevent melted ice water from leaking into the cooler. The large trash bag can be sealed by simply twisting the bag closed (while removing excess air) and taping the tail down. Prior to shipping, the drain plug of the ice chests should be taped shut, and packing tape should be used to secure the cooler lid.

Quality Assurance / Quality Control

Readiness reviews, post-event sampling reviews, and field audits will be performed as part of the programmatic quality assurance program to help ensure that appropriate protocols are followed.

Field crews must ensure that all sampling-derived wastes are contained and disposed of properly to prevent entry into the water body.

Consistent with the QAPP, reagents should be inspected upon receipt and usage to ensure that they are of appropriate grade (e.g., reagent-grade or better) for cleaning purposes.

Field Blank Samples

When required, field blank samples are collected in the same manner as the environmental samples, as described below. For grab samples, bottles full of analyte-free blank water provided by lab performing the analyses or Milli-Q water are opened at the site for the same length of time the sample bottles are open. The analyte-free blank water is poured directly into the blank sample container.

When samples are filtered for dissolved metals analysis, field blanks are typically collected at the last site of a sampling trip, with the same tube and filter used to collect the last dissolved metals-in-water sample of the day (before the ambient sample is collected); and with the tube used for the last total metals-in-water sample of the day. If each sample is taken using a new set of tubing, a separate tubing-set should be used for the blank.

Pumping Method

The same Clean Hands/Dirty Hands collection techniques are followed for the field blank as the samples, pumping analyte-free blank water provided by the lab(s) performing the analyses from a clean container supplied by the laboratory.

Syringe Method

Field blanks are collected in much the same way as in the pumping method. "Clean Hands/ Dirty Hands" techniques are used. The syringe is taken out of the double bags, analyte-free blank water is aspirated into the syringe, syringe is rinsed five times with ambient water, the filter is attached, and the blank water is extruded into a sample bottle. A minimum of one blank per trip is taken, if required.

Adherence to the procedures described above, along with adherence to referenced SOPs for cleaning sampling equipment, handling samples, and decontaminating field equipment, will help ensure that water samples are collected in a manner that is representative of environmental conditions, and help ensure comparability of data with SWAMP protocols and MRP requirements.

References

MPSL-DFG Field Sampling Team, 2007. Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. Version 1.0. October 15, 2007.

STANDARD OPERATING PROCEDURES
for
Performing Manual Field Measurements
(SOP FS-3)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment (re: field-measured water quality parameters)
Chlorine

SOP Background and Application

RMC participants intend to collect perform water quality measurements using consistent protocols across jurisdictional boundaries, to the extent reasonable and feasible. These field measurement protocols form part of the RMC field quality assurance program, to help ensure validity of resulting data and comparability with SWAMP protocols.

References to Existing SOPs

This SOP is adapted from information provided in the following SOPs:

(1) For field measurements of dissolved oxygen, temperature, conductivity, and pH: **Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)**, version 1.0, released October 15, 2007 (SWAMP 2007). A pdf of the SOP is available for download at: http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

The SWAMP Field Measurements SOPs portion of the above-referenced document is included in this RMC SOP FS-3 as Attachment 1.

Relevant QA/QC protocols are also referenced in the associated RMC QAPP for targeted parameters: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

Proper gloves must be worn to both prevent alteration of the field measurements, and to protect sampling personnel from environmental hazards. The user should wear at least one layer of gloves, but two layers help protect against leaks. All gloves must be powder-free. Disposable polyethylene, nitrile, or non-talc latex gloves are acceptable for field measurements.

CAUTIONS

When performing measurements in areas of unknown water quality, especially in waters that are suspected to contain hazardous substances, bacteria, or viruses, it is preferable that at least one layer of gloves be of shoulder length, to limit skin contact with the source water.

When using chemical cleaners, as required as part of the equipment cleaning and decontamination protocols (see SOP FS-7, Sampling Equipment Cleaning Procedures and SOP FS-8, Field Equipment Decontamination Procedures), always read the product label and adhere to all printed cautions and safety measures.

Methods / Procedures

These SOPs pertain to manual measurement of water quality parameters only. Automated field measurement is covered in SOP FS-4.

Field measurement of dissolved oxygen (DO), temperature, conductivity, and pH are required during the annual bioassessment monitoring. Specific protocols for these measurements are to be found in the SWAMP Field Measurement SOPs, Attachment 1.

Measurement of free and total chlorine is required twice annually, during the spring and dry weather seasons. Specific instructions for use of the Chemetrics test kits (K-2511 for low range, and K-2504 for high range) will be provided with individual test kits.

Field Meter Calibration

All field meters must be calibrated prior to use; this is typically done on a daily basis, prior to the first measurements of the day. Record the results of the field meter calibration on the Field Meter Calibration Record form, Attachment 2.

Sample Location

Direct field measurements or grab samples for field measurement purposes are collected from a location where the sample stream visually appears to be completely mixed. Ideally this is at the centroid of the flow (*Centroid* is defined as the midpoint of that portion of the stream width, which contains 50% of the total flow), but site conditions do not always allow centroid collection. The location must be accessible by boat or wading. Sampling from a bridge or from the shoreline of any water body is the least acceptable method, but in some cases will be necessary.

Sample Collection Depth

- **Sub-Surface Sample:** Grab samples for field measurements are typically collected at 0.1 m (~4 inches) below the water surface. When the field probe is inserted directly into the stream, a measurement depth of 0.8 m (~8 inches) should be used to ensure that the probe is appropriately submerged.
- **Surface Sample:** Grab samples for field measurements are collected at the surface when water depth is <0.1 m. Because there can be differences in water chemistry on the surface, compared to subsurface, surface samples should be noted on the field data sheet as collected at 0 m.

Field Measurement Methods

For DO, conductivity, temperature and pH, measurements may be made either by direct submersion of the instrument probe into the sample stream, or by collection of grab samples and immediate analysis of the grab sample in the field. Conductivity should be reported as specific conductivity/conductance (SC).

When using the Chemetrics test kits for measurement of free and total chlorine, grab samples must be collected using a clean container, and the relevant instructions provided with the kits must be followed for sample preparation and analysis.

Grab samples for field measurements are collected simply by direct submersion of the sample container into the stream whenever possible. Samples always should be collected upstream of sampling personnel and equipment, and with the sample container pointed upstream when the container is opened for sample collection.

Grab samples are collected before any bed sediment (sediment) samples are collected, where water and sediment samples are taken in the same reach. Care must be taken not to sample water downstream of areas where sediments have been disturbed in any manner by field personnel.

If the centroid of the stream cannot be sampled by wading, sampling devices can be used to reach the sampling location. Such devices typically involve a means to extend the reach of the sampler, with the sample bottle attached to the end of the device for filling at the desired location. These methods do not allow opening of the sample container under water, so there is some potential for contamination when the container is opened prior to lowering the sample container into the stream.

When sampling from a stream bank, the sample container is attached to a device which is attached in turn to the end of an extendable sampling pole. When no other option is available, sites may be accessed by bridge and can be sampled with a sample container-suspending device, lowered into the stream at the end of a rope. Extreme care must be taken to avoid contaminating the sample with debris from the rope and bridge. Care must also be taken to clean all sampling devices between stations, according to protocols specified in SOP FS-8, Field Equipment Decontamination Procedures.

Before leaving the sampling site, field personnel should do the following:

- Review datasheets to ensure they are complete and legible,

- Ensure that all sampling-related materials and equipment have been collected, and
- Clean sampling equipment as described in SOP FS-7, Sampling Equipment Cleaning Procedures, and decontaminate equipment as described in SOP FS-8, Field Equipment Decontamination Procedures before sampling at a different site.

Quality Assurance / Quality Control

Readiness reviews, post-event sampling reviews, and field audits will be performed as part of the programmatic quality assurance program to help ensure that appropriate protocols are followed.

Field crews must ensure that all sampling-derived wastes are contained and disposed of properly to prevent entry into the water body.

Consistent with the QAPP, calibration reagents should be inspected upon receipt and usage to ensure that they are not expired. Similarly, as part of mobilization efforts, field crews should verify Chemetrics test kits are not expired, as the relevant comparators typically have a shelf life of one year from date of manufacture.

Adherence to the procedures described above, along with adherence to referenced SOPs for cleaning sampling equipment and decontaminating field equipment, will help ensure that field measurements are made in a manner that is representative of environmental conditions, and help ensure comparability of data with SWAMP protocols and MRP requirements.

References

MPSL-DFG Field Sampling Team, 2007. Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. Version 1.0. October 15, 2007.

Attachment 1 – Standard Operating Procedures (SOPs) for Conducting Field Measurements of Water Samples in the Surface Water Ambient Monitoring Program (SWAMP)

Marine Pollution Studies Laboratory – Department of Fish and Game (MPSL-DFG) Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)

The SOPs below are for reference and information purposes only, the documents are not required by the Surface Water Ambient Monitoring Program (SWAMP). Please see the SWAMP Quality Assurance Management Plan (http://www.swrcb.ca.gov/swamp/qamp.html) for more information regarding SWAMP QA/QC requirements.

Table of Contents

Field Measurements

Field Data Sheets

Field data sheets are used to record field observations, probe measurements, and water and sediment chemistry sampling. Field data sheets are provided through the Marine Pollution Studies Laboratory website at:
http://mpsl.mlml.calstate.edu/swdwnlds.htm
Click on the *Field Data Sheets* for the most recent versions. There are guidelines provided below to standardize what is recorded on all data sheets and that should be helpful in completing each form. The Beaufort Scale (see at the end of this document) is also used for specifications and equivalent wind speeds for water conditions. The entries discussed below and on the field data sheets are recorded at each sampling site.

Notes to Standardize SWAMP Field Data Sheets (For in the field use)

Upon arrival at a sampling site, record visual observations on the appearance of the water and other information related to water quality and water use.

Key Reminders to identify samples:

1. **Sample Time** is the SAME for all samples (Water, Sediment, & Probe) taken at the sampling event. Use time of FIRST sample as it is important for the chain of custody (COC).
2. **Left Bank/Right Bank**
   Left bank is defined as the bank to the left of the observer when facing downstream, and the *right bank* is to the right of the observer when facing downstream

FIELD OBSERVATIONS: (each one of these observations has a *Comment* field in the database so use comment space on data sheet to add information about an observation if necessary)

1. **DOMINANT SUBSTRATE**: if possible; describe DOMINANT substrate type; use UNK if you cannot see the dominant substrate type
2. **WADEABILITY**: in general, is the water body being sampled wadeable to the average person AT the POINT of SAMPLE
3. **BEAUFORT SCALE**: use scale 0-12; refer to scales listed at the end of this document.
4. **WIND DIRECTION**: records the direction from which the wind is blowing
5. **PICTURES:** Digital photos are taken to help document the actual sampling site. The convention is to take photos facing DOWNSTREAM, overlooking the site. Right bank and left bank are thus defined in this downstream-facing direction. Document any discrepancies from this convention. Only one photo is necessary, if both, left and right

bank, fit into one frame. Record all photos in the field data sheet space to record picture numbers given by camera; be sure to rename accordingly back in the office. All photos should be renamed and saved with the StationCode_yyyy_mm_dd_uniquecode (e.g. 123ABC123_2007_07_01_BBDS).

6. **SITE ODOR**: Note if hydrogen sulfide odor, musty odor, sewage odor, etc. is in the sampling reach
7. **SKY CODE**: Note recent meteorological events that may have impacted water quality
8. **OTHER PRESENCE**: VASCULAR refers to terrestrial plants or submerged aquatic vegetation (SAV) and NONVASCULAR refers to plankton, periphyton etc.
9. **PRECIPITATION**: Note if any precipitation is occurring during sampling
10. **PRECIPITATION LAST 24 HOURS**: Note how much precipitation has occurred within the last 24-h of sampling
11. **WATER ODOR**: Note if the sample water being collected has odor
12. **WATER CLARITY**: this describes the clarity of the water while standing creek side; clear represents water that is clear to the bottom, cloudy may not be clear to bottom but greater than 4" can be seen through the water column.
13. **WATER COLOR**: This is the color of the water from standing creek side
14. **OBSERVED FLOW**: Visual estimates in cubic ft/s.

SAMPLE DETAILS:

1. **EVENT TYPE**: Note the event type based which type of media is being collected
2. **SAMPLE TYPE**: GRAB samples are when bottles are filled from a single depth; INTEGRATED sample are taken from MULTIPLE depths and combined.
   a. GRAB: use 0.1 for subsurface samples; if too shallow to submerge bottle; depth =0
   b. INTEGRATED: -88 in depth sampled, record depths combined in sample comments
3. **SAMPLING CREW**: J. Smith, S. Ride (first person listed is crew leader)
4. **STARTING BANK**: Which side of the stream was accessed first. Bearings are always recorded looking downstream
5. **OCCUPATION METHOD**: What media was used to access the site
6. **TARGET LAT/LONG**: Refers to the existing station location that the sampling crew is trying to achieve; can be filled out prior to sampling
7. **ACTUAL LAT/ LONG**: is the location of the current sample event.
8. **SAMPLE LOCATION**: describes from where IN water body sample was taken: Can be combined; ex: bank/thalweg or midchannel /thalweg
9. **HYDROMODIFICATION:** Describe existing hydromodifications such as a grade control, drainage pipes, bridge, culvert
10. **HYDROMOD LOC**: if there was an IMMEDIATE (with in range potentially effecting sample) hydromodification; was sample taken upstream or downstream of modification; if there is no hydromodification, NA is appropriate
11. **STREAM DEPTH, WIDTH & DISTANCE FROM BANK**: describe in meters at point of sample. Distance from bank should be recorded from the starting bank

Field Data Logbook

A Field Data Logbook or a Field Folder is taken into the field on each sampling trip. The use of bound or loose-leaf notebooks is left up to the entity conducting the monitoring. A good safety precaution against the loss of a bound field data logbook is to photocopy the current pages upon returning from the field. These pages are kept on file at the specific sample collection entity's office. If a loose-leaf notebook is used, take care to remove original field data log sheets from the notebook and file in the office. Copies of the field data log sheets may be left in the notebook for future reference.

Field Data Logbooks (bound or loose leaf sheets) are maintained on file indefinitely in each regional office or contract laboratory office. They are never discarded, since the logbook may be the only written record of field measurements. Field Data Logbooks are reviewed periodically during SWAMP QA site visits. At this point, these field notes are not inclusive of the information that would be collected for biological assessment work, and several other data measurement types.

Flow

Sampling crews should be notified on reconnaissance forms if it is known that there is an operational United States Geological Survey (USGS) gage is located at or nearby a sampling site. If there is a USGS gage nearby, a gage height in feet is recorded and later converted to an instantaneous flow value and recorded in the logbook. The gage height is always to be reported to the USGS for conversion to flow. If a USGS gage is not available, a flow measurement should be taken, if requested. See Instantaneous Flow Measurement information starting on page 13 in this document. In addition, it is recommended that a flow severity value is recorded at each stream or river station that is not tidally influenced. See the Flow Severity section starting on page 13 of this document. Centroid velocity measurements may also be taken as a minimum acceptable rough characterization of the stream flow as requested, although this measurement is not to be recorded as a flow, since it is only a velocity measurement.

Record of Samples Collected for Purposes of Chemical Analysis

The general types of chemical samples to be collected are listed for each site, since this may vary from site-to-site (e.g., metals-in-water, pesticides-in-sediments, routine water quality). Analyses authorization forms are recommended since different authorized laboratories perform different chemical analyses. The method of preservation for each chemical sample is recorded, as appropriate.

Record of Data Submission

The *Logbook* field must indicate in some manner whether data recorded in the logbook has been transcribed onto data forms and submitted to the SWAMP data management staff.

Other Observations

Water Appearance	Note general appearance (e.g., color, unusual amount of suspended matter, debris or foam)
Sediment Appearance	Color, Odor and sediment composition should be noted.
Weather	Note recent meteorological events that may have impacted water quality; (e.g., heavy rains, cold front, very dry, very wet)
Biological Activity	Note excessive macrophyte, phytoplankton or periphyton growth. The observation of water color and excessive algal growth is very important in explaining high chlorophyll a values. Other observations such as presence of fish, birds and spawning fish are noted.
Watershed or Instream Activities	Note instream or drainage basin activities or events that are impacting water quality (e.g., bridge construction, shoreline mowing, livestock watering upstream).
Record of Pertinent Observations Related to Water Quality and Stream Uses	If the water quality conditions are exceptionally poor, note that standards are not met in the observations, (e.g., dissolved oxygen is below minimum criteria). Note uses (e.g., swimming, wading, boating, fishing, irrigation pumps, navigation). Eventually, for setting water quality standards, the level of use will be based on comments related to the level of fishing and swimming activities observed at a station.
Specific Sample Information	Note specific comments about the sample itself that may be useful in interpreting the results of the analysis (e.g., number of sediment grabs, or type and number of fish in a tissue sample). If the sample was collected for a complaint or fish kill, make a note of this in the observation section.
Missing Parameters	If a scheduled parameter or group of parameters is not collected, make some note of this in the comments.

Field Data Measurements

While collecting water samples (see Field Collection Procedures for Water Samples section), record appropriate field measurements. When field measurements are made with a multiparameter instrument, it is preferable to place the sonde in the body of water to be sampled and allow it to equilibrate in the dissolved oxygen (D.O.) mode while water samples are collected. Field measurements are made at the centroid of flow, if the stream visually appears to be completely mixed from shore to shore. *Centroid* is defined as the midpoint of that portion of the stream width which contains 50% of the total flow. For routine field measurements, the date, time and depth are reported as a grab. Measure Quality Objectives (MQO's) for field measurements are listed in appendix C of the SWAMP QAMP.

Recommended Depths for Conducting Field Data Measurements

Water Depth Less than 5 ft (<1.5 m) If the water depth is less than 5 ft (1.5 m), grab samples for water are taken at approximately 0.1 m (4 in.), and multi-probe measurements are taken at approximately 0.2 m (8 in.). This is because all sensors have to be submerged, so 0.1 m would not be deep enough. But taking a grab sample at 0.2 m is not always feasible, as it is difficult to submerge bottles to that depth, and in many cases the bottle will hit the stream bottom.

Water Depth Greater than 5 ft (>1.5 m) If the water depth at the sampling point exceeds 5 ft (1.5 m) in depth, a vertical profile of dissolved oxygen, temperature, pH and specific conductance are made using the multiparameter probe equipment. The depth of the sonde at the time of measurement is most accurately determined from the depth sensor on the multiparameter sonde rather than depth labels on the cable.

Vertical Depth Profiles and Depth-Integrated Sample Collection If depth integration sampling is being conducted, or if vertical profile measurements are requested, multi-probe measurements are made starting at a depth of 0.2 m, and are then conducted at 1.0, 2.0, 3.0, 4.0, and 5.0 m depths after that until 5.0 m depth is reached. Beginning at 5.0 m, measurements are made every 5.0 m through depth profile.

Field data for multiparameter vertical depth profiles are recorded in final form on the SWAMP Field Data Sheets and submitted to the SWAMP data management staff.
Go to http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

Water Temperature (^{O}C)

Water temperature data are recorded for each SWAMP visit in final form in a Field Data Logbook and submitted to the SWAMP data management staff.
See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

Temperature Sampling Procedures

Temperature is measured in-stream at the depth(s) specified above. Measuring temperature directly from the stream by immersing a multiprobe instrument or thermometer is preferred.

Hand Held Centigrade Thermometer

If an electronic meter is not available, the temperature is measured with a hand-held, centigrade thermometer (Rawson, 1982).

- In wadeable streams, stand so that a shadow is cast upon the site for temperature measurement.

< Hold the thermometer by its top and immerse it in the water. Position the thermometer so that the scale can be read.

< Allow the thermometer to stabilize for at least one minute, then without removing the thermometer from the water, read the temperature to the nearest 0.1^{o} C and record.

< Do not read temperature with the thermometer out of the water. Temperature readings made with modern digital instruments are accurate to within $\pm$ 0.1^{o} C.

Temperature Measurement from a Bucket

When temperature cannot be measured in-stream, it can be measured in a bucket-Nalgene or plastic. Care must be taken to insure a measurement representative of in-stream conditions.

The following conditions must be met when measuring temperature from a bucket:

< The bucket must be large enough to allow full immersion of the probe or thermometer.

< The bucket must be brought to the same temperature as the water before it is filled.

< The probe must be placed in the bucket immediately, before the temperature changes.

< The bucket must be shaded from direct sunlight and strong breezes prior to and during temperature measurement.

< The probe is allowed to equilibrate for at least one minute before temperature is recorded.

< After these measurements are made, this water is discarded and another sample is drawn for water samples which are sent to the laboratory.

pH (standard units)

pH data is recorded for each SWAMP visit in final form on the Field Data Sheets and submitted to the SWAMP data management staff. See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

pH Sampling Equipment

The pH meter should be calibrated according to the recommended procedures for calibration and maintenance of SWAMP field equipment. Calibration directions are listed in the manufactures field equipment operations manual. The pH function is pre and post calibrated every 24 h of use for multiparameter instruments.

pH Sampling Procedures

In-stream Method

Preferably, pH is measured directly in-stream at the depth(s) specified earlier in this document. Allow the pH probe to equilibrate for at least one minute before pH is recorded to the nearest 0.1 pH unit.

pH Measurement from a Bucket

When pH cannot be measured in-stream, it can be measured in a bucket-Nalgene or plastic. The following precautions are outlined above; “Temperature Measurement from a Bucket”.

Potential Problems

- If the pH meter value does not stabilize in several minutes, out gassing of carbon dioxide or hydrogen sulfide, or the settling of charged clay particles may be occurring (Rawson, 1982).
- If out gassing is suspected as the cause of meter drift, collect a fresh sample, immerse the pH probe and read pH at one minute.
- If suspended clay particles are the suspected cause of meter drift, allow the sample to settle for 10 min, then read the pH in the upper layer of sample without agitating the sample.
- With care, pH measurements can be accurately measured to the nearest 0.1 pH unit.

Dissolved Oxygen (mg/L)

Dissolved oxygen (D.O.) data is recorded for each SWAMP visit in final form on a Field Data Sheet and submitted to the SWAMP data management staff.
See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

Dissolved Oxygen Sampling Equipment

The dissolved oxygen meter should be calibrated according to the recommended procedures for calibration and maintenance of SWAMP field equipment. Calibration directions are listed in the manufactures field equipment operations manual.

Multiprobe Instrument

Pre and post calibrate the D.O. sensor every 24 h and for elevations greater than 500 ft on the multiprobe instrument. Preferably, D.O. is measured directly in-stream at the depth(s) specified in the Field Measurements section above. The D.O. probe must equilibrate for at least 90 s before D.O. is recorded to the nearest 0.1 % saturation or mg/L. Care must be taken at profile stations to insure that the reading is stable for each depth. Since dissolved oxygen takes the longest to stabilize, record this parameter after temperature, conductivity and pH. If the D.O. probe has an operable, automatic stirrer attached, the D.O. probe does not have to be manually stirred. However, if the probe is not equipped with an automatic stirrer, manual stirring must be provided by raising and lowering the probe at a rate of 1 ft/s (0.3m/s) without agitating the water surface. If the stream velocity at the sampling point exceeds 1 ft/s, the probe membrane can be pointed upstream into the flow and manual stirring can be avoided (Rawson, 1982).

D.O. Measurement from a Bucket

When D.O. cannot be measured in-stream, it can be measured in a bucket-Nalgene or plastic, following precautions outlined in the Temperature Measurement from a Bucket listed above. During equilibration and reading, water should be moved past the membrane surface at a velocity of 1 ft/s (0.3 m/sec), either by automatic stirrer or manual stirring. If stirred manually in a bucket, the water surface is not agitated (Rawson, 1982).

24-Hour Average D.O. (if requested in special study)

Unattended 24-Hour D.O. Data Collection

Why Collect 24-Hour Data

Dissolved oxygen sampling for standards compliance is targeted to water bodies where low instantaneous D.O. levels indicate partial or nonsupport of designated aquatic life uses. Intensive monitoring is conducted with automated equipment that is preset to record and store field measurements hourly over one 24-h period. Four or more dissolved oxygen measurements may also be made manually at 4-6-h intervals over one 24-h period, as long as one is made near sunrise (0500-0900 h) to approximate the daily minimum. However, data collected with automated equipment is preferred.

When to Take Measurements

All 24-h D.O. monitoring events must be spaced over an index period representing warm-weather seasons of the year (approx March 15-October 15), with between one-half to two-thirds of the measurements occurring during the critical period (July 1-September 30). The ***critical period*** of the year is when minimum stream flows, maximum temperatures, and minimum dissolved oxygen concentrations typically occur in area streams. **A flow measurement must be taken at the time of deployment.** In a perennial stream, a 24-h data for standards compliance can not be used if the flow is less than the 7Q2. In perennial streams, the D.O. criterion to do not apply for flows under the 7Q2. A period of about one month must separate each 24-h sampling event. Additional samples may be collected outside the index period to further characterize a water body, but that information is generally not used for assessing standards compliance.

Frequency of Measurements

The measurement interval should be no more than once per 15 min and no less than once per hour.

Where to Take Measurements

For purposes of determining standards compliance with the 24-h average criteria, samples collected near the surface will be considered representative of the mixed surface layer. In deep streams, reservoirs, and tidally influenced water bodies, automated equipment is positioned between 1 foot (from the surface) to one-half the depth of the mixed surface layer. At least 10 24-h monitoring events (using the 24-h criteria and/or absolute minimum criteria) at each site within a 5-year period are recommended to provide adequate data for assessment.

When to Collect Other Routine Samples, if doing 24-hour D.O. measurements

Other routine field measurements and water samples should be collect at either the time of deployment, at the reference check, or when the multiprobe recording 24-h data is retrieved. When ever possible, flow must be measured at the 24-h site.

Priority for Scheduling 24-Hour Sampling Events

- 303d listed waterbodies
- Waterbodies with Concerns for DO problems (too few samples available for full use assessment).

- Occurrence of low D.O. concentrations observed during the day
- Waterbodies with trends indicating declining D.O. concentrations
- Waterbodies which would contribute to an Ecoregion data set

Data Reporting for 24-hour D.O. measurements

Dissolved oxygen values recorded over the 24-h period are summed and divided by the number of measurements to determine the average concentration, which is compared to the 24-h criterion. The lowest D.O. value from each 24-h set is compared to the minimum criterion. There will be occasions when a complete 24-h data set won't be possible. For example, if there are 18 measurements instead of 24, a time weighted diurnal average needs to be calculated. This can be easily done using GW Basic.

Support of assigned aquatic life use is based on 24-h D.O. average and minimum criteria for each monitoring event. Report the 24-h average D.O. value, number of measurements over a 24-h period, and the minimum, and maximum values. Report data as a time composite sample with a beginning and ending date and time, covering the 24-h period measured.

Specific Conductance (µS/cm)

Specific conductance should be recorded for each SWAMP visit in final form on a Field Data Sheet and submitted to the SWAMP data management staff.
See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

Specific Conductance Sampling Equipment

The conductivity meter should be calibrated according to the recommended procedures for calibration and maintenance of SWAMP field equipment. Calibration directions are listed in the manufactures field equipment operations manual.

Specific Conductance Sampling Procedure

Preferably, conductivity is measured directly in-stream at the depth(s) specified earlier in this document. Allow the conductivity probe to equilibrate for at least one minute before specific conductance is recorded to three significant figures (if the value exceeds 100). The primary physical problem in using a specific conductance meter is entrapment of air in the conductivity probe chambers. The presence of air in the probe is indicated by unstable specific conductance values fluctuating up to $\pm$100 µS/cm. The entrainment of air can be minimized by slowly, carefully placing the probe into the water; and when the probe is completely submerged, quickly move it through the water to release any air bubbles.

If specific conductance cannot be measured in-stream, it should be measured in the container it can be measured in a bucket-Nalgene or plastic. The following precautions are outlined above; "Temperature Measurement from a Bucket".

Salinity (parts per thousand--ppt, or ‰)

The value for salinity is computed from chloride concentration or specific conductance. The calculation assumes a nearly constant ratio for major ions in an estuary when seawater is diluted by river water. This assumption does not hold for cases where salinity is less than about three parts per thousand. Salinity determinations at such low values are only approximate. In estuarine waters, salinity is a relevant and meaningful parameter. Often the salinity may be low, approaching that of freshwater. Nevertheless, this is useful information. Determine if a station is estuarine from historical records (i.e., experiences cases where salinity is >2.0 ppt) and always report salinity at this station, regardless of the salinity during periods of high flow.

Salinity is measured directly in-stream at the depth(s) specified earlier in this document. Salinity data should be recorded for each SWAMP visit in final form on a Field Data Sheet and submitted to the SWAMP data management staff. See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

Values between 2.0 ppt and 1.0 ppt should be reported as <2.0 ppt rather than the actual value and values <1.0 ppt should be reported as <1.0 ppt. The field instruments compute salinity from specific conductance and temperature, and display the value in parts per thousand. Report salinity values above 2.0 ppt to the nearest 0.1 ppt.

Secchi Disc Transparency (meters)--if requested in special study

Secchi disk transparency should be recorded for each SWAMP visit in final form on a Field Data Sheet and submitted to the SWAMP data management staff. See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting.

Secchi Disk Sampling Equipment

< Secchi disk, 20 cm in diameter
< Measuring tape

Secchi Disk Transparency Sampling Procedures

Preferably, Secchi disk transparency is measured directly in-stream wherever conditions allow. The Secchi disk should be clean, weighted and suspended with chain, wire, or Dacron line (the line used to suspend the Secchi disk should not be nylon or cotton; stretching may cause erroneous readings). Another option is to attach the Secchi disk to a metal rod calibrated in metric units.

Average Turbidity The Secchi disk should be lowered vertically in a location shielded from direct sunlight. Glare from the water's surface will affect the accuracy of the measurement. Don't wear sunglasses.

Slowly lower the disk until it disappears from view. The person viewing the disk should maintain an eye level of less than two meters above the water's surface. Note the depth at which the disk disappears from view.

Slowly raise the disk until it becomes visible. Note the depth at which the disk reappears.

Compute the mathematical average of the two depths noted and record the average value to two significant figures in the field logbook. The recorded average value is the Secchi disk transparency.

High Turbidity (Muddy Water)

In streams with very high turbidity, high velocity, and/or poor access, it may be necessary to measure Secchi disk transparency in a bucket. Fill the bucket from the centroid of flow being careful not to disturb the substrate.

Follow steps above for measuring the Secchi disk depth within 30 s after raising the filled bucket from the water's surface. Or, re-suspend the solids by stirring, then quickly make the measurement.

Record Secchi disk transparency to two significant figures.

Low Turbidity (Clear Water)

Some bodies of water will be so clear and shallow that it will not be possible to lower the Secchi disk until it disappears from view.

Measure and record the depth at the deepest point accessible. Report Secchi disk transparency as greater than the deepest depth measured.

Example (Low Turbidity): South Fork Rocky Creek is a small (<1 ft^3/s) clear stream. The stream in the vicinity of the sampling site was less than 1 m deep and the bottom was clearly visible everywhere. However, a pool was located in the stream next to a bridge. The maximum depth of the pool was 2.6 m at which depth the Secchi disk was still visible. Therefore, Secchi disk transparency for South Fork Rocky Creek was recorded as > 2.6 m.

Importance of Secchi Disk Data

Eutrophication, the natural aging process in reservoirs and lakes is accelerated by human activities which add nutrients to lakes, reservoirs, and the surrounding watersheds. Section 314 of the Clean Water Act (CWA) of 1987 requires all states to classify lakes and reservoirs according to trophic state. Although chlorophyll a is the most direct measure of algal biomass, other indices and programs utilize Secchi disk depth as the primary factor.

Turbidity Measurement with Turbidity Meter

Nephelometric Turbidity can be determined by measuring the amount of scatter when light is passed through a sample using a turbidity meter. The LaMotte 2020 Turbidity meter is a suitable instrument for example.

Meters should be calibrated using a standard close to the expected sample value.

For instructions on how to operate the instruments refer to the manufacturer's manual. Turbidity measurements can be executed together with water sampling. The turbidity sample has to be representative for the sampled water mass. Make sure that no gas bubbles are trapped in the vial for the reading and that the outside of the vial is wiped completely clean (i.e., meaning free of moisture, lint and fingerprints). Take several measurements to assure an accurate reading. Do not record values that vary greatly. If variations are small, record an average. If settling particles are present, record a reading before and one after settling. The meter might have to be recalibrated with a different standard, if the sample water readings are outside of the calibration standard limits.

Days Since Last Significant Precipitation

Significant precipitation is defined as any amount that visibly influences water quality. Water quality in small to medium streams and in the headwaters of many reservoirs is influenced by runoff during and immediately after rainfall events. This influence is site specific and poorly studied. As part of a new initiative to understand and regulate the adverse effects of runoff, SWAMP would like to associate recent rains or melted snow with ambient water quality, using a parameter defined as "days since last significant precipitation". Record the number of days, rounded to the nearest whole number, since a rain has occurred that, in the best professional judgment of monitoring personnel, may have influenced water quality. If it is raining when the sample is collected, or has rained within the last 24-h, report a value of <1. If it has been a long time since a significant rain, record this as greater than that particular value, for example >7 days. If confidence about the recent history of precipitation is low, draw a line through the space on the data form.

Flow Severity -- recommended new parameter

Flow severity should be noted for each SWAMP visit to non-tidally influenced flowing streams and submitted in the comments on the SWAMP Field Data Sheet. It should be recorded even if flow is visible but not measurable on that sampling visit. There are no numerical flow guidelines associated with flow severity. This is an observational measurement that is highly dependent on the knowledge of monitoring personnel. It is a simple but useful piece of information when assessing water quality data. For example, a bacteria value of 10,000 with a flow severity of 1 would represent something entirely different than the same value with a flow severity of 5. The six flow severity values are; 1=No Flow, 2= Low Flow, 3 = Normal Flow, 4 = Flood, 5 = High Flow, and 6 = Dry. The following are detailed descriptions of severity values:

1 **No Flow** When a flow severity of one (1 = no flow) is recorded for a sampling visit, then a flow value of zero ft^3/s should also be recorded for that sampling visit. **A flow severity of one (1) (no flow) describes situations where the stream has water visible in isolated pools.** There should be no obvious shallow subsurface flow in sand or gravel beds between isolated pools. Low flow does not only apply to streams with pools. It also applies to long reaches of bayous and streams that have no detectable flow but may have water from bank to bank.

2 **Low Flow** When stream flow is considered low a flow severity value of two (2) is recorded for the visit and the corresponding flow measurement is also recorded for that visit. In streams too shallow for a flow measurement but with detected water movement, record a value of < 0.10 cfs. Note: Use a stick or other light object to verified the direction of water movement (i.e., movement is downstream and not the affect of wind.) What is low for one stream could be high for another.

3 **Normal Flow** When stream flow is considered normal, a flow severity value of three (3) is recorded for the visit and the corresponding flow measurement is also be recorded for that visit. Normal is highly dependent on the stream. Like low flow, what is normal for one could be high or low for another stream.

4 and 5 **Flood and High Flow** Flow severity values for high and flood flows have long been established by EPA and are not sequential. Flood flow is reported as a flow severity of four (4) and high flows are reported as a flow severity of five (5). High flows would be characterized by flows that leave the normal stream channel but stay within the stream banks. Flood flows are those which leave the confines of the normal stream channel and move out on to the flood plain.

6 **Dry** When the stream is dry a flow severity value of six (6 = dry) is recorded for the sampling visit. In this case the flow is not reported. This will indicate that the stream is completely dry with no visible pools.

Flow information for over 200 USGS sites is available on the Internet. The address is **http://water.usgs.gov/index.html**. This is useful information in determining flow conditions prior to sampling. This information may be included in general observations.

Flow Measurement Method (Reporting)

The method (or instrument) used to measure flow is noted by reporting a method number. The method numbers are:

1- Flow Gage Station (USGS/IBWC)	3- Electric (ex. Marsh-McBirney)
2- Mechanical (ex. Pigmy meter)	4- Weir/Flume
5- Other (orange peel, etc.)	

Flow (ft^3/s)
If requested, flow data should be recorded for each monitoring visit to non-tidal, flowing streams. Flow data should be recorded in final form on a Field Data Sheet and submitted to the SWAMP data management staff. See http://mpsl.mlml.calstate.edu/swdwnlds.htm for detailed information on data reporting. The following are two exceptions to the flow reporting requirement:

No Flow/ Pools If there is no flow at a stream site and accessible, isolated pools remain in the stream bed, collect and report the required field data and laboratory samples from the pools and report instantaneous flow. Under these conditions, flow (ft^3/s) should be reported as zero. The reported flow severity value should be one. Pools may represent natural low-flow conditions in some streams and the chemistry of these pools will reveal natural background conditions.

Dry If the stream bed holds no water, the sampling visit is finished. Report that the stream was "dry" in the observations and record a value of six (meaning "dry") for flow severity. No value is reported for flow since there is no water.

Flow Measurement

If a flow measurement is required at a site, measure and record flow after recording visual observations. The intent of measuring flow first is to delay collection of chemical and biological water samples with limited holding times. Care must be taken not to collect water samples in the area disturbed during flow measurement. There are several acceptable flow measurement methods that can be used.

U.S. Geological Survey (USGS) Gaging Station
Some SWAMP Stations are sampled at sites where the USGS maintains flow gaging equipment. On any type of sampling visit to a site that has a USGS flow gage, observe and record the gage height to the nearest hundredth of a foot in the field logbook. Upon return to the office, contact the USGS office responsible for maintaining the gage. USGS personnel can provide the flow value in cubic feet per second (ft^3/s) that corresponds to the gage height. Although SWAMP personnel may have a rating curve available to them, shifts associated with changes in the stream bed may occur over time. Always call the USGS to determine the shift. At some sites the shift changes frequently. At others, the relation between stream flow and gage height is almost unchanging. If a gage is no longer maintained by USGS, cross out the recorded gage height and be prepared to measure flow by another method on the return visit to that site.

Several factors may influence the accuracy of the USGS rating curves that are used to convert gage height to flow. If there is any doubt about the accuracy of a USGS gage height reading or flow rating curve, sampling personnel should measure the flow if possible.

Gage height may be indicated at a USGS gage by one of three methods:

Staff Gage

Staff gages are enameled steel plates (with the appearance of large measuring tapes) bolted to some stable structure. For example, staff gages may be bolted to concrete bridge abutments, pillars, or docks. The staff gage face is white with black lettering and gradations. The gradations shown are feet, tenths of a foot, and 0.02 of a foot. The point at which the water level crosses the staff gage should be recorded to the nearest hundredth of a foot.

Wire Weight Gage

Wire weight gages are locked, metal boxes with approximate dimensions of 15 in. long x 12 in. tall x 12 in. deep. Wire weight gages are usually affixed to bridge rails near mid-stream. They must be unlocked with a USGS key. The wire weight gages house a weight attached by wire cable to a graduated reel (gradations are tenths and hundredths of feet) with a counter at one end.

When the reel is released the weight can be gradually lowered until the bottom of the weight contacts the water surface. At the point of contact, the weight causes the water surface to ripple slightly. Maintaining the weight in that position, record the counter value to the nearest whole number and the point indicated by the stylus on the graduated reel to the nearest hundredth of a foot. Determine if the gage is the movable type that can be moved to multiple locations on the bridge. This type is common on braided streams. A correction value is stamped on the bridge near each point that the gage can be attached. Record the corrected value as the gage height in feet.

Bubble Gage

Bubble gages are locked in metal sheds that are approximately 4 ft wide x 4 ft deep x 6.5 ft tall. The gage houses are most frequently located on the shore near a bridge but sometimes are attached to bridge pillars near mid-stream or established on the stream bank far from any bridge. The gage house must be unlocked with a USGS key. Bubble gages in gage houses usually indicate the gage height in two or three locations. A counter attached to the manometer system indicates gage height in feet. Some gage houses have stilling wells that can be entered. Often there is a staff gage on the inside wall.

Most bubble gages are also equipped with digital recorders. Digital recorders consist of two white, coded discs, approximately 4 in. in diameter with a punch tape overlapping a portion of each disc. The discs are marked with 100 gradations. As the front of the digital recorder is viewed, the stylus at the disc on the left indicates height in feet. The stylus at the disc on the right indicates gage height in hundredths of feet. The gage height from both discs should be added and the number recorded in the field logbook as gage height to the nearest hundredth of a foot.

Many USGS metal sheds also contain a surface level recorder. This devise can be opened to determine how stable stream flow has been prior to the sampling event. Record observations concerning the flow hydrograph.

Instantaneous Flow Measurement

Water quality monitoring visits to sites where there are no nearby USGS flow gauges will require water quality monitoring personnel to measure flow, when requested by Regional Water Quality Control Boards (Regional Boards).

Flow Measurement Equipment

Flow meter

One of the following or an equivalent:

- Marsh-McBirney Electronic meter
- Montedoro-Whitney Electronic meter
- Price Pigmy meter (with timer and beeper)
- Price meter, Type AA (with Columbus weight)

Additional Equipment

- Top-setting wading rod (preferably measured in tenths of feet)(see Figure 1).
- Tape measure (with gradations every tenth of a foot).

Flow Measurement Procedure (USGS, 1969)

Select a stream reach with the following characteristics:

- Straight reach with laminar flow (threads of velocity parallel to each other) and bank to bank. These conditions are typically found immediately upstream of riffle areas or places where the stream channel is constricted.
- The site should have an even streambed free of large rocks, weeds, and protruding obstructions that create turbulence. The site should not have dead water areas near the banks, and a minimum amount of turbulence or back eddies.

Flat Streambed Profile (cross section)

Stretch the measuring tape across the stream at right angles to the direction of flow. When using an electronic flow meter, the tape does not have to be exactly perpendicular to the bank (direction of flow). When using a propeller or pigmy type meter, however, corrections for deviation from perpendicular must be made.

If necessary and possible, modify the measuring cross section to provide acceptable conditions by building dikes to cut off dead water and shallow flows, remove rocks, weeds, and debris in the reach of stream one or two meters upstream from the measurement cross section. After modifying a streambed, allow the flow to stabilize before starting the flow measurement.

Record the following information on the flow measurement form (see example Flow Measurement Forms at end of this document):

- Station Location and Station ID
- Date
- Time measurement is initiated and ended
- Name of person(s) measuring flow
- Note if measurements are in feet or meters
- Total stream width and width of each measurement section
- For each cross section, record the mid-point, section depth and flow velocity

Measuring the Stream Width

Measure and record the stream width between the points where the tape is stretched (waters edge to waters edge).

Determining the Number of Flow Cross Sections

Determine the spacing and location of flow measurement sections. Some judgment is required depending on the shape of the stream bed. Measurements must be representative of the velocity within the cross-section. If the stream banks are straight and the depth is nearly constant and the bottom is free of large obstructions, fewer measurements are needed, because the flow is homogeneous over a large section. Flow measurement sections do not have to be equal width. However, they should be unless an obstacle or other obstruction prevents an accurate velocity measurement at that point. ***No flow measurement section should have greater than 10% of the total flow.***

If the *stream width is less than 5 ft*, use flow sections with a width of 0.5 ft (See example 1 on page 23 of this document). If the *stream width is greater than 5 ft*, the minimum number of flow measurements is 10. The preferred number of flow measurement cross sections is 20-30 (See Example 2 on page 24 on this document). The total stream width is 26 ft with 20 measurements, section widths will be 1.3 ft (26/20 = 1.3).

Determining the Mid-Point of the Cross Section

To find the mid-point of a cross section, divide the cross section width in half. Using Example 2 (see forms at end of document);

< The total stream width is 26 ft with 20 cross sections and each cross section width is equal to 1.3 ft.

< Divide 1.3 ft in half and the mid-point of the first section is 0.65 ft. In this example the tape at waters edge is set at zero (0) ft.

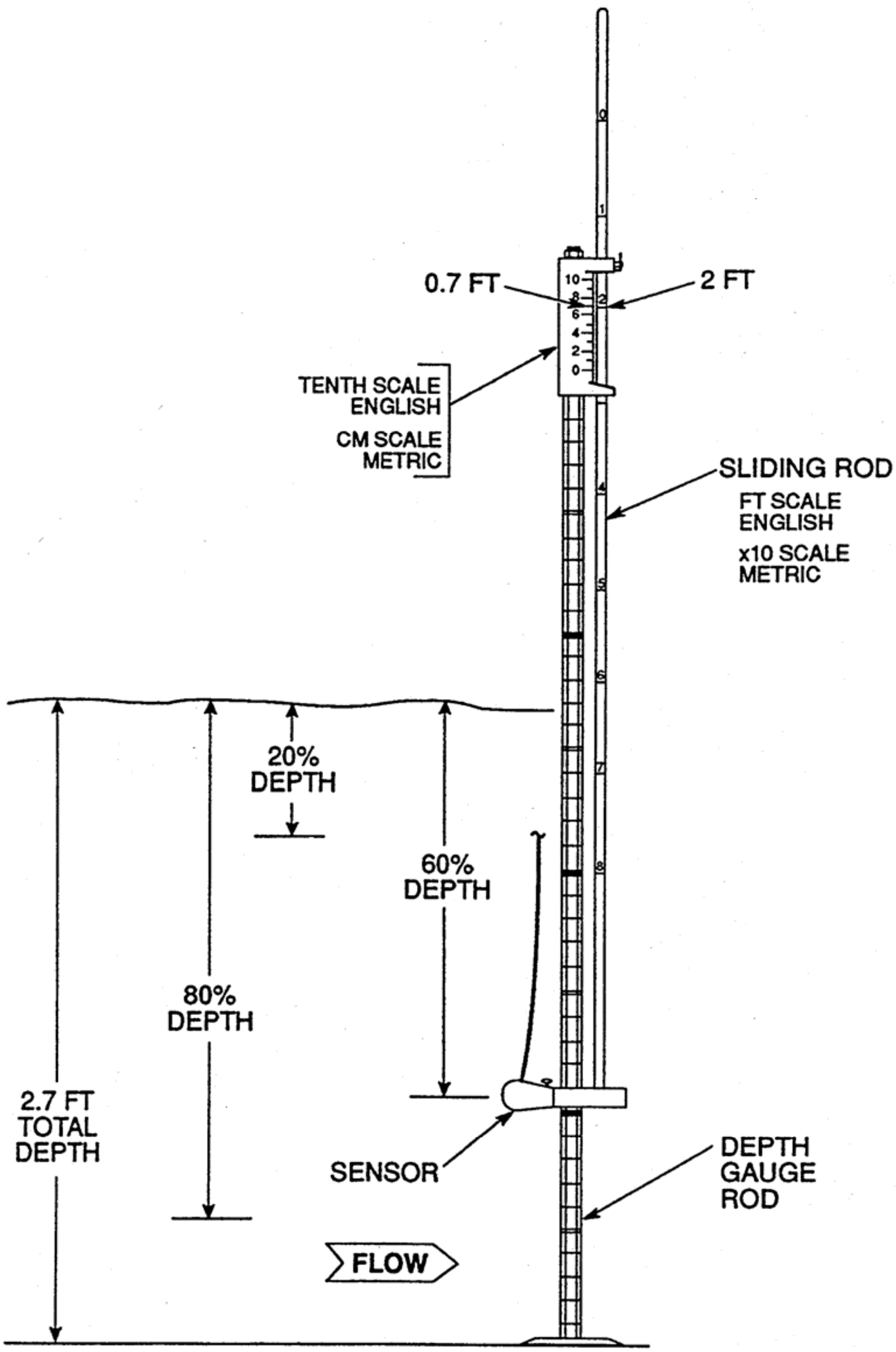
< By adding 0.65 to zero the mid-point of the first section is 0.65 ft.

< Each subsequent mid-point is found by adding the section width (1.3 ft) to the previous mid-point. For example; MIDPOINT #1 is 0.65 + 0.0 = 0.65; MIDPOINT #2 is 0.65 + 1.3= 1.95 ft; MIDPOINT #3 is 1.95 + 1.3 = 3.25 ft and ....MIDPOINT # 20 is 24.05 +1.3.

< Place the top setting wading rod at 0.65 ft for the first measurement.

< Using a top setting wading rod, measure the depth at the mid-point of the first flow measurement section and record to the nearest 0.01 ft.

Figure 1. Top-Setting Wading Rod (Marsh-McBirney)



Adjusting the Sensor Depth at a Cross Section

Adjust the position of the sensor to the correct depth at each mid-point. The purpose of the top setting wading rod is to allow the user to easily set the sensor at 20%, 60%, and 80% of the total depth. The total depth can be measured with the *depth gage rod*. Each single mark represents 0.10 foot, each double mark represents 0.50 foot, and each triple mark represents 1.00 foot (see Figure 2).

For Depths < 2.5 Ft — If the depth is less than 2.5 ft, only one measurement is required at each measurement section. To set the sensor at 60% of the depth, line up the foot scale on the *sliding rod* with the *tenth scale*, located on top of the depth gage rod. If, for example, the total depth is 2.7 ft (as shown on Figure 2), then line up the 2 on the foot scale with the 7 on the tenth scale (Marsh-McBirney 1990).

For Depths > 2.5 Ft — If the depth is greater than 2.5 ft, two measurements should be taken at 20% and 80% of the total depth. To set the sensor at 20% of the depth, multiply the total depth by two. For example, if the total depth is 2.7 ft, the rod would be set at 5.4 ft (2.7 x 2). Line up the 5 on the sliding rod with the 4 on the tenth scale.

For Depths > 2.5 Ft (cont) — To set the sensor at 80% of the depth, divide the total depth by two. For example, the total depth is 2.7 ft the rod would be set at 1.35 ft (2.7/2). Line up the 1 on the sliding rod with the 0.35 on the tenth scale. The average of the two velocity measurements is used in the flow calculation. See page 2-36 for an example of a flow form recording measurements for depths greater than 2.5 ft.

NOTE: The point where the rod is set for 20 and 80% of the depth will not equal values derived by calculating 20 and 80% of the total depth.

Measuring Velocity (this has typically been measured at 6/10 of the total depth, for velocity-only measurements)

< Position the meter at the correct depth and place at the mid-point of the flow measurement section. Measure and record the velocity and depth. The wading rod is kept vertical and the flow sensor kept perpendicular to the tape rather than perpendicular to the flow while measuring velocity with an electronic flow meter. When using a propeller or pigmy-type meter, however, the instrument should be perpendicular to the flow.

< Permit the meter to adjust to the current for a few seconds. Measure the velocity for a minimum of 20 s with the Marsh-McBirney and Montedoro-Whitney meters. Measure velocity for a minimum of 40 s (preferably 2 min with the Price and pigmy meters).

< When measuring the flow by wading, stand in the position that least affects the velocity of the water passing the current meter. The person wading stands a minimum of 1.5 ft downstream and off to the side of the flow sensor.

- A flow sensor, equipped with cable and weight may be used to measure flows where the water is too deep to wade. Follow the procedure involving meters attached to wading rods.
- Report flow values less than 10 ft^2 /s to two significant figures. Report flow values greater than 10 ft^3/s to the nearest whole number, but no more than three significant figures.
- In cases where the flow is low and falling over an obstruction, it may be possible to measure the flow by timing how long it takes to fill a bucket of known volume.

Avoid measuring flow in areas with back eddies. The first choice would be to select a site with no back eddy development. However, this can not be avoided in certain situations. Measure the negative flows in the areas with back eddies. These negative values will be included in the final flow calculation.

Calculating Flow

To calculate flow, multiply the width x depth (ft^2) to derive the area of the flow measurement section. The area of the section is then multiplied by the velocity (ft/s) to calculate the flow in cubic feet per second (cfs or ft^3/sec) for that flow measurement section. When flow is calculated for all of the measurement sections, they are added together for the total stream flow (see Figure 2).

Q=Total Flow (or discharge), W=Width, D=Depth, V=Velocity.

$$Q = (W_1 * D_1 * V_1) + (W_2 * D_2 * V_2) + \ldots\ldots (W_n * D_n * V_n)$$

What to Do with Negative Values

<u>Do not</u> treat cross sections with negative flow values as zero. Negative values obtained from areas with back eddies should be subtracted during the summation of the flow for a site.

Flow Estimate (ft^3/s)

Flow estimate data may be recorded for a non-tidally influenced stream when it is not possible to measure flows by one of the methods described above. Flow estimates are subjective measures based on field personnel's experience and ability to estimate distances, depths, and velocities. If flow can not be measured at a routine non-tidal station, a new site should be selected where flow can be measured.

Flow Estimate Procedure

- Observe the stream and choose a reach of the stream where it is possible to estimate the stream cross section and velocity.
- Estimate stream width (ft) at that reach and record.
- Estimate average stream depth (ft) at that reach and record. Estimate stream velocity (ft/s) at that reach and record. A good way to do this is to time the travel of a piece of floating debris. If doing this method from a bridge, measure the width of the bridge. Have one person drop a floating object (something that can be distinguished from other

floating material) at the upstream side of the bridge and say start. The person on the downstream side of the bridge will stop the clock when the floating object reaches the downstream side of the bridge. Divide the bridge width by the number of seconds to calculate the velocity. The velocity can be measured at multiple locations along the bridge. These velocities are averaged. If this is done alone, watch for road traffic.

< Multiply stream width (ft) times average stream depth (ft) to determine the cross sectional area (in ft^2) which when multiplied by the stream velocity (in ft/s) and a correction constant, gives an estimated flow (ft^3/s).

Example: A stream sampler conducted a sampling visit to a stream while the flow meter was being repaired. The sampler looked at the creek downstream from the bridge and saw a good place to estimate flow. The stream width was around 15 ft. It appeared the average depth on this reach was about 0.75 ft. The sampler timed a piece of floating debris as it moved a distance of 10 ft in 25 s downstream over the reach. An estimated flow with a smooth bottom was calculated using the following formula.

Width x Depth x Velocity x A (correction factor)= estimated flow
15 ft (width) x 0.75 ft (depth) x 2.5 ft/s (velocity) x A =25 ft^3/s (cfs)

A is a correction constant: 0.8 for rough bottom and 0.9 for smooth bottom

Estimated flow should be reported to one or two significant figures.

Experienced field personnel are able to estimate flow to within 20% of actual flow for total flows less than 50 ft^3/s. The best way to develop this skill is to practice estimating flow before making measurements at all monitoring visits to non-tidally influenced flowing streams and then compare estimated flows with those obtained from USGS gages or from instantaneous flow measurements

Figure 2. Stream Flow (Discharge) Measurement

Example 1.
Stream Flow (Discharge) Measurement
Small Stream < 5 Ft Wide and #2.5 Ft Deep

Stream:___**_OAK CREEK**_________________________________Date:__**5/29/91**___ ______
Station Description:_____**at US Hwy 90A**________ __________________________
Time Begin:__**1545**______Time End:__**1630**_______Meter Type:_**_Marsh-McBirney**_____________
Observers:_____**BK/MK**_______Stream Width*:____**5 ft**_____ Section Width:____**0.5 ft**_________ _
Observations:____

Section Midpoint (ft)	Section Depth (ft)	Observational Depth** Ft	Velocity		Area W x D (ft^2)	Discharge (Q) V x A (ft^3/s)
			At Point (ft/s)	Average (ft/s)		
0.25	**0.55**			**0.05**		**0.01375**
0.75	**0.80**			**0.11**		**0.044**
1.25	**0.85**			**0.27**		**0.42635**
1.75	**0.90**			**0.49**		**0.2205**
2.25	**1.10**			**0.58**		**0.275**
2.75	**1.50**			**0.72**		**0.540**
3.25	**1.20**			**0.76**		**0.456**
3.75	**0.90**			**0.76**		**0.342**
4.25	**0.75**			**0.44**		**0.165**
4.75	**0.30**			**0.00**		**0.00**

$m^3/s \times 35.3 = ft^3/s$

Total Discharge (3Q) (ft^3/s)	2.4826

Example 2.

Stream Discharge Measurement Example (Larger Stream > 5 Ft and #2.5 Ft Deep)

Stream:___**_RED RIVER**____Date:__**5/28/91**___________

Station Description:_____**Post Oak Creek 40 m Below Sherman WWTP Outfall**__________________

Time Begin:__**1542**_____________Time End:__**1601**_____Meter Type:_**Marsh-McBirney**_________

Observers:_____**CM, EW, DO**_______Stream Width*:____**26 ft**___ Section Width:___**1.3 ft**_______

Observations:____

Section Midpoint (ft)	Section Depth (ft)	Observational Depth** ft	Velocity		Area W x D (ft^2)	Discharge (Q) V x A (ft^3/s)
			At Point (ft/s)	Average (ft/s)		
0.65	**0.55**			**2.03**	**0.715**	**1.451**
1.95	**0.40**			**2.04**	**0.520**	**1.061**
3.25	**0.42**			**2.02**	**0.546**	**1.103**
4.55	**0.38**			**1.77**	**0.494**	**0.874**
5.25	**0.40**			**1.75**	**0.520**	**0.910**
7.15	**0.42**			**1.93**	**0.546**	**1.054**
8.45	**0.40**			**1.99**	**0.52**	**1.035**
9.75	**0.37**			**1.92**	**0.481**	**0.924**
11.05	**0.37**			**1.56**	**0.481**	**0.750**
12.35	**0.43**			**1.32**	**0.559**	**0.738**
13.65	**0.40**			**1.36**	**0.520**	**0.707**
14.95	**0.42**			**1.33**	**0.546**	**0.726**
16.25	**0.40**			**1.35**	**0.520**	**0.702**
17.55	**0.45**			**1.64**	**0.585**	**0.959**
18.85	**0.48**			**1.70**	**0.624**	**1.061**
20.15	**0.48**			**2.00**	**0.624**	**1.248**
21.45	**0.50**			**1.95**	**0.650**	**1.268**
22.75	**0.40**			**2.18**	**0.520**	**1.134**
24.05	**0.48**			**1.71**	**0.624**	**1.067**
25.35	**0.50**			**0.60**	**0.650**	**0.390**
			Total Discharge (3Q) (ft^3/s)			**19.162**

$m^3/s \times 35.3 = ft^3/s$

Example 3.
Stream Flow (Discharge) Measurement (Larger Stream > 5 Ft and >2.5 Ft Deep)

Stream:____ARROYO COLORADO______________________________Date:__**6/16/98**__________
Station Description:_____Downstream of Harlingen WWTP___________________________________
Time Begin:__**1400**______Time End:__**1445**_____Meter Type:___**Marsh-McBirney**_____________
Observers:_____**JD, CK**________Stream Width*:___**47.5 ft**___ Section Width:___**2.375 ft**________
Observations: *Note that the starting point is at 4.7 ft on the measuring tape and not zero.

Section Midpoint (ft)	Section Depth (ft)	Observational Depth** ft	Velocity At Point (ft/sec)	Velocity Average (ft/sec)	Area W x D (ft^2)	Discharge (Q) V x A (ft^3/s)
4.70	0.73			0.65	1.73	1.127
7.08	1.10			1.08	2.61	2.822
9.45	1.85			0.90	4.39	3.954
11.83	2.20			1.05	5.23	5.486
14.20	2.20			1.44	5.23	7.531
16.58	2.45			1.09	5.82	6.342
18.95	2.55	0.20 0.80	1.75 1.76	1.76	6.06	10.659
21.33	2.60	0.20 0.80	1.79 1.32	1.56	6.18	9.633
23.70	2.70	0.20 0.80	1.63 1.26	1.45	6.41	9.298
26.10	3.05	0.20 0.80	1.68 1.15	1.42	7.24	10.286
28.48	3.10	0.20 0.80	1.23 0.69	0.96	7.36	7.068
30.85	2.90	0.20 0.80	1.22 0.89	1.06	6.89	7.301
33.23	2.84	0.20 0.80	0.60 0.37	0.49	6.75	3.305
35.60	2.65	0.20 0.80	0.80 0.21	0.51	6.29	3.210
37.98	2.65	0.20 0.80	0.85 0.96	0.91	6.29	5.727
40.35	2.20			0.28	5.23	1.464
42.73	2.30			0.16	5.46	0.874
45.10	2.05			0.51	4.87	2.483
47.48	1.10			0.49	2.61	1.280
49.86	0.65			0.62	1.54	0.957

$m^3/s \times 35.3 = ft^3/s$

Total Discharge (ΣQ) (ft^3/s)

Stream Flow (Discharge) Measurement Form

Stream:____ Date:____________

Station Description:____

Time Begin:________ Time End:_________ Meter Type:________________

Observers:______________ Stream Width*:__________ Section Width:________

Observations:____

Section Midpoint (ft) (m)	**Section Depth (ft) (m) (cm)**	**Observational Depth** ft-m-cm**	**Velocity**		**Area W x D (ft^2) (m^2)**	**Flow (Q) V x A (m^3/s) (ft^3/s)**
			At Point (ft/s) (m/s)	**Average (ft/s)(m/s)**		

$m^3/s \times 35.3 = ft^3/s$

Total Flow (Discharge) (3Q) (ft^3/s)	

* Make a minimum of 10 measurements when the total width is > 5.0 ft, 20 measurements preferred.

** When water is < 2.5 ft deep take one measurement at each cross section. When water is > 2.5 ft deep, take two measurements at each cross section; one at 2 the total depth and the other at 2 x the total depth. Average the two velocity measurements. See SWAMP Procedures Manual for a detailed flow measurement method.

Summary of Significant Figures for Reporting Field Parameters

Parameter	Field Data Reporting Requirements
Water Temperature (^oC)	Report temperature to the nearest tenth of a degree. Round insignificant figures 0 through 4 down and 5 thru 9 up.
pH (s.u.)	Report pH to the nearest tenth of a pH standard unit.
D.O. mg/L **D.O.** (% saturation)	Report dissolved oxygen to the nearest tenth of a mg/L. Report % saturation to the nearest tenth of a percent
Specific Conductance (micro siemens/cm)	Report specific conductance to only three significant figures if the value exceeds 100. Do not report ORP which is displayed by some multiprobes.
Salinity (ppt)	Report salinity values above 2.0 ppt to the nearest tenth of a part per thousand. In estuarine waters report the actual values displayed by the multiprobe above 2.0 ppt and values less than 2.0 as <2.0 or <1.0 only. Determine if a station is estuarine (i.e., experiences cases where salinity is >2.0 ppt) and always report salinity at this station, regardless of the salinity during periods of high flow.
Secchi Disk (meters)	Report Secchi depth transparency in meters to two significant figures.
Days Since Last Significant Precipitation(days)	Report whole numbers. If it is raining when the sample is collected or has rained within the last 24 h, report a value of <1. If it has been over a week since a rainfall event, report a value of > 7.
Flow (ft^3/s)	Report instantaneous flow values less than 10 ft^3/s to two significant figures. Report flow values greater than 10 ft^3/s to the nearest whole number, but no more than three significant figures. When there is no flow (pools), report as 0.0. When there is no water, don't report a value, but report as "dry" in the observations.
Flow Severity (1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry)	When there is no flow (pools), report the severity as 1, and the instantaneous flow as 0.0 ft^3/s. If the stream is dry, record only flow severity, as a value of 6.

BEAUFORT SCALE: Specifications and equivalent speeds for use at sea

FORCE	EQUIVALEN SPEED 10 m above ground Miles/hour	knots	DESCRIPTION	SPECIFICATIONS FOR USE AT SEA
0	0-1	0-1	Calm	Sea like a mirror
1	1-3	1-3	Light air	Ripples with the appearance of scales are formed, but without foam crests.
2	4-7	4-6	Light Breeze	Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break.
3	8-12	7-10	Gentle Breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.
4	13-18	11-16	Moderate Breeze	Small waves, becoming larger; fairly frequent white horses.
5	19-24	17-21	Fresh Breeze	Moderate waves, taking a more pronounced long form; many white horses are formed. Chance of some spray.
6	25-31	22-27	Strong Breeze	Large waves begin to form; the white foam crestsare more extensive everywhere. Probably some spray.
7	32-38	28-33	Near Gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.
8	39-46	34-40	Gale	Moderately high waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.
9	47-54	41-47	Severe Gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble, and roll over. Spray may affect visibility.
10	55-63	48-55	Storm	Very high waves with long over- hanging crests. he resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On he whole the surface of the sea takes on a white appearance. The 'tumbling' of the sea becomes heavy and shock-like. Visibility affected.

Last edited on 09 January, 1999 Dave Wheeler weatherman@zetnet.co.uk
Web Space kindly provided by Zetnet Services Ltd, Lerwick, Shetland.
http://www.zetnet.co.uk/sigs/weather/Met_Codes/beaufort.htm

Attachment 2 – Field Meter Calibration Record Form

Form 1: Calibration Record Sheet

Pre-run Calibration

Date:		Time:	
Altitude (ft):		S/N:	
Battery Voltage (%):		Calibrated by:	

For DO Calibration (Value of DO Standard)	
Barometric Pressssure: (uncorrected)	mm Hg
O_2 100% Saturation Value at Ambient Temperature:(2)	mg/L
Altitude Correction Factor : (Table 2)	

Instrument Function	Temp. of Standard	Value of Standard (1)	Initial Reading:	Calibrated to:	Please record calibration standard lot numbers. **Record pH millivolts after each pH calibration.**	
Sp.Cond. uS/cm					Lot #:	pH Millivolts/Wiper Ck
pH Buffer 4.00					Lot #:	mv
pH Buffer 7.00					Lot #:	mv
pH Buffer 10.00					Lot #:	mv
Turbidity 0 NTU					Lot #	Wiper OK
Turbidity 10.0 NTU					Lot #	Wiper OK
Dissolved Oxygen (mg/L) (1) Minimum 10 min equilibration time	Ambient Temp (2)		mg/L	mg/L	**DO Charge:**	Wiper OK

(1) Value of DO Standard = 100% Saturation Value X Altitude Correction Factor

Calibration Information

Record the following diagnostic numbers <u>after</u> calibration			Comments
Conductivity Cell Constant		Range 4.5 to 5.5	(Sonde Menu - Advanced - Cal Constants)
DO Charge **(N/A for ROX Probe)**		Range 25 to 75	(Sonde Menu - immediately after DO calibration)
DO Gain		Range 0.7 to 1.5	(Sonde Menu - Advanced - Cal Constants)
pH MV Buffer 4.00		Range 177 +-50 MV	(Sonde Menu - immediately after pH 4calibration)
pH MV Buffer 7.00		Range 0 +- 50 MV	(Sonde Menu - immediately after pH 7 calibration)
pH MV Buffer 10.00		Range -177 +- 50 MV	(Sonde Menu - immediately after pH 10 calibration)
pH Slope (pH 7 MV - pH 10 MV)		Range 162 to 180 MV	If slope is very near lower limit, use only for spot-checking, not long-term deployment

Post-run Calibration Check

Date:		Time:	
Altitude (ft):		Calibration Check by:	
Battery Voltage (%):			

DO Calibration Value = O_2 100% Sat. Value X Altitude Correction Factor

For DO Calibration Value	
Barometric Pressure: (uncorrected)	mm Hg
O_2 100% Saturation Value at Ambient Temperature:	mg/L
Altitude Correction Factor : (Table 2)	

Instrument Function	Temp. of Standard	Value of Standard	Instrument Reading	DO Calib. Value	Drift (+ -)	Post Calibration Error Limits and Q/A Check	
Sp.Cond. uS/cm				DO Calibration Value = O_2 100% Sat. Value X Altitude Correction Factor		+- 5%	Q/A Ck:
pH Buffer 4.00						+- 0.3 units	Q/A Ck:
pH Buffer 7.00						+- 0.3 units	Q/A Ck:
pH Buffer 10.00						+- 0.3 units	Q/A Ck:
Turbidity						+-0.3 NTU	Q/A Ck:
Dissolved Oxygen (mg/L)		N/A	mg/L	mg/L		+- 0.5 mg/l	Q/A Ck:

Notes: ______

Rev.2/21/2008

STANDARD OPERATING PROCEDURES for Continuous General Water Quality Measurements (SOP FS-4)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This standard operating procedure (SOP) is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

General Water Quality

SOP Background and Application

This SOP is intended to standardize procedures for the maintenance, calibration, deployment, post-deployment and data evaluation of multi-probe instrument YSI 6600 or 6920 series sonde or equivalent equipment.

References to Existing SOPs

This SOP is based on information provided in the document "**Standard Operating Procedures for Conducting Time-Series Field Monitoring of Ambient Water Quality Measurements with a Multiparameter Instrument (YSI 6600 or 6920 Sonde)**", March 2011, developed by Water Board Region 2.

Relevant QA/QC protocols are also referenced in the associated RMC QAPPs for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

Proper gloves must be worn to both prevent contamination of the sample and to protect sampling personnel from environmental hazards. The user should wear at least one layer of gloves, but two layers help protect against leaks. All gloves must be powderfree. Disposable polyethylene, nitrile, or non-talc latex gloves are acceptable for many types of sampling; however, samples for low level metals and mercury analysis can only be collected and handled using polyethylene gloves as the outer layer.

CAUTIONS

When conducting sampling in areas of unknown water quality, especially in waters that are suspected to contain hazardous substances, bacteria, or viruses, it is preferable that at least one layer of gloves be of shoulder length, to limit skin contact with the source water.

When using chemical cleaners, as required as part of the equipment cleaning and decontamination protocols (see SOP FS-7, Sampling Equipment Cleaning Procedures and SOP FS-8, Field Equipment Decontamination Procedures), always read the product label and adhere to all printed cautions and safety measures.

Methods / Procedures

The following standard procedures are provided for collecting general water quality data using multi-parameter probes. Parameters include temperature, dissolved oxygen (DO), specific conductivity, and pH. Water quality measurements will be collected once during the spring (concurrent with bioassessment sampling) and once during late summer (August – September) for 15 minute intervals over 1-2 week time period.

CALIBRATION

The accuracy of sonde probe readings must be checked against calibration standard solutions. Calibration of these probes to these standards must be performed prior to initial deployment, during interruptions in the deployment (i.e., field checks) and after the sonde is retrieved. The post-run calibration allows the data collected to be checked for accuracy and flagged as not meeting measurement quality objectives if necessary.

It is recommended that both pre- and post-deployment calibrations be conducted in the laboratory. Field calibrations are only recommended when equipment is deployed for longer than 2-3 weeks and field checks are necessary either due to need for battery replacement or potential for fouling. If field calibrations are necessary, to the extent possible, work in the shade and maintain standard solutions at the same temperature. Example calibration data sheet is provided in Attachment 1.

The following reagents and volumes are required to calibrate YSI 6600 sonde probes:

Sensor	Standard Solution	Volume (ml)	
		Upright	Inverted
DO (optical)	Tap water	200	NA
Specific conductivity	1000 uS	650	250
pH	7.0 buffer	500	250
pH	10.0 buffer	500	250

A calibration option that reduces the volume of solution needed to calibrate sondes is the inverted position. Refer to Section 2 in YSI (2009) User Manual for specific instructions on calibrating YSI 6600 sonde probes or the specifications given in user manual for equivalent monitoring equipment.

SITE SELECTION

Site selection should be completed during field reconnaissance prior to the planned deployment date. There are several factors to consider in the placement and installation of continuous water quality equipment, including:

- Potential for water quality measurements at the site to be representative of the location being monitoring;
- Potential for cross-section variation and/or vertical stratification;
- Variability in stream stage than can be expected during deployment;
- Conditions that may enhance rate of fouling (e.g., excessive fine sediment);
- Need to protect equipment from high flow conditions; and
- Need to protect from vandalism and theft.

Refer to Wagner et al. (2007) for United States Geological Survey guidelines on selecting appropriate sites for the deployment of continuous water quality equipment.

Once the monitoring site has been established, the deployment location needs to be determined. The location should provide limited access and visibility of equipment to prevent human interference. Ideally the deployment location should be partially shaded to reduce influence of direct sunlight on temperature readings. The site should also ensure that sondes are continually submerged during any anticipated change in flow stage.

Monitoring objectives should guide site selection process so that sondes can be used to collect the most useful and relevant data. For example, if the objective is to evaluate potential factors limiting salmonid fish production, sondes could be deployed to measure temperature and DO in suitable spawning and/or rearing habitats that are utilized for key life stages (e.g., pool refugia during later summer season).

MOBILIZATION

The following equipment is mobilized by field personnel in advance of deployment.

- YSI 6600 or equivalent (calibrated less than 24 hours before deployment event)
- YSI 650 Multi-parameter Display System and Cable or field computer
- Sonde Deployment Field Sheet
- Pencils and clipboard
- GPS
- Camera
- Toolkit (see SONDE INSTALLATION)
- Clean probe guard
- Wading gear
- Site access materials (maps, directions, keys, permits)
- Spare or Replacement sonde parts

Assemble needed equipment and go to site. Obtain GPS coordinates of site location and record the sampling event information on standard field sheet for sonde data provided in SOP FS-10. Prior to installation, remove calibration/transport cup and install probe guard. Connect sonde to 650 Display System or laptop computer and program the sonde at specified time interval to start logging water quality measurements following instructions provided in Section 3.3 in Water Board (2011).

SONDE INSTALLATION

There are many different methods for securing water quality equipment. Two methods of deployment of continuous water quality equipment are provided here: (1) attached to a metal cage and (2) anchored to an existing structure in a channel. Sondes can be attached to metal cages, constructed with heavy gage 2-3 inch diameter metal tubing, with weights attached to the base (Figure 1). The monitoring equipment is attached to the metal cage using hose clamps. The metal cage can be placed in deepest part of the channel and anchored to a fixed location on the streambank (e.g., tree) using stainless steel cables and key locks. The cage protects the equipment and keeps sensors about 6 inches off the stream bottom to reduce potential for fouling by fine sediment.

Figure 1. Metal cage used to secure sonde during deployment.

An alternative method is to use place a sonde inside a section of 4-inch diameter PVC pipe modified with holes to allow water to flow around the probes. Screw caps containing eyebolts are secured at each end. Steel cables and key locks are used to attach the PVC pipe (at eyebolt) to a fixed location in the streambed or on the bank (e.g., existing tree). PVC tubing can be placed at different depths depending on the structures used for anchoring the tubing.

Measure the following and record on the site field sheet: Stream Depth (at sonde probes), Stream Width and Distance from Bank (always measure from left streambank - LB). Take a couple pictures of the sonde deployed (from the streambank as well as a close up) and record them on the field sheet. Document detailed instructions about how to access the site and find the sonde deployment location so that someone with little or no knowledge of the site can find the instrument with minimal effort.

FIELD CHECK

At locations suspected of variable water stages or potential for fouling during the deployment period, a field check of the sonde may be necessary to ensure that its probes remain submerged under the water and/or the sensors are operating efficiently. If the stream flow drops significantly between field checks, especially in non-perennial creeks, the field operator(s) need to re-evaluate conditions and decide whether or not to retrieve the instrument from its original deployment location. In the event that the field crew decides to retrieve the sonde from its current deployment location, they will also need to evaluate if there is another suitable deployment location within the reach. If a sonde is re-deployed in the field, data should be downloaded and sonde should be calibrated following instructions provided in Section 2.2 Water Board (2011).

SONDE RETRIEVAL

Retrieve the data sonde and connect to the 650 MDS or field computer. End data logging using procedures outlined in Section 5.2 Water Board (2011). Remove the cable from the sonde and replace the waterproof cap. Remove the sonde from the creek, detaching it from its anchor and collecting any wire or fasteners. Remove the probe guard and secure the calibration cup over the probes, making sure there is a little water in the bottom to keep the air damp. Gather all equipment and exit site.

POST-DEPLOYMENT ACCURACY CHECK

Complete a post-deployment accuracy check on the retrieved sonde as soon as possible after data retrieval. A post-deployment accuracy check is conducted in the field **before** cleaning the probes. To do this, follow the directions in Section 2.2 Water Board (2011) but **without selecting Calibrate**. The sonde probes are placed in each standard solution and all pertinent information including initial readings are recorded.

After the field accuracy check, the instrument should be transported back to the lab and cleaned before performing an additional accuracy check/calibration. This provides information about the amount of influence that fouling may have had on the field measurements. The first accuracy check is performed in the field to minimize the disturbance of the buildup. If instrument fouling is minimal, the double accuracy check may be unnecessary.

Quality Assurance / Quality Control

There are two processes for reviewing and validating YSI multi-probe water chemistry data. The first process is to export YSI EcoWatch data to Excel and review the raw data to flag potential outliers and removed "out-of-water" data. Refer to Section 7 in Water Board (2011) for specific instructions on downloading and formatting data.

The second process is to review the pre- and post-deployment calibration data to determine if the data are within acceptable ranges of accuracy and precision. Calculate the drift between the two measurements to determine if it meets SWAMP Measurement Quality Objectives (MQOs) (see SWAMP Quality Assurance Project Plan - Table A25). Any parameters that drifted significantly must be noted. Data must be flagged as estimated or rejected depending on how severely they exceed the MQOs.

A calibration record spreadsheet is available that automatically calculates drift as well as percent accuracy or bias for post-deployment accuracy checks or calibration events:

http://www.swrcb.ca.gov/water_issues/programs/swamp/docs/cwt/toolbox/15_21_dqmprojectfile.xls

Navigate to the Calibration & Accuracy Checks tab and enter post-deployment accuracy checks and calibrations. The formula will calculate the differential or drift and the percent accuracy. The Field Precision tab uses the repeated field measurements to calculate reproducibility (RPD) and determines the maximum RPD.

References

YSI. 2009. 6-Series Multiparameter Water Quality Sondes User manual. Revision E. April 2009.

Wagner, R.J., Boulger, R.W., Jr., Oblinger, C.J., and Smith, B.A., 2006, Guidelines and standard procedures for continuous water-quality monitors—Station operation, record computation, and data reporting: U.S. Geological Survey Techniques and Methods 1–D3, 51 p. + 8 attachments; accessed April 10, 2006, at *http://pubs.water.usgs.gov/tm1d3*

Water Board. 2011. Standard Operating Procedures for Conducting Time-Series Field Monitoring of Ambient Water Quality Measurements with a Multiparameter Instrument (YSI 6600 or 6920 Sonde). March 2011.

Attachment 1 – Calibration Work Sheet for Multiparameter Probes

Form 1: Calibration Record Sheet

Pre-run Calibration					For DO Calibration (Value of DO Standard)	
Date:		Time:		Altitude (ft):	Barometric Pressssure: (uncorrected)	mm Hg
S/N:			Battery Voltage (%):		O_2 100% Saturation Value at Ambient Temperature:(2)	mg/L
	Calibrated by:				Altitude Correction Factor : (Table 2)	

Instrument Function	Temp. of Standard	Value of Standard (1)	Initial Reading:	Calibrated to:	Please record calibration standard lot numbers. **Record pH millivolts after each pH calibration.**	
Sp.Cond. uS/cm					Lot #:	pH Millivolts/Wiper Ck
pH Buffer 4.00					Lot #:	mv
pH Buffer 7.00					Lot #:	mv
pH Buffer 10.00					Lot #:	mv
Turbidity 0 NTU					Lot #	Wiper OK
Turbidity 10.0 NTU					Lot #	Wiper OK
Dissolved Oxygen (mg/L) (1) Minimum 10 min equilibration time	Ambient Temp (2)		mg/L	mg/L	**DO Charge:**	Wiper OK

(1) Value of DO Standard = 100% Saturation Value X Altitude Correction Factor

Calibration Information

Record the following diagnostic numbers <u>after</u> calibration			Comments
Conductivity Cell Constant		Range 4.5 to 5.5	(Sonde Menu - Advanced - Cal Constants)
DO Charge **(N/A for ROX Probe)**		Range 25 to 75	(Sonde Menu - immediately after DO calibration)
DO Gain		Range 0.7 to 1.5	(Sonde Menu - Advanced - Cal Constants)
pH MV Buffer 4.00		Range 177 +-50 MV	(Sonde Menu - immediately after pH 4calibration)
pH MV Buffer 7.00		Range 0 +- 50 MV	(Sonde Menu - immediately after pH 7 calibration)
pH MV Buffer 10.00		Range -177 +- 50 MV	(Sonde Menu - immediately after pH 10 calibration)
pH Slope (pH 7 MV - pH 10 MV)		Range 162 to 180 MV	If slope is very near lower limit, use only for spot-checking, not long-term deployment

Post-run Calibration Check					For DO Calibration Value	
Date:		Time:		Altitude (ft):	Barometric Pressure: (uncorrected)	mm Hg
Calibration Check by:			Battery Voltage (%):		O_2 100% Saturation Value at Ambient Temperature:	mg/L
DO Calibration Value = O_2 100% Sat. Value X Altitude Correction Factor					Altitude Correction Factor : (Table 2)	

Instrument Function	Temp. of Standard	Value of Standard	Instrument Reading	DO Calib. Value	Drift (+ -)	Post Calibration Error Limits and Q/A Check	
Sp.Cond. uS/cm				DO Calibration Value = O_2 100% Sat. Value X Altitude Correction Factor		+- 5%	Q/A Ck:
pH Buffer 4.00						+- 0.3 units	Q/A Ck:
pH Buffer 7.00						+- 0.3 units	Q/A Ck:
pH Buffer 10.00						+- 0.3 units	Q/A Ck:
Turbidity						+-0.3 NTU	Q/A Ck:
Dissolved Oxygen (mg/L)		N/A	mg/L	mg/L		+- 0.5 mg/l	Q/A Ck:

Notes: ______________________________

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STANDARD OPERATING PROCEDURES for Continuous Temperature Measurements (SOP FS-5)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This standard operating procedure is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Temperature

SOP Background and Application

This SOP is intended to standardize procedures for the collection of time series temperature data using the Onset HOBO ® Water Temp Pro V2 temperature data loggers (hereafter referred to as Hobos) or equivalent equipment.

References to Existing SOPs

This SOP is based on information provided in the document "**Standard Operating Procedures for Conducting Time-Series Field Monitoring of Ambient Water Temperature Measurements with an Onset HOBO ® Water Temp Pro V2",** May 2011, developed by Water Board Region 2.

Relevant QA/QC protocols are also referenced in the associated RMC Quality Assurance Project Plans for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

Proper gloves must be worn to both prevent contamination of the sample and to protect sampling personnel from environmental hazards. The user should wear at least one layer of gloves, but two layers help protect against leaks. All gloves must be powderfree. Disposable polyethylene, nitrile, or non-talc latex gloves are acceptable for many types of sampling; however, samples for low level metals and mercury analysis can only be collected and handled using polyethylene gloves as the outer layer.

CAUTIONS

When conducting sampling in areas of unknown water quality, especially in waters that are suspected to contain hazardous substances, bacteria, or viruses, it is preferable that at least one layer of gloves be of shoulder length, to limit skin contact with the source water.

When using chemical cleaners, as required as part of the equipment cleaning and decontamination protocols (see SOP FS-7, Sampling Equipment Cleaning Procedures and SOP FS-8, Field Equipment Decontamination Procedures), always read the product label and adhere to all printed cautions and safety measures.

Methods/Procedures

The following standard procedures are provided for the collection of time series water temperature data. Temperature measurements will be collected for 60 minute intervals between April and September one time each year.

CALIBRATION

The accuracy of HOBOs or equivalent equipment should be checked against a certified NIST-traceable reference thermometer in water baths at two temperatures: room temperature and ice water. The NIST-traceable reference thermometer should be sent to an authorized specialist annually for at least a 2-point accuracy check and re-certification. Accuracy of the reference thermometer must be within $\pm$ 0.2 °C. HOBOs must be fully immersed in water in order to perform a proper accuracy check (Water Board 2011). Temperature sensors should be within 0.2 °C at both temperatures. If they do not meet this requirement, they should not be considered suitable for deployment.

Ice water accuracy check procedures documented here are based on the recommendations from the manufacturer and from Water Board staff. Onset documentation suggests allowing 15 minutes minimum for temperature to stabilize before proceeding with the accuracy check. HOBO models requiring waterproof housings for underwater deployment have been shown to exhibit much longer lag times for full equilibration. Consequently, allow more time for temperature stabilization with HOBOs that require separate waterproof housings.

SITE SELECTION

Site selection should be completed during field reconnaissance prior to the planned deployment date. There are several factors to consider in the placement and installation of equipment, including:

- Potential for temperature measurements at the site to be representative of the location being monitoring
- Potential for cross-section variation and/or vertical stratification
- Variability in stream stage than can be expected during deployment
- Need to protect from vandalism and theft

Once the monitoring site has been established, the deployment location needs to be determined. The location should provide limited access and visibility of equipment to prevent human interference. Ideally the deployment location should be partially shaded to reduce the influence of direct sunlight on temperature readings and allow HOBOs to be continually submerged during any anticipated change in flow stage.

Monitoring objectives should guide site selection process so HOBOs can collect the most useful and relevant data. For example, if the objective is to evaluate potential factors limiting salmonid fish production, equipment could be deployed to measure temperature in suitable spawning and/or rearing habitats that are utilized for key life stages (e.g., pool refugia during later summer season).

MOBILIZATION

The following equipment is mobilized by field personnel in advance of deployment.

- Onset HOBO Water Temp Pro V2 or equivalent (pre-programmed in office)
- Blank HOBO Deployment Field Sheet
- Handheld water quality instrument to take field measurements (water temp, DO, pH, and conductivity).
- HOBO deployment schedule
- Pencils and clipboard
- GPS
- Camera
- Toolkit (see HOBO INSTALLATION)
- Wading gear
- Site access materials (maps, directions, keys, permits)
- Spare HOBOs (or equivalent)

Prior to a field visit, program HOBOs, or equivalent equipment, to collect data at minimum of 60-minute intervals following instructions provided in Section 3.2: Instrument Programming of Water Board (2011) or specifications in user manual. For HOBOs, this programming step will require accessing the most current version of HOBOware Pro software on a computer.

Assemble needed equipment and go to deployment site. Obtain GPS coordinates of the site location and record the sampling event information on a field sheet. Using handheld water quality instrument, take two measurements of temperature, pH, dissolved oxygen (mg/L & %) and specific conductivity approximately 2 minutes apart. Prepare for HOBO installation following procedures provided in next section.

INSTALLATION

Secure the HOBO or equivalent device, at deployment site using weights (u-bolts, fish weights), cable and clamps, zip ties or other equipment.. Measure the following and record on the field sheet: Stream Depth (at HOBO location), Stream Width and Distance from Bank ((always measure from left streambank - LB). Take a couple pictures of the sonde deployed (from the streambank as well as a close up) and record them on the field sheet. Document detailed instructions about how to access the site and find the

Sonde deployment location so that someone with little or no knowledge of the site can find the instrument with minimal effort.

If multiple devices are being deployed within one reach, repeat previous steps to deploy any additional HOBOs. Assemble equipment and return to the office. The equipment will not be harmed if the flow decreases or their deployment location goes dry so field checks are not necessary.

Upon returning to the office, locate deployment site on Google Earth or anther satellite program and print screen image(s) to be included in the site file. These will be valuable to the retrieval team.

RETRIEVAL

Before leaving office to retrieve the instrument, make sure that the crew is familiar with the current deployment location – review pictures and notes from deployment. Assemble all necessary keys or combinations to access the site as well as necessary equipment, and go to the site. Once at site, obtain GPS coordinates of the site location and record the sampling event information on a field sheet. Using a handheld water quality instrument, take two measurements of temperature, pH, dissolved oxygen (mg/L & %) and specific conductivity approximately 2 minutes apart. Gather all equipment and exit site.

Quality Assurance / Quality Control

Accuracy checks on HOBO devices, or equivalent, are conducted prior to deployment and typically done one time each year (i.e., accuracy checks are not necessary for subsequent deployments within year time period). **No post-deployment checks are necessary.**

The following steps are necessary to check instrument measurement accuracy for HOBOs:

- Program HOBO(s) and record temperatures in water, taken at room temperature and in an ice bath, for a 15-minute period following procedures described in Section 2.2 of Water Board (2011)
- Download data from HOBO to computer using HOBOware Pro software
- Create an Excel file that includes the NIST thermometer readings, transcribed from the hardcopy, and each of the HOBO temps data for the room temperature and ice water accuracy checks.
- To determine if all the HOBOs meet manufacturer's accuracy specifications, calculate the mean difference and standard deviation for each HOBO using form in Attachment 1 and following instructions provided in Section 2.2 of Water Board (2011).

A mean difference exceeding 0.2 °C indicates that a particular HOBO unit exceeds the manufacturer's accuracy specification and should be repaired or replaced. Measurements should not exceed 0.2 standard deviations. **Once the accuracy check and analysis is complete, any HOBOs that meet the accuracy specifications mentioned above are ready to prepare for deployment in the field.**

References

Onset Computer Corporation. 2001. HOBO Water Temp Pro User's Manual.

Onset Computer Corporation. undated. Quick accuracy check. Available online:

http://www.onsetcomp.com/Support/HS_Support/5317_acc_test.html

Water Board. 2011. (Draft) Standard Operating Procedures for Conducting Time-Series Field Monitoring of Ambient Water Temperature Measurements with an Onset HOBO ® Water Temp Pro V2. May 2011.

Attachment 1 – HOBO accuracy worksheet

Form 1: HOBO Accuracy Check Record Sheet

HOBO Temp. Accuracy Check
NIST Thermometer ID:
Operator:
Date:

Room Temp: NIST started:
Room Temp: Hobo started:

Time (min:sec)	NIST reading (°C)
0:00	
0:30	
1:00	
1:30	
2:00	
2:30	
3:00	
3:30	
4:00	
4:30	
5:00	
5:30	
6:00	
6:30	
7:00	
7:30	
8:00	
8:30	
9:00	
9:30	
10:00	

Ice Bath: NIST started:
Ice Bath:Hobo started:

Time (min:sec)	NIST reading (°C)
0:00	
0:30	
1:00	
1:30	
2:00	
2:30	
3:00	
3:30	
4:00	
4:30	
5:00	
5:30	
6:00	
6:30	
7:00	
7:30	
8:00	
8:30	
9:00	
9:30	
10:00	

STANDARD OPERATING PROCEDURES
for
Collection of Bedded Sediment Samples for Chemical Analysis & Toxicity
(SOP FS-6)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Toxicity – Bedded Sediment, Fine-Grained
Pollutants – Bedded Sediment, Fine-grained

SOP Background and Application

Consistent techniques to collect, aliquot, and handle sediment samples are employed as part of the RMC field quality assurance program to ensure validity of resulting data and comparability with SWAMP protocols.

References to Existing SOPs

This SOP is adapted from information provided in the following SOPs:

(1) For sediment sampling: **Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)**, version 1.0, released October 15, 2007 (SWAMP 2007). A pdf of the SOP is available for download at:
http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

Relevant QA/QC protocols are also referenced in the associated RMC QAPP for targeted parameters: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety\

CAUTIONS

When using chemical cleaners, as required as part of the equipment cleaning proocols (see SOP FS-11, Sampling Equipment Cleaning Procedures and FS-12, Field Equipment Decontamination Procedures), always read the product label and adhere to all printed cautions and safety measures. Proper gloves must be worn to both prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended, however, metals and mercury sample containers can only be sampled and handled using polyethylene gloves as the outer layer). The user should wear at least one layer of gloves, but two layers help protect against leaks.

When conducting sampling in areas of unknown water quality, it is preferable that at least one layer be of shoulder length when conducting sampling to limit skin contact with water source.

Methods/Procedures

Sampling methods employed for collection of sediment toxicity and sediment chemistry samples are identical, and in the interests of efficiency and representativeness, sampling for the two should be conducted concurrently. Bed sediment (sediment) samples are collected after any water samples are collected where water and sediment are taken in the same reach. Care must be taken not to sample sediments that have been disturbed in any manner by field personnel.

Sediment samples are collected into a compositing bucket or container, where they are thoroughly homogenized in the field, and then aliquotted into separate jars for chemical or toxicological analysis. After collection and homogenization, sediment samples are submitted to the respective analytical laboratories in containers as identified in SOP FS-13, Sample Containers, Handling, and Chain of Custody Procedures.

MOBILIZATION

Following is a recommended list of equipment to be mobilized by field personnel in advance of sampling operations; field crews are able to modify this list to account for site- and event-specific conditions present. This list assumes that sampling will be conducted via the preferred sediment scoop method. If reconnaissance indicates that an alternative method is required, additional equipment will need to be mobilized and prepared.

- Compositing bucket (glass or inert-coated[1] stainless steel)
- Sampling scoops, 2 minimum (polyethylene or inert-coated[2] stainless steel)
- Detergent (Micro™, Liqui-Nox™, or equivalent)
- Reagents (5% HCL, methanol, both reagent-grade)
- Aluminum foil
- Deionized water
- Scrub brushes, minimum 2
- Sample gloves (PE or vinyl, including shoulder-length gloves)
- PPE (properly decontaminated)
- Sampling containers (with labels)
- Coolers
- Wet ice, with zip-top bags for double-bagging
- Zip-top bags for individual sample containers
- Dunnage material for protecting sample containers

[1] Kynar or similar
[2] Ibid

- Container for collecting liquid waste
- Receptacle for collecting solid waste
- GPS (with spare batteries)
- Camera (with spare batteries)
- Cell phone (with spare batteries / backup)
- Paperwork (sampling plan, SOPs, COCs, datasheets, maps, permits, etc. as required)
- Tear by hand transparent tape (for sample labeling)

All equipment coming into contact with sample material should be pre-cleaned per protocols in FS-11, Sampling Equipment Cleaning Procedures.

SITE SELECTION

Many of the chemical constituents of concern are adsorbed onto fine particles. One of the major objectives in selecting a sample site, and in actually collecting the sample while on site, is to obtain recently deposited fine sediment, to the extent possible. Field personnel should avoid hard clay, bank deposits, gravel, disturbed and/or filled areas. Any sediment that resists being scooped is probably not recently deposited fine sediment material. In following this guidance, the collection of sediment is purposefully being biased for fine materials, which must be discussed thoroughly in any subsequent interpretive reporting of the data, in regards to representation of the collected sample to the environment from which it was collected. Field personnel should select a sampling site with lower hydrologic energy, looking first at areas such as the leading edges of point bars, around emergent vegetation, near the toe of bank in slight bays, beneath undercuts and root wads at bank (also where scoured below old channel structures), and behind large rocks or other obstructions. Field personnel should take care to sample only sediments deposited by stream processes, not sediments deposited by other processes such as local landslides and bank sloughing.

As described in the following sections, field personnel will conduct a qualitative assessment of the proposed sampling site to identify appropriate sampling locations. If a suitable site for collecting sediments cannot be found at a station, sampling personnel should not collect the sediment sample, and should instead attempt to reschedule the sample collection. If this is not possible or unlikely to yield positive results, field personnel should make a note so that the missing sample is accounted for in the reconciliation of monitoring events during reporting phase. Sites that are routinely difficult to collect should be considered for elimination or relocation from the sample schedule, if appropriate.

SEDIMENT COLLECTION

Field personnel should collect no deeper than the top 2 cm of sediment for analysis. Five or more (depending on the volume of sediment needed for conducting analyses) fine-sediment sub-sites within a 100-m reach are sampled into the compositing bucket prior to aliquotting.

Before conducting sampling, field personnel should survey the proposed sampling area for appropriate fine-sediment depositional areas before stepping into the stream, to avoid disturbing possible sediment collection sub-sites. Personnel should then carefully enter the stream and start sampling at the closest appropriate reach, then continue sampling upstream. If sampling sites that passed the visual assessment do not in fact contain a sufficient volume of suitable sediments, then field personnel should follow the above-identified steps for rescheduling/reporting. In some cases, access restrictions may require that field personnel enter the creek upstream of likely sampling locations. In this case, field personnel should attempt to walk on hard substrate and avoid areas of fine sediments. Three possible sampling methods may be selected from, depending on site-specific conditions present:

SEDIMENT SCOOP METHOD

This is the preferred method for sampling within shallow streams. Field personnel submerge a pre-cleaned scoop no more than 2cm into the substrate and transfer sediment to the homogenizing bucket and aliquot samples as detailed below. Care should be taken to move slowly to best ensure that a minimal amount of fine materials escape with overlying water from the scoop during this process. Should the sample collector determine that a particular scoop of sediment is unacceptable due to loss of fine material in the sampling process, or inappropriate substrate collected, the sediment should be discarded in the stream or on the bank, downstream of the sampling area. Once a sufficient volume of material is collected, field personnel should homogenize and aliquot samples as described below.

HAND CORE METHOD

A hand core may be used in wadeable streams where there is very fine sediment. The hand core sampler consists of a 3-in. diameter polycarbonate core that is 8 inches long. Field personnel push the core into the sediment to the desired depth, pull the core out of the sediment, and cap the bottom by placing their gloved hand underneath the core to hold the sediment in place. Hand cores are usually measured and marked at 2 cm length so the sampler knows how far to deploy the core into the sediment. The grab may be rejected by the collector if material is observed slumping out of the bottom or if the core overpenetrates. Should the sample collector Field personnel then empty the collected sediment into a homogenizing bucket and aliquot samples as detailed below.

MECHANICAL GRAB METHOD

A mechanical sediment grab (e.g., Ekman grab) may be used be used to collected sediment from deeper, non-wadeable streams, or from locations where access to the creek is limited. Field personnel should slowly lower the grab to the bottom with a minimum of substrate disturbance, trigger the device, and retrieve the closed grab at a moderate speed. Upon retrieval, field personnel should examine the sample to ensure that the sample is acceptable. Criteria for accepting / rejecting grabs include:

- Mud surface must not be pressing out of the top of the sampler. If it is, lower the grab more slowly.
- Sediment surface should be flat and level in the sampler. If it is not level, the grab has tilted over before closing.
- Sediment surface should appear undisturbed.

Upon collection of an acceptable grab, the sediment is next examined for depth of penetration, color and thickness of top aerobic zone, and texture. These observations are recorded in the logbook. Field personnel then collect the top 2cm of sediment using sampling scoops, transfer to homogenizing bucket, and follow instructions for aliquotting as described below. All adhering sediments should be scrubbed away prior to using the grab again at the same site.

SAMPLE PREPARATION

The process of homogenizing and aliquotting material into sample containers requires two field personnel, both gloved and observing standard clean sampling technique protocols. One member of the field team homogenizes and aliquots sample material, while the second member retrieves sample containers, opens them, and caps after filling.

Field personnel should stir the collected sediment within the homogenizing bucket with a sample scoop until sample material attains a homogeneous nature. Field personnel should then quickly scoop sediment out of the homogenizing container and place into desired sampling containers, making sure to stir the sediment in the homogenizing jar in between each aliquot. Before leaving the site, field personnel should ensure that all containers are capped tightly and stored in a cooler on double-bagged cubed ice (SOP FS-13, Sample Containers, Handling, and Chain of Custody Procedures). Samples should be returned to an appropriate sample refrigerator or transferred to analytical laboratory as soon as possible after conclusion of daily sampling activities, but always sufficiently within sample hold time requirements (SOP FS-13, Sample Containers, Handling, and Chain of Custody Procedures).

DEMOBILIZATION

Before leaving the sampling site, field personnel should review datasheets to ensure they are complete and legible, and should verify that all sampling-related materials have been collected. After completing sampling operations, field personnel should preserve samples as described in SOP FS-13, Sample Containers, Handling, and Chain of Custody Procedures. Field personnel should also clean sampling equipment as described in SOP FS-11, Sampling Equipment Cleaning Procedures, and decontaminate PPE as described in SOP FS-12, Field Equipment Decontamination Procedures before sampling at a different site.

Quality Assurance / Quality Control

Readiness reviews, post-event sampling reviews, and field audits will be performed as part of the programmatic quality assurance program as a means to ensure that appropriate protocols are followed.

Field crews should ensure that all sampling-derived wastes are contained and disposed of properly to best ensure against loss to the water body.

Consistent with the QAPP, reagents should be inspected upon receipt and usage to ensure that they are of appropriate grade (e.g., reagent-grade or better) for cleaning purposes.

Adherence to procedures for locating and accessing sample sites, and for rejecting grabs as described above, will best ensure that fine materials are collected in a manner that is representative of environmental conditions present. Adherence to referenced SOPs for cleaning sampling equipment, handling samples, and decontaminating field equipment will best ensure comparability of data with SWAMP.

References

MPSL-DFG Field Sampling Team, 2007. Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. Version 1.0. October 15, 2007.

STANDARD OPERATING PROCEDURES
for
Field Equipment Cleaning Procedures
(SOP FS-7)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment (WQ monitoring elements)
Toxicity – Water Column
Toxicity – Bedded Sediment, Fine-Grained
Pollutants – Bedded Sediment, Fine-grained
Pathogen Indicators

SOP Background and Application

Contaminant-specific decontamination and cleaning of field sampling equipment used in collection of samples for chemical and toxicological analysis is required as part of a quality assurance program to best ensure samples collected are representative of environmental conditions present, and not an artifact of the equipment used.

References to Existing SOPs

This SOP is adapted from information provided in the following SOPs:

(1) For sediment sampling: **Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)**, version 1.0, released October 15, 2007 (SWAMP 2007). A pdf of the SOP is available for download at:
http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

(2) For pathogen indicators (bacteria): **Fecal indicator bacteria (ver. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A7, section 7.1,** A pdf of the SOP is available for download at:
http://pubs.water.usgs.gov/twri9A7/

Relevant QA/QC protocols are also referenced in the associated RMC QAPP for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

CAUTIONS

When using chemical cleaners, always read the product label and adhere to all printed cautions and safety measures. Proper gloves must be worn to both prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended, however, metals and mercury sample containers can only be sampled and handled using polyethylene gloves as the outer layer). The user should wear at least one layer of gloves, but two layers help protect against leaks.

Methods / Procedures

Cleaning methods are determined by type of equipment used, media sampled, and constituent analyzed. Appropriate protocols are discussed below, by media:

WATER SAMPLING

Water samples may be collected via direct immersion of sample container or by use of sampling equipment to collect water and transfer to sample containers (e.g., peristaltic pump with Masterflex™ tubing). It is assumed that all water samples collected associated with RMC targeted sampling and bioassessments will be collected via direct immersion in small, wadeable streams, and that analytical laboratories or commercial suppliers will provide appropriately cleaned sample containers. Therefore, no additional sampling equipment is required to be prepared for most if not all water samples to be collected through RMC.

The one likely exception to the above is in the case of pathogen indicators in waters where excess chlorine levels have been detected or are suspected (see FS-3 for procedures regarding collection of bacteriological samples). Direct immersion of sample containers pre-filled with sample preservative (sodium thiosulfate), especially in fast-moving waters, may cause loss of preservative to the waterbody. In this case, it is often preferred to collect water samples using a pre-cleaned bottle into the sample container. For this application, intermediary containers used for collection of pathogen indicators should be cleaned in the following fashion (Myers et al, 2007):

- Wash equipment thoroughly with a dilute, non-phosphate, laboratory-grade detergent in tap water. A liquid detergent (e.g., Liqui-Nox™) is preferred over powder detergent due to its ability to dissolve more readily.
- Rinse the equipment three times with tap water.
- Rinse the equipment three times with distilled water.
- Place the cleaned equipment in a clean zip-top bag until use in the field.

SEDIMENT SAMPLING

The sediment sampling equipment (e.g., scoop) will be cleaned prior to sampling each site (pre-cleaned) by use of the following procedure:

- Rinse all surfaces with ambient (or tap) water
- Scrub all sediment sample contact surfaces with Micro™, Liqui-Nox™, or equivalent detergent
- Rinse all surfaces with ambient (or tap) water
- Rinse sediment sample contact surfaces with 5% HCl
- Rinse all sediment sample contact surfaces with reagent-grade methanol
- Wrap the sampling equipment in clean aluminum foil and place into a clean zip-top bag until use in the field.

If applicable, the sediment sampling equipment will be scrubbed with ambient water between successive deployments within a site, in order to remove adhering sediments from contact surfaces possibly originating below the sampled layer, thus preventing contamination from areas beyond target sampling area.

Quality Assurance / Quality Control

Readiness reviews, post-event sampling reviews, and field audits will be performed as part of the programmatic quality assurance program as a means to ensure that appropriate cleaning protocols are followed.

Field crews should ensure that all sampling-derived wastes are contained and disposed of properly to best ensure against loss to the waterbody.

Consistent with the QAPP, reagents should be inspected upon receipt and usage to ensure that they are of appropriate grade (e.g., reagent-grade or better) for cleaning purposes.

References

MPSL-DFG Field Sampling Team, 2007. Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. Version 1.0. October 15, 2007.

Myers, D.N., Stoeckel, D.M., Bushon, R.N., Francy, D.S., and Brady, A.M.G., 2007, Fecal indicator bacteria (ver. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A7, section 7.1, February, accessed *June 17, 2011* from http://pubs.water.usgs.gov/twri9A7/

STANDARD OPERATING PROCEDURES
for
Field Equipment Decontamination Procedures
(SOP FS-8)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment
General Water Quality
Chlorine
Temperature
Toxicity – Water Column
Toxicity – Bedded Sediment, Fine-Grained
Pollutants – Bedded Sediment, Fine-grained
Pathogen Indicators
Stream Survey

SOP Background and Application

Invasive species, such as the New Zealand Mudsnail (see Attachment 1), can be transported unintentionally from site to site on field equipment and clothing, especially footwear. This SOP is designed to help avoid unintentional spreading of invasives by inspecting, removing, and treating apparel and equipment before moving to a new site or water body.

References to Existing SOPs

This SOP is based on information provided in the following documents:

(1) "**How to Prevent the Spread of New Zealand Mudsnails through Field Gear**", second edition, Feb., 2010, produced by the Oregon Department of Fish and Wildlife. Copies of this brochure, call 541-737-4849 or e-mail Oregon Sea Grant at: sea.grant.communications@oregonstate.edu

A pdf of the brochure is available for download at:
http://seagrant.oregonstate.edu/sgpubs/onlinepubs.html

and is also available on the Oregon DFW web site:
http://www.dfw.state.or.us/conservationstrategy/invasive_species/docs/NZ_Mudsnails_10-page.pdf

(2) California Department of Fish and Game (CDFG) Aquatic Invasive Species Decontamination Protocol, dated September 17, 2010.

Relevant QA/QC protocols are also referenced in the associated RMC QAPPs for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

CAUTIONS

When using chemical cleaners, always read the product label and adhere to all printed cautions and safety measures. Wear rubber gloves and eye protection when using chemical cleaners.

Treating field gear with chemical methods may result in unintended contamination of the environment. In particular, extreme caution must be taken to avoid contamination of waterways and wetlands. DO NOT rinse your treated gear in a water body.

Treating rubber gear or boots with Formula 409® and other disinfectants with quaternary ammonium compounds (QACs) may result in surface cracking of the rubber and loss of water repellency.

Chemical methods are not always effective in killing mudsnails. Always scrub your gear and consider using physical methods before resorting to chemical methods.

Methods/Procedures

To prevent the survival of mudsnails or other invasives on field clothing and equipment, it is necessary to first clean all field gear and then to treat it, using either the physical or chemical methods listed below. The following steps are recommended:

- If possible, keep different sets of field gear for use in different bodies of water.
- **Clean** all gear before leaving a site, scrubbing with a stiff-bristled scrub brush and rinsing with water, preferably high-pressure. This is often the simplest and most effective measure for prevention.
- **Inspect** gear before it is packed for transport. Visible traces of sand, mud, gravel, and plant fragments are signs that gear has not been properly cleaned and mudsnails may have been retained.

- **Select** a treatment method in addition to scrubbing and rinsing if mudsnails are present or suspected to be present. Two general categories of treatment are available - physical methods and chemical methods:
    - **Freezing, hot water, or drying treatments** are recommended over chemical treatments because they are usually less expensive, more environmentally sound, and possibly less destructive to gear. However, most physical methods require longer treatment times and often cannot be performed in the field.
    - **Chemical treatments** require a 10-minute soak in a special solution (see "CHEMICAL," page 5). After chemical treatment, gear must be rinsed thoroughly with tap water away from all bodies of water, and all soak solutions and rinse water must be properly disposed of.

PHYSICAL TREATMENT

These methods for cleaning gear are effective as well as environmentally sound. Use *one* of the following methods:

- **Freeze** your gear for a minimum of 4 hours to kill all mudsnails. Freezer temperatures should be at 26°F (-3°C) or below.
- **Soak** gear in a bath of hot water (at least 120°F, 46°C) for 10 minutes.
  NOTE: This method is not advised for Gortex.
- **Dry** your gear before reuse. A drying time of at least 48 hours under low humidity is recommended to remove all pockets of dampness.
  Gear must be completely dry for a minimum of 24 hours. Check to ensure that boots are totally dry.

CHEMICAL TREATMENT

Common disinfecting cleaners containing quaternary ammonium compounds (QACs, e.g., alkyl dimethyl benzylammonium chloride [ADBAC]; diecyl dimethyl ammonium chloride [DDAC]) are effective for decontaminating gear.

Disinfectants listed below will kill other aquatic invasive species but may not result in 100% mortality.

Gear should be soaked in *one* of the following solutions for 5 minutes and then rinsed thoroughly with tap water, away from the water body:

- Commercial disinfectant solutions containing quaternary ammonium compounds (e.g., Formula 409® Cleaner Degreaser Disinfectant, alkyl dimethyl benzylammonium chloride [ADBAC]; diecyl dimethyl ammonium chloride [DDAC]). Formula 409®. Cleaner Degreaser Disinfectant has been proven effective for killing mudsnails at 50% dilution.

- The compounds Quat 128® and Sparquat 256® are commercial disinfectants with an active ingredient (QAC) similar to that of Formula 409® Cleaner Degreaser Disinfectant, which has proven effective for killing mudsnails and other aquatic invasive species (see the table on the foldout page of the brochure for dilution rates).
- Many household bath and kitchen disinfectants contain quaternary ammonium compounds (check the label for active ingredients containing alkyl dimethyl benzylammonium chloride [ADBAC]; diecyl dimethyl ammonium chloride [DDAC]).

These and other chemical treatments are constantly being evaluated and are updated online at: seagrant.oregonstate.edu/themes/invasives/

Store and dispose of solution and used rinse water properly.

Quality Assurance / Quality Control

If chemical treatments are used, ensure that rinsing is performed thoroughly, to prevent contamination of water courses.

References

For more information on the testing of chemical treatment methodology, see:
R. C. Hosea, and B. Finlayson, 2005, *Controlling the Spread of New Zealand Mud Snails on Wading Gear,* Administrative Report 2005-02, Rancho Cordova, California: Resources Agency, California Department of Fish and Game.

For more information on identification and prevention of spread of aquatic invasive species within California creeks, see: *California Department of Fish and Game Aquatic Invasive Species Decontamination Protocol*, dated September 17, 2010.

STANDARD OPERATING PROCEDURES
for
Sample Container, Handling, and Chain of Custody Procedures
(SOP FS-9)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment
General Water Quality
Chlorine
Toxicity – Water Column
Toxicity – Bedded Sediment, Fine-Grained
Pollutants – Bedded Sediment, Fine-grained
Pathogen Indicators

SOP Background and Application

While there are a variety of different media being sampled through the RMC, as referenced above, sample handling and chain of custody techniques are relatively consistent across different media types. Following the recommended sample handling techniques will go a long way toward ensuring comparability with SWAMP QAPP.

References to Existing SOPs

This SOP is adapted from information provided in the following SOPs:

(1) **Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)**,version 1.0, released October 15, 2007 (SWAMP 2007). A pdf of the SOP is available for download at:
http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

(2) **Quality Assurance Project Plan for Monitoring and Mitigation to Address Fecal Pathogen Pollution along California Coast.** Proposition 50 Coastal Management Program Agreement No. 06-076-553-0.

Relevant QA/QC protocols are also referenced in the associated RMC QAPP for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

CAUTIONS

Sample preservation may require use of reagents posing an environmental health or human health concern. When using such chemicals, always wear appropriate PPE, store reagents appropriately, read the product label, and adhere to all printed cautions and safety measures.

Methods / Procedures

All samples will be handled, prepared, transported and stored in a manner so as to minimize bulk loss, analyte loss, contamination, or biological degradation of sample material. Appropriate safeguards should be implemented at the time of sample collection through shipping and receipt at the laboratory to ensure integrity of samples.

Details associated with different phases of the sample handling process are described below:

FIELD SAMPLING

One member of each sampling team will be identified as "Team Lead", and will be responsible for overall collection and custody of samples during field sampling.

Field crews should properly store and preserve samples as soon as possible after collection (see requirements, Attachment 1). See SOP FS-2 for a description of protocols for field filtration and sample preservation. Following any required field filtration or preservation, but as soon as possible after sample collection, sample containers should be placed on crushed or cube ice in an insulated ice chest; ice should be placed into sealed, double-bagged zip-top bags prior to sampling to prevent any contamination of samples by meltwater. Sufficient ice will be needed to lower the sample temperature to $\leq$6°C within 45 min after time of collection. Sample temperature should be maintained at $\leq$6°C until delivered to the laboratory.

In addition, care is taken at all times during sample collection, handling and transport to prevent exposure of the sample to direct sunlight. Samples are preserved, if necessary, according to protocol for specific analysis (acidification in most cases). In the case of some samples, the sample preservative may be pre-loaded into the sample container by the laboratory. In these cases, care should be taken not to overfill the sample container and thereby spill preservative.

SAMPLE SHIPPING

Sample transport should be arranged so that samples arrive at the laboratory well within hold time requirements (Attachment 1). For analytes with relatively short holding times, analytical laboratories should be informed in advance and reminded at time of sample delivery of the holding time requirements, so that required preservation or analyses are initiated as soon as possible. The following summarizes the packaging procedures that will be followed for low concentration samples that are to be shipped cold (i.e., not frozen). This encompasses all RMC Project samples with the exception of frozen sediments.

- When ice is used, pack it in zip-locked, double plastic bags. If applicable, seal the drain plug of the cooler with duct tape to prevent melting ice from leaking out of the cooler.
- The bottom of the cooler should be lined with bubble wrap to prevent breakage during shipment.
- Check screw caps for tightness.
- Ensure sample labels are securely fastened and legible.
- Wrap all glass sample containers in bubble wrap / bubble bags to prevent breakage.
- Place samples in a sturdy cooler(s). Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid.

CHAIN OF CUSTODY PROCEDURES

Chain-of-custody (COC) procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. Individual stormwater programs will be expected to supply their own COC form, or to use forms supplied by contract laboratories. COCs will be completed and sent with the samples for each laboratory and each shipment. If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler, either placed in an envelope and taped to the inside of the top of the cooler, or placed into a zip-top bag and placed within the cooler.

The COC will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of the field crew. The sampling team leader or designee will sign the COC in the "relinquished by" box and note date and time.

A self-adhesive custody seal will be placed across the lid of each sample at a point of closure. The shipping containers in which samples are stored (usually an ice chest) will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

Each receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation and holding times. Contract laboratories will follow sample custody procedures outlined in their QA plans. Contract laboratory QA plans are on file with each respective laboratory.

Quality Assurance / Quality Control

PMLs should review shipping procedures as part of Readiness Reviews conducted prior to specific sampling events. PMLs should also review practices implemented as part of Post Sampling Event reviews and communicate any deficiencies identified to CQAO.

References

AMS, 2007.Quality Assurance Project Plan for Monitoring and Mitigation to Address Fecal Pathogen Pollution along California Coast.Proposition 50 Coastal Management Program Agreement No. 06-076-553-0. February 15, 2007.

MPSL-DFG Field Sampling Team, 2007.Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. Version 1.0. October 15, 2007.

Attachment 1 –Sample Handling Requirements for RMC Analytes

Table 1. Specifications for Sample Handling for RMC Targeted Analytes in Water

Analyte	Analyte Group	Sample Container Material & Property	Minimum Container Amount	Preservative	Holding Time (at ≤6 C)
Phosphorus (Total as P)	Conventional	Polyethylene Bottles	100 mL	Cool to ≤6º C and store in the dark. Acidify with H_2SO_4 to pH<2 [1]	28 days
Orthophosphate (Dissolved, as P)	Conventional	Polyethylene Bottles	150 mL	Filter within 15 minutes of collection, Cool to ≤6°C and store in the dark	48 hours
Nitrogen (Total as N) - calculated as sum of TKN + nitrate + nitrite	Conventional	NA	NA	NA	NA
Total Kjeldahl Nitrogen (TKN)	Conventional	Polyethylene Bottles	200 mL	Cool to ≤6º C and store in the dark. Acidify with H_2SO_4 to pH<2 [1]	28 days
Nitrate (as N)	Conventional	Polyethylene Bottles	100 mL	Cool to ≤6º C and store in the dark	48 hours
Nitrite (as N)	Conventional	Polyethylene Bottles	100 mL	Cool to ≤6º C and store in the dark	48 hours
Ammonia as N	Conventional	Polyethylene Bottles	200 mL	Cool to ≤6º C and store in the dark. Acidify with H_2SO_4 to pH<2 [1]	28 days
Silica	Conventional	Polyethylene Bottles	100 mL	Cool to ≤6º C and store in the dark.	28 days
Chloride	Conventional	Polyethylene Bottles	100 mL	Cool to ≤6º C and store in the dark	28 days
Dissolved Organic Carbon (DOC)	Conventional	40-mL glass vial	250 mL	Filter within 15 minutes of collection, Cool to ≤6º C and store in the dark. Acidify with H_2SO_4 to pH<2 [1]	28 days

[1] Acidify samples in the field when possible. Preservative may be added to sample bottles in advance by laboratory. When field acidification is not possible, deliver samples to lab as soon as possible on day of collection, and instruct lab to acid-preserve samples immediately upon receipt.

Analyte	Analyte Group	Sample Container Material & Property	Minimum Container Amount	Preservative	Holding Time (at ≤6 C)
Suspended Sediment Concentration (SSC)	Conventional	125-mL amber glass jar or Polyethylene Bottles*	500 mL	Cool to ≤6º C and store in the dark	NA
Chlorophyll a	Biological	Polyethylene Bottles	25 mL	Field filter (0.7 mm GFF) and field freeze using Dry Ice	28 days
Ash Free Dry Weight	Biological	Polyethylene Bottles	25 mL	Field filter (0.7 mm pre-ashed) and field freeze Dry Ice	28 days
Pathogen Indicators (Fecal coliform and *E. coli*)	Pathogens	Factory-sealed, pre-sterilized, Whirlpak bags or 125 mL sterile plastic (high density PE or PP) container	100 mL	Cool to ≤6º C and store in the dark. Preserve with sodium thiosulfate only when sample tests positive for chlorine.	6 hours [2]
Toxicity	Toxicity	4 @ 2.25-L amber glass	20 L	Cool to ≤6º C and store in the dark	36 hrs

Table 2. Specifications for Sample Handling for RMC Targeted Analytes in Sediment

Analyte	Analyte Group	Sample Container Material & Property	Minimum Container Amount	Preservative	Holding Time (at 6 C)
Toxicity	Toxicity	1-L I-Chem HDPE with Teflon lid liner; precleaned	2 L	Cool to ≤6º C and store in the dark	14 days at 6 ºC
Total Organic Carbon (TOC)	Conventional	125-mL clear glass jar; pre-cleaned	125 mL	Cool to ≤6º C in the dark up to 28 days	Sample may be frozen at any time during the initial 28 days, for up to 1 year maximum at -20 ˚C.
Grain Size	Conventional	125-mL clear glass jar; pre-cleaned	125 mL	Cool to ≤6º C in the field, then refrigerate at 6º	1 year
Metals	Inorganics	60-mL I-Chem 300 or 200 series clear glass jar with Teflon lid-liner	100 g	Cool to ≤6º C and in the dark	1 year at -20 ˚C; Samples must be analyzed within 14 days of collection or thawing.
Mercury	Inorganics	60-mL I-Chem 300 or 200 series clear glass jar with Teflon lid-liner	100 g	Cool to ≤6º C and in the dark	1 year at -20 ˚C; Samples must be analyzed within 14 days of collection or thawing.

[2] USEPA allows up to 6 hours for transport of samples to lab, plus an additional 2 hours for sample processing and start of analysis. Per Federal Register, March 26, 2007

Analyte	Analyte Group	Sample Container Material & Property	Minimum Container Amount	Preservative	Holding Time (at 6 C)
PAHs	Synthetic Organics	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to ≤6º C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
OC Pesticides	Synthetic Organics	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to ≤6º C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Pyrethroids	Synthetic Organics	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	500 g (two jars)	Cool to ≤6º C in the dark	1 year at -20 °C; Samples must be extracted within 14 days of collection or thawing and analyzed within 40 days of extraction.
Archive, as needed to supplement contracted analyses	N/A	Pre-cleaned 250-mL I-Chem 300 Series amber glass jar with Teflon lid liner	250 g	Cool to ≤6º C in the dark, freeze to -20º C	Indefinite

Table 3. Specifications for Sample Handling for RMC Bioassessment Samples

Analyte	Analyte Group	Sample Container Material & Property	Minimum Container Amount	Preservative	Holding Time (at 6 C)
Benthic Macroinvertebrates	Biological	Plastic Wide Mouth Jars	500mL	95% ethanol	>1 year after preservation
Diatoms	Biological	Plastic Centrifuge Tubes	50mL	Add 10 mL 10% Formalin (buffered with borax) to 40 mL sample	>1 year after preservation
Soft Algae	Biological	Plastic Centrifuge Tubes	50mL	Add 5 mL 25% glutaraldehyde to 45mL sample. Must add within 4 days and keep sample cool 4-6º C and in dark	>1 year after preservation

STANDARD OPERATING PROCEDURES
for
Completion and Processing of Field Datasheets
(SOP FS-10)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment
General Water Quality
Chlorine
Temperature
Toxicity – Water Column
Toxicity – Bedded Sediment, Fine-Grained
Pollutants – Bedded Sediment, Fine-grained
Pathogen Indicators

SOP Background and Application

In order to ensure SWAMP comparability, datasheets used associated with collection of RMC field samples and measurements will rely upon those developed and updated by Moss Landing for the SWAMP program.

References to Existing SOPs

This SOP is adapted from information provided in the following SOPs:

(1) For water quality, water measurements, and sediment sampling: **Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in the Surface Water Ambient Monitoring Program (SWAMP)**, version 1.0, released October 15, 2007 (SWAMP 2007). A pdf of the SOP is available for download at:
http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

(2) For bioassessments: **Standard Operating Procedures for Collecting Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California.** California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001, released February 2007 (Ode, 2007). A pdf of the SOP is available for download at: http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

(3) For algal sampling: **Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California.** California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 002, released June 2009 (Fetscher et al, 2009). A pdf of the SOP is available for download at: http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/standard-operating-procedures

(4) For stream surveys: **Unified Stream Assessment: A User's Manual. Version 2.0, released February 2005 (CWP, 2005).** A pdf of the SOP is available for download at:
http://www.cwp.org/documents/cat_view/68-urban-subwatershed-restoration-manual-series/87-manual-10-unified-stream-assessment-a-users-manual-.html

Relevant QA/QC protocols are also referenced in the associated RMC QAPPs for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

None

Methods/Procedures

Field datasheets are to be selected from available SWAMP products based upon the type of sampling conducted: (1) water quality measurement and sampling; (2) sediment sampling; (3) bioassessment: and (4) stream survey. These are appended to this SOP as Attachments 1, 2, 3, and 4, respectively. Information for completing field datasheets is included both within the datasheets themselves and within the appropriate SOP referenced above.

MOBILIZATION

As part of mobilization process, Field Crew leaders are responsible for ensuring an adequate number of the appropriate type of datasheets are mobilized as part of the readiness review for a specific field effort.

FIELD SAMPLING

As weather allows, all datasheets should be completed in blue or black ink. Any changes to field datasheets should be made by crossing out the relevant information with a single line and initialing beside the mark out. As inclement weather dictates, field forms may also be printed on Rite in the Rain paper, with information completed in pencil.

Upon completing field efforts at a site, the non-recording member of each field team should review the completed field datasheet(s) prior to leaving the sampling site to ensure completeness and legibility.

DEMOBILIZATION

As soon as possible after returning from the field, information from the field datasheets should be transferred to the LIMC, who will be responsible for reviewing and making required corrections to field datasheets.

Quality Assurance / Quality Control

The RMC MCC should verify that field datasheets are current at a sufficient period prior to implementation of field efforts, and distribute revised sheets as appropriate, to ensure that datasheets employed by field personnel are current.

Either the RMC CIMC or LIMC may be responsible for entering information from field datasheets into electronic templates. The CIMC / LIMC position will identify any deficiencies in field datasheets and return to the appropriate field crew for correction. The CQAO will be responsible for ensuring compliance with programmatic DQOs.

Review of field crews' performance in completing field datasheets will be conducted associated with field audits, which will be performed on at least a biennial basis.

References

Center for Watershed Protection, 2005. Unified Stream Assessment: A User's Manual. Version 2.0.

Fetscher, A.E., L. Busse, and P. R. Ode. 2009. Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 002.

MPSL-DFG Field Sampling Team, 2007. Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. Version 1.0. October 15, 2007.

Ode, P.R., 2007. Standard Operating Procedures for Collecting Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001.

Attachment 1 – Field Datasheets for Collection of Water Quality Measurements and Samples

SWAMP Field Data Sheet (Water Chemistry & Discrete Probe) - EventType=WQ

Entered in d-base (initial/date)

Pg ____ of ____ Pgs

***StationID:** __ __ __ __ __ __ __ __ __	*Date (mm/dd/yyyy): / /	*Group:	*Agency:
***Funding:** __ __ __ __ __ __ __ __ __	ArrivalTime: DepartureTime:	*SampleTime (1st sample):	*Protocol:
***ProjectCode:**	*Personnel:	*Purpose (circle applicable): WaterChem WaterTox Habitat FieldMeas	*PurposeFailure:

***Location**: Bank Thalweg Midchannel OpenWater	*GPS/DGPS	**Lat (dd.ddddd)**	**Long (ddd.ddddd)**	OCCUPATION METHOD: Walk-in Bridge R/V __________ Other
GPS Device:	**Target:**		-	STARTING BANK (facing downstream): LB / RB / NA
Datum: NAD83 Accuracy (ft / m):	***Actual:**		-	Point of Sample (if Integrated, then -88 in dbase)

Habitat Observations (CollectionMethod = Habitat_generic)

WADEABILITY: Y / N / Unk

BEAUFORT SCALE (see attachment):

DISTANCE FROM BANK (m):

STREAM WIDTH (m):

WATER DEPTH (m):

SITE ODOR: None,Sulfides,Sewage,Petroleum,Smoke,Other

SKY CODE: Clear, Partly Cloudy, Overcast, Fog, Smoky, Hazy

WIND DIRECTION (from): N W E S

HYDROMODIFICATION: None, Bridge, Pipes, ConcreteChannel, GradeControl, Culvert, AerialZipline, Other LOCATION (to sample): US / DS / WI / NA

OTHER PRESENCE: Vascular,Nonvascular,OilySheen,Foam,Trash,Other______

PHOTOS (RB & LB assigned when facing downstream; RENAME to StationCode_yyyy_mm_dd_uniquecode):

1: (RB / LB / BB / US / DS / ##)

DOMINANT SUBSTRATE: Bedrock, Concrete, Cobble, Gravel, Sand, Mud, Unk, Other____________________

WATERCLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)

PRECIPITATION: None, Fog, Drizzle, Rain, Snow

2: (RB / LB / BB / US / DS / ##)

WATERODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other__________

PRECIPITATION (last 24 hrs): Unknown, <1", >1", None

WATERCOLOR: Colorless, Green, Yellow, Brown

EVIDENCE OF FIRES: No, <1 year, <5 years

3: (RB / LB / BB / US / DS / ##)

OVERLAND RUNOFF (Last 24 hrs): none, light, moderate / heavy, unknown

OBSERVED FLOW: NA, Dry Waterbody Bed, No Obs Flow, Isolated Pool, Trickle (<0.1cfs), 0.1-1cfs, 1-5cfs, 5-20cfs, 20-50cfs, 50-200cfs, >200cfs

Field Measurements (SampleType = FieldMeasure; Method = Field)

	DepthCollec (m)	Velocity (fps)	Air Temp (°C)	Water Temp (°C)	pH	O_2 (mg/L)	O_2 (%)	Specific Conductivity (uS/cm)	Salinity (ppt)	Turbidity (ntu)			
SUBSURF/MID/ BOTTOM/REP													
SUBSURF/MID/ BOTTOM/REP													
SUBSURF/MID/ BOTTOM/REP													
Instrument:													
Calib. Date:													

Samples Taken (# of containers filled) - Method=Water_Grab

Field Dup YES / NO: (SampleType = Grab / Integrated; LABEL_ID = FieldQA; create collection record upon data entry

SAMPLE TYPE: Grab / Integrated COLLECTION DEVICE: Indiv bottle (by hand, by pole, by bucket); Teflon tubing; Kemmer; Pole & Beaker; Other __________________

	DepthCollec (m)	Inorganics	Bacteria	Chl a	TSS / SSC	TOC / DOC	Total Hg	Dissolved Mercury	Total Metals	Dissolved Metals	Organics	Toxicity	VOAs
Sub/Surface													
Sub/Surface													

COMMENTS:

Modified 02/10/11

Notes to Standardize SWAMP Field Data Sheets
(For in the field use)

Key Reminders to identify samples:

1. **Sample Time** is the SAME for all samples (Water, Sediment, & Probe) taken at the sampling event. Use time of FIRST sample; important for COC.
2. **Group;** many diffrent ways to do a group, one suggestion is to create groups which assign trips to assess frequency of field QA

Collection Details

1. **Personnel**: S. Mundell, G Ichikawa (first person listed is crew leader)
2. **Location:** Use "openwater" in bay/estuary/harbor only if no distinguishable channel exists
3. **GRAB vs INTEGRATED**: GRAB samples are when bottles are filled from a single depth; INTEGRATED sample are taken from MULTIPLE depths and combined.
   a. GRAB: use 0.1 for subsurface samples; if too shallow to submerge bottle; depth =0
   b. INTEGRATED: -88 in depth sampled, record depths combined in sample comments
4. **TARGET LAT/LONG**: Refers to the existing station location that the sampling crew is trying to achieve; can be filled out prior to sampling
5. **ACTUAL LAT/ LONG**: is the location of the current sample event.
6. **HYDROMODIFICATION:** Describe existing hydromodifications such as a grade control, drainage pipes, bridge, culvert
7. **HYDROMOD LOC**: if there is an IMMEDIATE (with in range potentially effecting sample) hydromodification; Is the hydromodification upstream/downstream/within area of sample; if there is no hydromodification, NA is appropriate
8. **STREAM WIDTH and DEPTH**: describe in meters at point of sample.

FIELD OBSERVATIONS: (each one of these observations has a comment field in the database so use comment space on data sheet to add information about an observation if necessary)

1. **PICTURES:** use space to record picture numbers given by camera; be sure to rename accordingly back in the office. (StationCode_yyyy_mm_dd_uniquecode)
2. **WADEABILITY**: in general, is waterbody being sampled wadeable to the average person AT the POINT of SAMPLE
3. **DOMINANT SUBSTRATE**: if possible; describe DOMINANT substrate type; use UNK if you cannot see the dominant substrate type
4. **BEAUFORT SCALE**: use scale 0-12; refer to scales listed below.
5. **WIND DIRECTION**: records the direction from which the wind is blowing
6. **OTHER PRESENCE**: VASCULAR refers to terrestrial plants or submerged aquatic vegetation (SAV) and NONVASCULAR refers to plankton, periphyton etc. These definitions apply to vegetation IN the water at the immediate sampling area.
7. **OBSERVED FLOW**: Visual estimates in cubic feet/ second.
8. **WATER COLOR**: This is the color of the water from standing creek side
9. **WATER CLARITY**: this describes the clarity of the water while standing creek side; clear represents water that is clear to the bottom, cloudy may not be clear to bottom but greater than 4” can be seen through the water column.
10. **PRECIPITATION LAST24hrs:** refers to field crews best categorization of rainfall in the last 24 hrs; may or may not effect Overland Runoff Last 24 hrs
11. **OVERLAND RUNOFF LAST 24 hrs:** Light Precip = fog, drizzle, and/or light rain with no overland runoff; Mod to Heavy Precip = rain such that site probably or definitely received at least some overland runoff
12. **SedimentComp**: generally described sediments used for chemistry sample

Note: these reminders do not give all details needed to maintain equivalent SWAMP sampling protocols, they are strictly for “infield” use to help insure comparability of field observations.

BEAUFORT SCALE: Specifications and equivalent speeds for use at sea

FORCE	EQUIVALENT SPEED 10 m above ground		DESCRIPTION	SPECIFICATIONS FOR USE AT SEA
	miles/hour	knots		
0	0-1	0-1	Calm	Sea like a mirror.
1	1-3	1-3	Light air	Ripples with the appearance of scales are formed, but without foam crests.
2	4-7	4-6	Light breeze	Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break.
3	8-12	7-10	Gentle breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.
4	13-18	11-16	Moderate breeze	Small waves, becoming larger; fairly frequent white horses.
5	19-24	17-21	Fresh breeze	Moderate waves, taking a more pronounced long form; many white horses are formed. Chance of some spray.
6	25-31	22-27	Strong breeze	Large waves begin to form; the white foam crests are more extensive everywhere. Probably some spray.
7	32-38	28-33	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.
8	39-46	34-40	Gale	Moderately high waves of greater length; edges of crests begin to breakinto spindrift. The foam is blown in well-marked streaks along the direction of the wind.
9	47-54	41-47	Severe gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility.
10	55-63	48-55	Storm	Very high waves with long over-hanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The 'tumbling' of the sea becomes heavy and shock-like. Visibility affected.

Source:

Last edited on 09 January, 1999 Dave Wheeler weatherman@zetnet.co.uk

Web Space kindly provided by Zetnet Services Ltd, Lerwick, Shetland.

BEAUFORT SCALE: Specifications and equivalent speeds for use on land

FORCE	EQUIVALENT SPEED 10 m above ground miles/hour	knots	DESCRIPTION	SPECIFICATIONS FOR USE ON LAND
0	0-1	0-1	Calm	Calm; smoke rises vertically
1	1-3	1-3	Light air	Direction of wind shown by smoke drift, but not by wind vanes
2	4-7	4-6	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind
3	8-12	7-10	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag
4	13-18	11-16	Moderate Breeze	Raises dust and loose paper; small branches are moved.
5	19-24	17-12	Fresh Breeze	Small trees in leaf begin to sway crested wavelets form on inland waters
6	25-31	22-27	Strong Breeze	Large branches in motion; whistling heard in telegraph wires umbrellas used with difficulty
7	32-38	28-33	Neargale	Whole trees in motion; inconvenience felt when walking against the wind
8	39-46	34-40	Gale	Breaks Twigs and generally impedes progress

Source:

Last edited on 09 January, 1999 Dave Wheeler weatherman@zetnet.co.uk

Web Space kindly provided by Zetnet Services Ltd, Lerwick, Shetland.

Attachment 2 – Field Datasheets for Collection of Bedded Sediment Samples

SWAMP Field Data Sheet (Sediment Chemistry) - EventType=WQ

Entered in d-base (initial/date)

Pg of Pgs

***StationID:** ___ ___ ___ ___ ___ ___ ___ ___ ___

*Date (mm/dd/yyyy): / /

*Group:

*Agency:

***Funding:** ___ ___ ___ ___ ___ ___ ___ ___

ArrivalTime:

DepartureTime:

*SampleTime (1st sample):

*Protocol:

***ProjectCode:**

*Personnel:

*Purpose (circle applicable): SedChem SedTox Habitat Benthic

*PurposeFailure:

***Location:** Bank Thalweg Midchannel OpenWater

GPS Device:

Datum: NAD83 Accuracy (ft / m):

*GPS/DGPS	Lat (dd.ddddd)	Long (ddd.ddddd)
Target:		-
***Actual:**		-

Same as Water/Probe Collection? YES NO

OCCUPATION METHOD: Walk-in Bridge R/V __________ Other

STARTING BANK (facing downstream): LB / RB / NA

Point of Sample (if Integrated, then -88 in dbase)

DISTANCE FROM BANK (m):

STREAM WIDTH (m):

WATER DEPTH (m):

HYDROMODIFICATION: None, Bridge, Pipes, ConcreteChannel, GradeControl, Culvert, AerialZipline, Other

LOCATION (to sample): US / DS / WI / NA

Habitat Observations (CollectionMethod = Habitat_generic) ****Only complete Sed Observations (bolded) if WQ Observations are already recorded**

WADEABILITY: Y / N / Unk

BEAUFORT SCALE see Attachment

WIND DIRECTION (from):

N W E S

SITE ODOR:	None,Sulfides,Sewage,Petroleum,Smoke,Other_______
SKY CODE:	Clear, Partly Cloudy, Overcast, Fog, Smoky, Hazy
OTHERPRESENCE:	Vascular,Nonvascular,OilySheen,Foam,Trash,Other______
DOMINANTSUBSTRATE:	Bedrock, Concrete, Cobble, Gravel, Sand, Mud, Unk, Other___________________
SEDODOR:	None, Sulfides, Sewage, Petroleum, Mixed, Other__________
SEDCOLOR:	Colorless, Green, Yellow, Brown
SEDCOMPOSITION:	Silt/Clay, FineSand, CoarseSand, Gravel, Cobble, Mixed, HardPanClay
OBSERVED FLOW:	NA, Dry Waterbody Bed, No Obs Flow, Isolated Pool, Trickle (<0.1cfs), 0.1-1cfs, 1-5cfs, 5-20cfs, 20-50cfs, 50-200cfs, >200cfs

PRECIPITATION:	None, Fog, Drizzle, Rain, Snow
PRECIPITATION (last 24 hrs):	Unknown, <1", >1", None
EVIDENCE OF FIRES:	No, <1 years, <5 years

PHOTOS (RB & LB assigned when facing downstream; RENAME to StationCode_yyyy_mm_dd_uniquecode):

1: (RB / LB / BB / US / DS / ##)

2: (RB / LB / BB / US / DS / ##)

3: (RB / LB / BB / US / DS / ##)

Samples Taken (# of containers filled) - Method=Sed_Grab

Field Dup YES / NO: (SampleType = Grab / Integrated; LABEL_ID = FieldQA; create collection record upon data entry

COLLECTION DEVICE: Scoop (SS / PC / PE, Core (SS / PC / PE), Grab (Van Veen / Eckman / Petite Ponar)

COLLECTION DEVICE AREA (m2): ____________

Sample Type:	DepthCollec (cm)	Equipment Used	Sediment Only (Y / N)	Grain Size/TOC	Organics	Metals/HgT	Selenium	Toxicity	SWI	Archive Chemistry	Benthic Infauna	Benthic Coll. Area (m^2)	Sieve Size (mm)
Integrated Grab													
Integrated Grab													
Integrated Grab													
Integrated Grab													

COMMENTS:

Modified 06/27/08

Attachment 3 – Field Datasheets for Bioassessment and Algal Collections

REACH DOCUMENTATION

Standard Reach Length (wetted width ≤ 10 m) = 150 m Distance between transects = 15 m
Alternate Reach Length (wetted width >10 m) = 250 m Distance between transects = 25 m

Project Name:	Date: / / 2011	Sample Collection Time:
Stream Name:	Site Name/ Description:	
Site Code:	Crew Members:	
Latitude (actual – decimal degrees): ºN	**datum:** NAD83	
Longitude (actual – decimal degrees): ºW	*other:*	GPS Device:

AMBIENT WATER QUALITY MEASUREMENTS

turbidity and silica are optional; calibration date required

Temp (Deg C)		pH		Alkalinity (mg/L)		Turbidity (ntu)	
		cal. date				cal. date	
Dissolved O^2 (mg/L)		Specific. Conduct (uS/cm)		Salinity. (ppt)		Silica (mg/L)	
cal. date		cal. date		cal. date		cal. date	

REACH LENGTH

Actual Length (m) *(see reach length guidelines at top of form)*	
Explanation:	

DISCHARGE MEASUREMENTS

1st measurement = left bank (looking downstream)

check if discharge measurements not possible (explain in field notes section) ☐

VELOCITY AREA METHOD (preferred)

cal. date | **Transect Width (m):**

	Distance from Left Bank (cm)	Depth (cm)	Velocity (ft/sec)		Distance from Left Bank (cm)	Depth (cm)	Velocity (ft/sec)
1				11			
2				12			
3				13			
4				14			
5				15			
6				16			
7				17			
8				18			
9				19			
10				20			

BUOYANT OBJECT METHOD (use ONLY if velocity area method not possible)

	Float 1	Float 2	Float 3
Distance (m)			
Float Time (sec)			

Float Reach Cross Section

width (m) depth(cm)	Upper Section	Middle Section	Lower Section
Width			
Depth 1			
Depth 2			
Depth 3			
Depth 4			
Depth 5			

NOTABLE FIELD CONDITIONS (check one box per topic)

Evidence of recent rainfall (enough to increase surface runoff)	NO		minimal		>10% flow increase	
Evidence of fires in reach or immediately upstream (<500 m)	NO		< 1 year		< 5 years	
Dominant landuse/ landcover in area surrounding reach	Agriculture		Forest		Rangeland	
	Urban/ Industrial		Suburb/Town		Other	

ADDITIONAL COBBLE EMBEDDEDNESS MEASURES

(carry over from transect forms if needed to attain target count of 25; measure in %)

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	

Site Code:	Date: __ __ / __ __ / 2011

SLOPE and BEARING FORM (transect based - for Full PHAB only)

AUTOLEVEL	☐
CLINOMETER	☐
HANDLEVEL	☐
OTHER	☐

Starting Transect	MAIN SEGMENT (record percent of inter-transect distance in each segment **if supplemental segments are used**)					SUPPLEMENTAL SEGMENT (record percent of inter-transect distance in each segment **if supplemental segments are used**)				
	Stadia rod measurements	Slope (%) or Elevation Difference cm ☐ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)	Stadia rod measurements	Slope or Elevation Difference cm ☐ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)
K										
J										
I										
H										
G										
F										
E										
D										
C										
B										
A										
additional calculation area										

ADDITIONAL HABITAT CHARACTERIZATION

High Gradient ☐ Low Gradient ☐

Parameter	Optimal	Suboptimal	Marginal	Poor
Epifaunal Substrate/ Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover (50% for low-gradient streams); mix of submerged logs, undercut banks, cobble or other stable habitat	40-70% mix of stable habitat (30-50% for low-gradient streams); well-suited for full colonization potential	20-40% mix of stable habitat (10-30% in low-gradient streams); substrate frequently disturbed or removed	Less than 20% stable habitat (10% in low-gradient streams); lack of habitat is obvious; substrate unstable or lacking
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition (<20% in low-gradient streams)	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected (20-50% in low-gradient streams)	Moderate deposition of new gravel, sand, or fine sediment on bars; 30-50% of the bottom affected (50 - 80% in low-gradient streams)	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently (>80% in low-gradient streams)
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, (e.g., bridge abutments); evidence of past channelization (> 20yrs) may be present but recent channelization not present	Channelization may be extensive: embankments or shoring structures present on both banks; 40 to 80% of stream reach disrupted	Banks shored with gabian or cement; Over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Site Code:	Site Name:	Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):

Transect A

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)
0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY
0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel)
0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

TAKE PHOTOGRAPHS
(check box if taken & record photo code)

Downstream (**optional**) ☐

Upstream (**required**) ☐

Inter-Transect: AB

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect B**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)	0 = Absent (0%) 3 = Heavy (40-75%) 1 = Sparse (<10%) 4 = Very Heavy (>75%) 2 = Moderate (10-40%)	
Vegetation Class	**Left Bank**	**Right Bank**
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17) *count covered dots*	
Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE (circle only the closest to wetted channel)	**0** = Not Present; **B** = On Bank; **C** = Between Bank & 10m from Channel; **P** = >10m+<50m from Channel; **Channel** (record Yes or No)		
	Left Bank	**Channel**	**Right Bank**
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY (score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)			
Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: BC

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect C**

Transect Substrates										
Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes	**Microalgae Thickness Codes**
Left Bank					P A		P A D	P A D	P A D	**0** = No microalgae present, Feels rough, not slimy; **1** = Present but not visible, Feels slimy; **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail. **3** = 1-5mm; **4** = 5-20mm; **5** = >20mm; **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code). **D** = Dry, not assessed
Left Center					P A		P A D	P A D	P A D	
Center					P A		P A D	P A D	P A D	
Right Center					P A		P A D	P A D	P A D	
Right Bank					P A		P A D	P A D	P A D	
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)									

RIPARIAN VEGETATION (facing downstream)	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)	
Vegetation Class	**Left Bank**	**Right Bank**
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17) *count covered dots*	
Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE (circle only the closest to wetted channel)	**0** = Not Present; **B** = On Bank; **C** = Between Bank & 10m from Channel; **P** = >10m+<50m from Channel; **Channel** (record Yes or No)		
	Left Bank	**Channel**	**Right Bank**
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY (score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)			
Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: CD

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect D**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)
0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY
0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel)
0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: DE					Wetted Width (m):					
Inter-Transect Substrates										
Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes	**Microalgae Thickness Codes**
Left Bank					P A		P A D	P A D	P A D	**0** = No microalgae present, Feels rough, not slimy; **1** = Present but not visible, Feels slimy; **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail. **3** = 1-5mm; **4** = 5-20mm; **5** = >20mm; **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code). **D** = Dry, not assessed
Left Center					P A		P A D	P A D	P A D	
Center					P A		P A D	P A D	P A D	
Right Center					P A		P A D	P A D	P A D	
Right Bank					P A		P A D	P A D	P A D	
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)									

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect E**

Transect Substrates										
Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes	**Microalgae Thickness Codes**
Left Bank					P A		P A D	P A D	P A D	**0** = No microalgae present, Feels rough, not slimy;
Left Center					P A		P A D	P A D	P A D	**1** = Present but not visible, Feels slimy;
Center					P A		P A D	P A D	P A D	**2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
Right Center					P A		P A D	P A D	P A D	**3** = 1-5mm; **4** = 5-20mm;
Right Bank					P A		P A D	P A D	P A D	**5** = >20mm; **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)									**D** = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)	0 = Absent (0%) 3 = Heavy (40-75%) 1 = Sparse (<10%) 4 = Very Heavy (>75%) 2 = Moderate (10-40%)	
Vegetation Class	**Left Bank**	**Right Bank**
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17) *count covered dots*	
Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE (circle only the closest to wetted channel)	**0** = Not Present; **B** = On Bank; **C** = Between Bank & 10m from Channel; **P** = >10m+<50m from Channel; **Channel** (record Yes or No)		
	Left Bank	**Channel**	**Right Bank**
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY (score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)			
Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: EF	Wetted Width (m):									
Inter-Transect Substrates										
Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes	**Microalgae Thickness Codes**
Left Bank					P A		P A D	P A D	P A D	**0** = No microalgae present, Feels rough, not slimy;
Left Center					P A		P A D	P A D	P A D	**1** = Present but not visible, Feels slimy;
Center					P A		P A D	P A D	P A D	**2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
Right Center					P A		P A D	P A D	P A D	**3** = 1-5mm; **4** = 5-20mm;
Right Bank					P A		P A D	P A D	P A D	**5** = >20mm; **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)									**D** = Dry, not assessed

FLOW HABITATS (% between transects, total=100%)	
Channel Type	**%**
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect F**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)
0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY
0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel)
0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

TAKE PHOTOGRAPHS
(check box if taken & record photo code)

Downstream (**required**) ☐

Upstream (**required**) ☐

Inter-Transect: FG

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect G**

Transect Substrates										
Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes	**Microalgae Thickness Codes**
Left Bank					P A		P A D	P A D	P A D	**0** = No microalgae present, Feels rough, not slimy; **1** = Present but not visible, Feels slimy; **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail. **3** = 1-5mm; **4** = 5-20mm; **5** = >20mm; **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code). **D** = Dry, not assessed
Left Center					P A		P A D	P A D	P A D	
Center					P A		P A D	P A D	P A D	
Right Center					P A		P A D	P A D	P A D	
Right Bank					P A		P A D	P A D	P A D	
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)									

RIPARIAN VEGETATION (facing downstream)	0 = Absent (0%) 3 = Heavy (40-75%) 1 = Sparse (<10%) 4 = Very Heavy (>75%) 2 = Moderate (10-40%)	
Vegetation Class	**Left Bank**	**Right Bank**
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17) *count covered dots*	
Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE (circle only the closest to wetted channel)	**0** = Not Present; **B** = On Bank; **C** = Between Bank & 10m from Channel; **P** = >10m+<50m from Channel; **Channel** (record Yes or No)		
	Left Bank	**Channel**	**Right Bank**
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY (score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)			
Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: GH

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect H**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)

0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY

0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel)

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: HI	Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect I**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes
- **0** = No microalgae present, Feels rough, not slimy;
- **1** = Present but not visible, Feels slimy;
- **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
- **3** = 1-5mm;
- **4** = 5-20mm;
- **5** = >20mm;
- **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
- **D** = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)

0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY

0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel)

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: IJ

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:	Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m): Bankfull Height (m):	**Transect J**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
- **0** = No microalgae present, Feels rough, not slimy;
- **1** = Present but not visible, Feels slimy;
- **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
- **3** = 1-5mm;
- **4** = 5-20mm;
- **5** = >20mm;
- **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
- **D** = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)

0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY

0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17) *count covered dots*

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE **(circle only the closest to wetted channel)**

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: JK

Wetted Width (m):

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	
Pool	
Dry	

Site Code:	Site Name:		Date: __ __ / __ __ / 2011
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect K**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
U = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION (facing downstream)

0 = Absent (0%) 3 = Heavy (40-75%)
1 = Sparse (<10%) 4 = Very Heavy (>75%)
2 = Moderate (10-40%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY

0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	
Center Upstream	
Center Right	
Center Downstream	
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel)

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

BANK STABILITY
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

TAKE PHOTOGRAPHS
(check box if taken & record photo code)

Downstream (**required**) ☐

Upstream (**optional**) ☐

Site Code:	Date: __ __ / __ __ / 2011	FULL FORM

BENTHIC INVERTEBRATE SAMPLES

Collection Method (indicate standard or margin-center-margin)			Replicate	# jars
RWB (standard)	**RWB** (MCM)	**TRC**	**1**	
RWB (standard)	**RWB** (MCM)	**TRC**	**2**	
RWB (standard)	**RWB** (MCM)	**TRC**		
RWB (standard)	**RWB** (MCM)	**TRC**		

Field Notes/ Comments:

Chemistry Equipment ID

Analyte	Equipment
pH	
temperature	
dissolved oxygen	
specific conductance	
salinity	
alkalinity	
turbidity	
silica	
Velocity	

ALGAE SAMPLES

Collection Method (circle one or write new method if applicable)	SWAMP EMAP	SWAMP EMAP	SWAMP EMAP	SWAMP EMAP
Collection Device (sum # of transects per device)	**Rep. 1**	**Rep. 2**	**Rep.**	**Rep.**
Rubber Delimiter (area=12.6cm^2)				
PVC Delimiter (area=12.6cm^2)				
Syringe Scrubber (area=5.3cm^2)				
Other area=				
Number of transects sampled (0-11)				
Composite Volume (mL)				
Assemblage ID volume **(diatoms)** (50 mL tube)				
Assemblage ID volume **(soft algae)** (50 mL tube)				
Check if Qualitative Algae sample was collected with soft algae/diatom sample (required even if macroalgae not visible)	☐	☐	☐	☐
Check if a water chem. **integrated** sample was collected (chl, AFDM)	☐	☐	☐	☐
Chlorophyll a volume use GF/F filter (25 mL **(preferred volume)**				
Ash Free Dry Mass (AFDM) volume use GF/F filter (25 mL **(preferred vol)**				

Water and Sediment Chemistry Samples

Check if a WATER chemistry **grab** sample was collected (nutrients, SSC, etc.)	☐
Check if a DUPLICATE WATER chemistry **grab** sample was collected	☐
Check if a SEDIMENT chemistry sample was collected	☐
Check if a DUPLICATE SEDIMENT chemistry sample was collected	☐
Sediment Collection Device: SCOOP CORE GRAB	
Material: Stainless Steel Polyethylene Polycarbonate Other	
Sediment Collection Depth (cm): 2 or 5	
Create Lab Collection records for each checked box for integrated and grab water chemistry samples	

ADDITIONAL PHOTOGRAPHS

Description	Photo Code	Description	Photo Code

Flow Habitat Type	DESCRIPTION
Cascades	Short, high gradient drop in stream bed elevation often accompanied by boulders and considerable turbulence
Falls	High gradient drop in elevation of the stream bed associated with an abrupt change in the bedrock
Rapids	Sections of stream with swiftly flowing water and considerable surface turbulence. Rapids tend to have larger substrate sizes than riffles
Riffles	Shallow sections where the water flows over coarse stream bed particles that create mild to moderate surface turbulence; (< 0.5 m deep, > 0.3 m/s).
Runs	Long, relatively straight, low-gradient sections without flow obstructions. The stream bed is typically even and the water flows faster than it does in a pool; (> 0.5 m deep, > 0.3 m/s). A **step-run** is a series of runs separated by short riffles or flow obstructions that cause discontinuous breaks in slope
Glides	A section of stream with little or no turbulence, but faster velocity than pools; (< 0.5 m deep, < 0.3 m/s)
Pools	A reach of stream that is characterized by deep, low-velocity water and a smooth surface; (> 0.5 m deep, < 0.3 m/s)

Size Class Code	Size Class Range	Size Class Description	Common Size Reference
RS	> 4 m	bedrock, smooth	larger than a car
RR	> 4 m	bedrock, rough	larger than a car
XB	1 - 4 m	boulder, large	meter stick to car
SB	25 cm - 1.0 m	boulder, small	basketball to meter stick
CB	64 - 250 mm	cobble	tennis ball to basketball
GC	16 - 64 mm	gravel, coarse	marble to tennis ball
GF	2 – 16 mm	gravel, fine	ladybug to marble
SA	0.06 – 2 mm	sand	gritty to ladybug
FN	< 0.06 mm	fines	not gritty
HP	< 0.06 mm	hardpan (consolidated fines)	
WD	NA	wood	
RC	NA	concrete/ asphalt	
OT	NA	other	

BANK STABILITY

Although this measure of the degree of erosive potential is subjective, it can provide clues to the erosive potential of the banks within the reach. Assign the category whose description best fits the conditions in the area between the wetted channel and bankfull channel (see figure below)

Eroded	Banks show obvious signs of erosion from the current or previous water year; banks are usually bare or nearly bare
Vulnerable	Banks have some vegetative protection (usually annual growth), but not enough to prevent erosion during flooding
Stable	Bank vegetation has well-developed roots that protect banks from erosion; alternately, bedrock or artificial structures (e.g., concrete/ rip-rap) prevent bank erosion

CPOM/ COBBLE EMBEDDEDNESS

CPOM: Record presence (P) or absence (A) of coarse particulate organic matter (>1.0 mm particles) within 1 cm of each substrate particle

Cobble Embeddedness: Visually estimate % embedded by fine particles (record to nearest 5%)

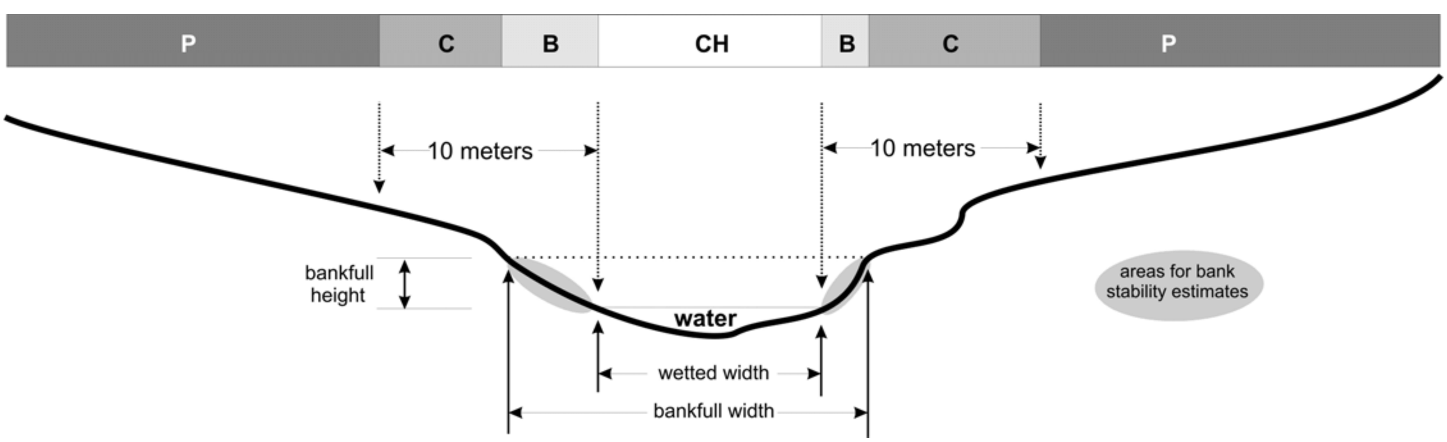
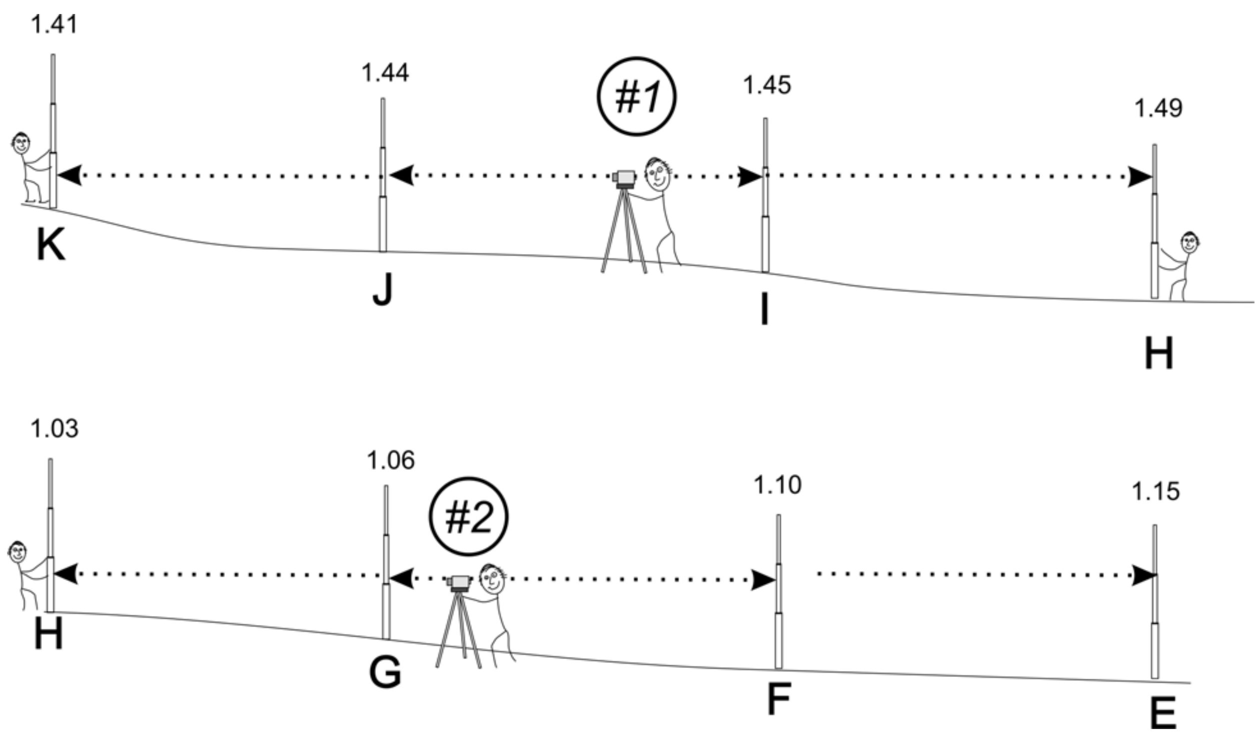


Figure 1. Cross-sectional diagram of stream transect indicating regions for assessing human influence measures:

- The measurement zone extends 5 meters upstream and 5 meters downstream of each transect
- Record one category for each bank and for the wetted channel (3 values possible)
- In reaches with wide banks, region "C" may be entirely overlapped by region "B"; in these cases, circle "B"
- Region "P" extends from 10 meters to the distance that can be seen from the channel, but not greater than 50 m

SLOPE and BEARING FORM **EXAMPLE**	AUTOLEVEL	X
	CLINOMETER	
	HANDLEVEL	

Starting Transect	MAIN SEGMENT (record percent of inter-transect distance in each segment **if supplemental segments are used**)						SUPPLEMENTAL SEGMENT (record percent of inter-transect distance in each segment **if supplemental segments are used**)					
	Stadia rod measurements		Slope (%) or Elevation Difference cm ■ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)	Stadia rod measurements		Slope or Elevation Difference cm ☐ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)
K	1.41											
J	1.44		3	15	140	100						
I	1.45		1	15	145	100						
H	1.49	1.03	4	15	150	100						
G		1.06	3	15	143	100						
F		1.10	4	15	187	100						
E		1.15	5	15	195	100						



1. Level the autolevel at Position #1
2. Place base of stadia rod at water level every time
3. Sight to stadia rod at Transect K, then Transect J
4. Rotate scope and sight to Transects I and H.
5. Move level to Position #2 and re-level
6. Re-sight to stadia rod at Transect H, then Transect G
7. Rotate scope and sight to Transects F and E

Note: Sites will vary in the number of separate level positions needed to survey the reach.

Attachment 4 – Field Datasheets for Stream Surveys

Storm Water Outfalls

OT

WATERSHED/SUBSHED:		**DATE:** ___/_____/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:**___:____AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#	
SITE ID (*Condition-#*): **OT-**_____	**LAT** ___° _____' _____" **LONG** ___° _____' _____" **LMK**_____		**GPS:** (*Unit ID*)

BANK: ☐ LT ☐ RT ☐ Head

FLOW: ☐ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE:	**MATERIAL:**	**SHAPE:**	**DIMENSIONS:**	**SUBMERGED:**
☐ Closed pipe	☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:	☐ Single ☐ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:	Diameter:______(in)	☐ No ☐ Partially ☐ Fully
☐ Open channel	☐ Concrete ☐ Earthen ☐ Other:	☐ Trapezoid ☐ Parabolic ☐ Other:	Depth: ______(in) Width (Top):______(in) " (Bottom):______(in)	*NOT APPLICABLE*

CONDITION:	**ODOR:** ☐ No	**DEPOSITS/STAINS:**	**VEGGIE DENSITY:**	**PIPE BENTHIC GROWTH:** ☐ None
☐ None	☐ Gas	☐ None	☐ None	☐ Brown ☐ Orange ☐ Green
☐ Chip/Cracked	☐ Sewage	☐ Oily	☐ Normal	☐ Other:
☐ Peeling Paint	☐ Rancid/Sour	☐ Flow Line	☐ Inhibited	**POOL QUALITY:** ☐ No pool
☐ Corrosion	☐ Sulfide	☐ Paint	☐ Excessive	☐ Good ☐ Odors ☐ Colors ☐ Oils
☐ Other:	☐ Other:	☐ Other:	☐ Other:	☐ Suds ☐ Algae ☐ Floatables
				☐ Other:

FOR FLOWING ONLY	**COLOR:**	☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:
	TURBIDITY:	☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque
	FLOATABLES:	☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:
OTHER CONCERNS:	☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation	
	☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:	

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization
☐ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:
Length of vegetative cover from outfall: __________ft Type of existing vegetation:____________________ Slope: __________°

If yes for stormwater:
Is stormwater currently controlled? Land Use description:______________________________
☐ Yes ☐ No ☐ Not investigated Area available:

OUTFALL SEVERITY: *(circle #)*	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5 4	3 2	1

SKETCH/NOTES:

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Severe Bank Erosion **ER**

WATERSHED/SUBSHED:	**DATE:** ___/____/___	**ASSESSED BY:**
SURVEY REACH: **TIME:**___:___AM/PM	**PHOTO ID** (CAMERA-PIC #): /#	
SITE ID: (*Condition-#*) ER-_____	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** _____ *END* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** _____	**GPS:** (*Unit ID*)

PROCESS: ☐ Currently unknown

☐ Downcutting ☐ Bed scour
☐ Widening ☐ Bank failure
☐ Headcutting ☐ Bank scour
☐ Aggrading ☐ Slope failure
☐ Sed. deposition ☐ Channelized

BANK OF CONCERN: ☐ LT ☐ RT ☐ Both (*looking downstream*)
LOCATION: ☐ Meander bend ☐ Straight section ☐ Steep slope/valley wall ☐ Other:

DIMENSIONS:

Length (*if no GPS*) LT______ft and/or RT________ft | Bottom width _______ft
Bank Ht LT______ft and/or RT________ft | Top width _________ft
Bank Angle LT______° and/or RT________° | Wetted Width _______ft

LAND OWNERSHIP: ☐ Private ☐ Public ☐ Unknown | **LAND COVER:** ☐ Forest ☐ Field/Ag ☐ Developed:

POTENTIAL RESTORATION CANDIDATE: ☐ Grade control ☐ Bank stabilization
☐ No ☐ Other:

THREAT TO PROPERTY/INFRASTRUCTURE: ☐ No ☐ Yes (Describe):

EXISTING RIPARIAN WIDTH: ☐ ≤25 ft ☐ 25 - 50 ft ☐ 50-75ft ☐ 75-100ft ☐ >100ft

EROSION SEVERITY (*circle#*) Channelized= ☐ 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5 4	3 2	1
ACCESS:	**Good access:** Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair access:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult access.** Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5 4	3 2	1

NOTES/CROSS SECTION SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Impacted Buffer **IB**

WATERSHED/SUBSHED:		**DATE:** ___/____/___	**ASSESSED BY:**
SURVEY REACH:	**TIME:**___:____AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#	
SITE ID: (*Condition-#*) IB-______	*START* LAT ___° ___' ___" LONG ___° ___' ___" LMK _____ / *END* LAT ___° ___' ___" LONG ___° ___' ___" LMK _____	**GPS:** (*Unit ID*)	

IMPACTED BANK: ☐ LT ☐ RT ☐ Both

REASON INADEQUATE: ☐ Lack of vegetation ☐ Too narrow ☐ Widespread invasive plants ☐ Recently planted ☐ Other:

LAND USE: (*Facing downstream*)	Private	Institutional	Golf Course	Park	Other Public
LT Bank	☐	☐	☐	☐	☐:
RT Bank	☐	☐	☐	☐	☐:

DOMINANT LAND COVER:	Paved	Bare ground	Turf/lawn	Tall grass	Shrub/scrub	Trees	Other
LT Bank	☐	☐	☐	☐	☐	☐	☐:
RT Bank	☐	☐	☐	☐	☐	☐	☐:

INVASIVE PLANTS: ☐ None ☐ Rare ☐ Partial coverage ☐ Extensive coverage ☐ unknown

STREAM SHADE PROVIDED? ☐ None ☐ Partial ☐ Full

WETLANDS PRESENT? ☐ No ☐ Yes ☐ Unknown

POTENTIAL RESTORATION CANDIDATE ☐ Active reforestation ☐ Greenway design ☐ Natural regeneration ☐ Invasives removal ☐ no ☐ Other:

RESTORABLE AREA

	BANK LT	RT
Length (ft):	_______	_______
Width (ft):	_______	_______

REFORESTATION POTENTIAL: (*Circle #*)

Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting		Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate		Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
5	4	3	2	1

POTENTIAL CONFLICTS WITH REFORESTATION ☐ Widespread invasive plants ☐ Potential contamination ☐ Lack of sun ☐ Poor/unsafe access to site ☐ Existing impervious cover ☐ Severe animal impacts (deer, beaver) ☐ Other:

NOTES:

Stream Crossing **SC**

WATERSHED/SUBSHED:		**DATE:** ___/___/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** *(Camera-Pic #)* /#	
SITE ID: *(Condition-#)* SC-_____	**LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK**_____		**GPS** *(Unit ID)*

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY	**SHAPE:** ☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical ☐ Circular ☐ Other:	**# BARRELS:** ☐ Single ☐ Double ☐ Triple ☐ Other:	**MATERIAL:** ☐ Concrete ☐ Metal ☐ Other:	**ALIGNMENT:** ☐ Flow-aligned ☐ Not flow-aligned ☐ Do not know	**DIMENSIONS:** *(if variable, sketch)* Barrel diameter: _______(ft) Height: _______(ft)
	CONDITION: *(Evidence of…)* ☐ Cracking/chipping/corrosion ☐ Downstream scour hole ☐ Sediment deposition ☐ Failing embankment ☐ Other *(describe)*:			**CULVERT SLOPE:** ☐ Flat ☐ Slight ($2^{\circ} - 5^{0}$) ☐ Obvious ($>5^{0}$)	Culvert length: _______(ft) Width: _______(ft) Roadway elevation: _______(ft)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: _____(in)
☐ Flow too shallow Water Depth: _____(in)
☐ Other:

BLOCKAGE SEVERITY: *(circle #)*

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
5 4	3	2 1

NOTES/SKETCH:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Channel Modification **CM**

WATERSHED/SUBSHED:		**DATE:** ___/___/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:** ___:___ AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#	
SITE ID: (*Condition-#*) CM-____	*START* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ____ *END* **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ____		**GPS:** (*Unit ID*)

TYPE: ☐ Channelization ☐ Bank armoring ☐ concrete channel ☐ Floodplain encroachment ☐ Other:

MATERIAL:			**DIMENSIONS:**
☐ Concrete ☐ Gabion	Does channel have perennial flow?	☐ Yes ☐ No	Height ______________(ft)
☐ Rip Rap ☐ Earthen	Is there evidence of sediment deposition?	☐ Yes ☐ No	Bottom Width ______________(ft)
☐ Metal	Is vegetation growing in channel?	☐ Yes ☐ No	Top Width: ______________(ft)
☐ Other:	Is channel connected to floodplain?	☐ Yes ☐ No	Length: ______________(ft)

BASE FLOW CHANNEL	**ADJACENT STREAM CORRIDOR**
Depth of flow ____________(in)	Available width LT________(ft) RT________(ft)
Defined low flow channel? ☐ Yes ☐ No	Utilities Present? ☐ Yes ☐ No
% of channel bottom __________%	Fill in floodplain? ☐Yes ☐ No

POTENTIAL RESTORATION CANDIDATE ☐ Structural repair ☐ Base flow channel creation ☐ Natural channel design ☐ Can't tell
☐ no ☐ De-channelization ☐ Fish barrier removal ☐ Bioengineering

CHANNELIZATION SEVERITY: (*Circle #*)	A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.	A moderate length (> 200') ,but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed in channel.	An earthen channel less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchannelized stream reaches above and below impacted area.
	5 4	3	2 1

NOTES:

Trash and Debris **TR**

WATERSHED/SUBSHED:		**DATE:** ___/___/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:**___:___AM/PM	**PHOTO ID:** *(Camera-Pic #)* /#	
SITE ID: *(Condition-#)* **TR-**_____	**LAT** ___° ____' ____" **LONG** ___° ____' ____" **LMK** _____		**GPS:** *(Unit ID)*

TYPE:	**MATERIAL:**	**SOURCE:**	**LOCATION:**	**LAND OWNERSHIP:**
☐ Industrial ☐ Commercial ☐ Residential	☐ Plastic ☐ Paper ☐ Metal ☐ Tires ☐ Construction ☐ Medical ☐ Appliances ☐ Yard Waste ☐ Automotive ☐ Other:	☐ Unknown ☐ Flooding ☐ Illegal dump ☐ Local outfall	☐ Stream ☐ Riparian Area ☐ Lt bank ☐ Rt bank	☐ Public ☐ Unknown ☐ Private **AMOUNT** *(# Pickup truck loads)*:

POTENTIAL RESTORATION CANDIDATE ☐ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping
☐ no ☐ Other:

If yes for trash or debris removal	**EQUIPMENT NEEDED :** ☐ Heavy equipment ☐ Trash bags ☐ Unknown	**DUMPSTER WITHIN 100 FT:** ☐ Yes ☐ No ☐ Unknown
	WHO CAN DO IT: ☐ Volunteers ☐ Local Gov ☐ Hazmat Team ☐ Other	

CLEAN-UP POTENTIAL: *(Circle #)*	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials	
	5	4	3	2	1

NOTES:

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Utility Impacts **UT**

WATERSHED/SUBSHED:	**DATE:** ___/____/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:**___:___AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **UT-**____	**LAT**___°____'____" **LONG**___°____'____" **LMK:** ____	**GPS:** (*Unit ID*)

TYPE:	**MATERIAL:**	**LOCATION:**	**POTENTIAL FISH BARRIER:**	**PIPE DIMENSIONS:**
☐ Leaking sewer ☐ Exposed pipe ☐ Exposed manhole ☐ Other:	☐ Concrete ☐ Corrugated metal ☐ Smooth metal ☐ PVC ☐ Other:	☐ Floodplain ☐ Stream bank ☐ Above stream ☐ Stream bottom ☐ Other:	☐ Yes ☐ No **CONDITION:** ☐ Joint failure ☐ Protective covering broken ☐ Other:	Diameter: ____in Length exposed: ____ft ☐ Pipe corrosion/cracking ☐ Manhole cover absent

EVIDENCE OF DISCHARGE:		
	COLOR	☐ None ☐ Clear ☐ Dark Brown ☐ Lt Brown ☐ Yellowish ☐ Greenish ☐ Other:
	ODOR	☐ None ☐ Sewage ☐ Oily ☐ Sulfide ☐ Chlorine ☐ Other:
	DEPOSITS	☐ None ☐ Tampons/Toilet Paper ☐ Lime ☐ Surface oils ☐ Stains ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Structural repairs ☐ Pipe testing ☐ Citizen hotlines ☐ Dry weather sampling
☐ no ☐ Fish barrier removal ☐ Other:

If yes to fish barrier, Water Drop: _______ (in)

UTILITY IMPACT SEVERITY: (*Circle #*)			
Leaking= ☐ 5	Section of pipe undermined by erosion and could collapse in the near future; a pipe running across the bed or suspended above the stream; a long section along the edge of the stream where nearly the entire side of the pipe is exposed; or a manhole stack that is located in the center of the stream channel and there is evidence of stack failure.	A moderately long section of pipe is partially exposed but there is no immediate threat that the pipe will be undermined and break in the immediate future. The primary concern is that the pipe may be punctured by large debris during a large storm event.	Small section of exposed pipe, stream bank near the pipe is stable; the pipe is across the bottom of the stream but only a small portion of the top of the pipe exposed; the pipe is exposed but is reinforced with concrete and it is not causing a blockage to upstream fish movement; a manhole stack that is at the edge of the stream and does not extend very far out into the active stream channel.
	5	4 3	2 1

NOTES:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED:	**DATE:** ___/____/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:**___:____AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-**_____	**LAT**___°_____'_____" **LONG**___°_____'_____" **LMK:** _____	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED:	**DATE:** ___/____/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:**___:____AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-**_____	**LAT**___°_____'_____" **LONG**___°_____'_____" **LMK:** _____	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

WATERSHED/SUBSHED:	**DATE:** ___/____/___	**ASSESSED BY:**
SURVEY REACH ID:	**TIME:**___:____AM/PM	**PHOTO ID:** (*Camera-Pic #*) /#
SITE ID: (*Condition-#*) **MI-**_____	**LAT**___°_____'_____" **LONG**___°_____'_____" **LMK:** _____	**GPS:** (*Unit ID*)

POTENTIAL RESTORATION CANDIDATE ☐ Storm water retrofit ☐ Stream restoration ☐ Riparian Management
☐ no ☐ Discharge Prevention ☐ Other:

DESCRIBE:

REPORTED TO LOCAL AUTHORITIES ☐ Yes ☐ No

Reach Level Assessment **RCH**

SURVEY REACH ID: ____	**WTRSHD/SUBSHD:**	**DATE:** ___/___/___	**ASSESSED BY:**

START **TIME:** ___:___AM/PM **LMK:** _____ **LAT** ___° ___' ___" **LONG** ___° ___' ___" **DESCRIPTION:**	*END* **TIME:** ___:___AM/PM **LMK:** _____ **LAT** ___° ___' ___" **LONG** ___° ___' ___" **DESCRIPTION:**	**GPS ID:**

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☐ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☐ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Urban/Residential ☐ Suburban/Res ☐ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☐ Other:

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☐ 0-25% ☐ 50%-75% ☐25-50 % ☐ 75-100%

DOMINANT SUBSTRATE
☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10")
☐ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☐ Bed rock

WATER CLARITY ☐ Clear ☐Turbid *(suspended matter)*
☐ Stained *(clear, naturally colored)* ☐ Opaque *(milky)*
☐ Other *(chemicals, dyes)*

AQUATIC PLANTS IN STREAM
Attached: ☐ none ☐ some ☐ lots
Floating: ☐ none ☐ some ☐ lots

WILDLIFE IN OR AROUND STREAM
(Evidence of)
☐ Fish ☐ Beaver ☐ Deer
☐ Snails ☐ Other:

STREAM SHADING (water surface)
☐ Mostly shaded (≥75% coverage)
☐ Halfway (≥50%)
☐ Partially shaded (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☐ Unknown
☐ Downcutting ☐ Bed scour
☐ Widening ☐ Bank failure
☐ Headcutting ☐ Bank scour
☐ Aggrading ☐ Slope failure
☐ Sed. deposition ☐ Channelized

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank __________(ft)
RT bank __________(ft)
Width: Bottom __________(ft)
Top __________(ft)

REACH ACCESSIBILITY

Good	Fair	Difficult
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 3 2 1

REACH SKETCH AND SITE IMPACT TRACKING

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow

NOTES: *(biggest problem you see in survey reach)*

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Photo Inventory
(By Camera)

Project: ______________

Group: ______________

Camera: ______________

This field sheet is to be completed AS photos are taken in the field. The intent is to force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description

Date	Stream/ Reach	Location ID	Photo #	Description

Comments:

(BACK)

STANDARD OPERATING PROCEDURES
for
Site and Sample ID Naming Conventions
(SOP FS-11)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

- Biological Assessment
- General Water Quality
- Chlorine
- Temperature
- Toxicity – Water Column
- Toxicity – Bedded Sediment, Fine-Grained
- Pollutants – Bedded Sediment, Fine-grained
- Pathogen Indicators

SOP Background and Application

The RMC site and sample ID naming convention is designed to ensure consistency across local program monitoring efforts.

References to Existing SOPs

None

Special Cautions and Considerations; Health and Safety

None

Methods/Procedures

SITE NAMING CONVENTION

Site naming convention for RMC sites are dependent upon the monitoring design used to select the sites, and is separated into two categories: (1) probabilistic, and (2) targeted. Naming conventions for both types of monitoring sites are described below:

PROBABLISTIC SITES

RMC identification of sampling sites derived using a probabilistic design will follow similar conventions being used by the California State Water Resources Control Board's Perennial Stream Assessment (PSA) and the Stormwater Monitoring Coalition (SMC) Programs. The naming convention is as follows:

HHHR#####

Where:

HHH	=	The Water Board Region followed by the two digit California Hydrologic Unit (HUC) Code. The codes for each RMC Program are as follows:

- Contra Costa - 206, 207, 543, 544
- Alameda - 203, 204, 205
- Santa Clara - 204, 205
- San Mateo - 202, 204
- Fairfield-Suisun, Vacaville - 207

R	=	One letter code that represents the Monitoring Program, in this case "R" stands for the RMC Creek Status Monitoring Program.
#####	=	Five digit number that is generated from the sample draw (note: PSA only uses a four digit number).

TARGETED SITES

RMC identification of targeted sites will be identified using standard SWAMP site naming convention as interpreted by BASMAA in Attachment 1 (EOA Inc. 2006). For RMC sites, the following convention will be used:

HHHSSS###

Where:

HHH	=	The Water Board Region followed by the two digit California Hydrologic Unit (HUC) Code. The codes for each RMC Program are as follows:

- Contra Costa - 206, 207, 543, 544
- Alameda - 203, 204, 205
- Santa Clara - 204, 205
- San Mateo - 202, 204
- Fairfield-Suisun, Vacaville - 207

SSS	=	Three letter code representing the creek sampled. Unless otherwise requested by Water Board personnel, for one word creek names, the first three letters of the creek name

are used (e.g., ALA for Alameda Creek). For two-word creek names, the first letter of the first word is combined with the first two letters of the second word (e.g., SFR for San Francisquito Creek).

#####	=	Three digit number, beginning at 010 at the creek mouth and increasing by an increment of 10 per station going upstream. Additional sites added between two existing stations are assigned a number between the two existing numbers.

SAMPLE ID NAMING CONVENTION

Sample naming convention for RMC samples is dependent upon type of sample collected, and is separated into two broad categories: (1) biological samples, and (2) chemistry / toxicity samples. Naming conventions for the two types of samples are described below.

BIOLOGICAL SAMPLES

Each sample will be assigned a distinct sample ID code using the following convention:

HHHR#####-M-NN

Where:

HHHR#####	=	Six digit site code, consistent with protocol above
M	=	Media (B for benthic macroinvertebrates, A for algae)
NN	=	Two digit number for each sample collected at a given site on a given day, beginning with 01, with an increment of 01 per sample collected

CHEMISTRY / TOXICITY SAMPLES

Each sample will be assigned a distinct sample ID code using the following convention:

HHHR#####-M-NN

Where:

HHHR#####	=	Six digit site code, consistent with protocol above
M	=	Media (W for water, S for sediment)
NN	=	Two digit number for each sample collected at a given site on a given day, beginning with 01, with an increment of 01 per sample collected

SAMPLE LABELING CONVENTION

Standard SWAMP protocols for collection and analysis of biological samples associated with bioassessment use descriptive sample labels for benthic macroinvertebrates (Figure

1) and benthic algae (Figure 2). Specific instructions on filling out BMI sample labels is provided in Ode (2007) and for filling out algae sample labels in Fetcher et al. (2010).

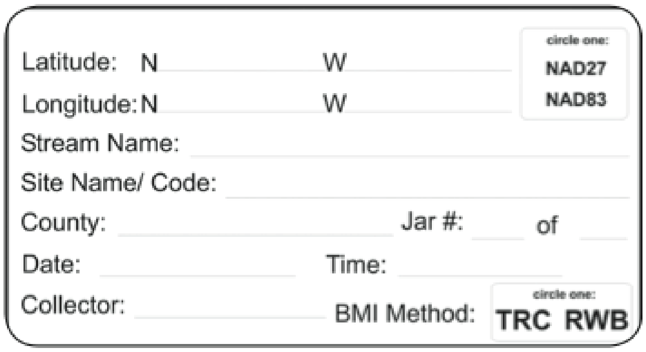
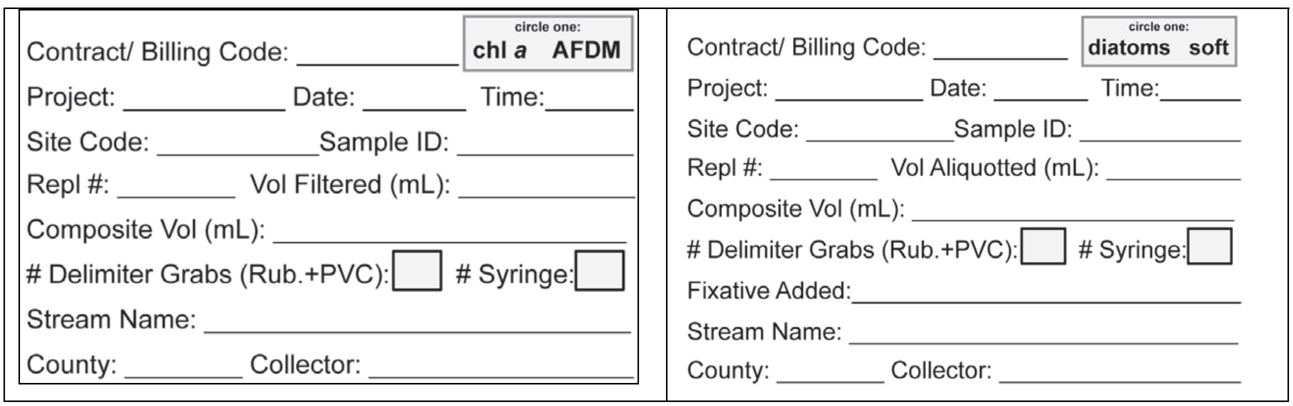

Latitude: N W
Longitude: N W
circle one: NAD27 NAD83
Stream Name:
Site Name/ Code:
County: Jar #: of
Date: Time:
Collector: BMI Method: circle one: TRC RWB

Figure 1. Typical Label for RMC Benthic Macroinvertebrate Samples


Contract/ Billing Code: circle one: chl *a* AFDM
Project: Date: Time:
Site Code: Sample ID:
Repl #: Vol Filtered (mL):
Composite Vol (mL):
Delimiter Grabs (Rub.+PVC): # Syringe:
Stream Name:
County: Collector:

Contract/ Billing Code: circle one: diatoms soft
Project: Date: Time:
Site Code: Sample ID:
Repl #: Vol Aliquotted (mL):
Composite Vol (mL):
Delimiter Grabs (Rub.+PVC): # Syringe:
Fixative Added:
Stream Name:
County: Collector:

Figure 2. Typical Labels for RMC Benthic Algae Samples

Sample labels to be used with samples collected for analysis of chemistry or toxicity come in a variety of forms. Often the labels are provided by the laboratories.

Quality Assurance / Quality Control

Site codes should be assigned prior to sampling and reviewed as part of readiness reviews.

Sample container labels should be prepared to the extent possible prior to mobilizing for field work, and filled out completely prior to sample collection, as labels are much more difficult to compete when wet.

Before leaving a site, field crews will verify presence, accuracy, and legibility of sample labels employed for a particular sample. At the conclusion of sampling, prior to delivery of samples to labs, the sample labels must be checked against the completed chain of custody forms for accuracy and consistency.

References

EOA Inc., 2006. DRAFT Guidance Document: Assigning SWAMP Station IDs. January 24, 2006.

Fetscher, A.E., L. Busse, and P. R. Ode. 2009. Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 002. (updated May 2010).

Ode, P.R., 2007. Standard Operating Procedures for Collecting Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001.

Attachment 1 – EOA Draft Guidance Document: Assigning SWAMP Station IDs

EOA, Inc.

MEMORANDUM

TO: Chris Sommers

FROM: Terri Fashing

DATE: January 24, 2006

SUBJECT: **DRAFT** Guidance Document: Assigning SWAMP Station IDs

Chris,

A note from Matt Cover with SWAMP: "An important step for us now is to assign a rough numbering system to every stream in the region, so that it is done consistently. Although we don't need to assign exact locations to all the stations right now, we want someone to be able to look at a map or the site list and say, okay, my site is approximately near 090, I'll give it this code since no one else has designated this site yet. When additional sites are added the final digit in the code reflects the relative distance between the upstream and downstream sites, and the potential for other sites to be located nearby." This step has not been completed and may be a good task for Leslie Perry who now works for SWAMP. She might also be able to turn this into a Final Guidance Document. What I've included here is based on feedback from Matt Cover and Steve Moore and on my own experience. What I've left out is all of the detail that one encounters in trying to really determine where a site is that may not have be described well or that may or may not be in the same location of an existing SWAMP station. There are always judgment calls that have to be made and the person assigning the Station ID has to sleuth around a bit sometimes.

I. Determine Locations of Existing SWAMP Stations

The first step in assigning SWAMP Station IDs to either existing or new monitoring stations is to obtain an updated Station Table from SWAMP. Region 2 SWAMP maintains a list of all of their monitoring stations and the target latitude and longitudes (in either Nad83 or WGS84). Written station location information can be obtained from SWAMP as well.

Use a mapping program (e.g., ArcView or Topo!) to project all of the SWAMP stations in order to compare SWAMP station locations to existing or new non-SWAMP station locations.

II. Determine Locations of Existing or New Non-SWAMP Stations

Using coordinates and/or written directions, plot existing or new non-SWAMP stations onto map and compare locations with SWAMP station locations. If SWAMP has not established any monitoring stations on a given creek or within a given watershed, create SWAMP-compatible station IDs according to instructions below.

III. SWAMP Station-naming Convention

The proper SWAMP Database format for the StationCode is R##ABC123, where R is one of the 9 watershed regions (For the SF Bay Regional Board the correct watershed region is 2), ## is the Hydrologic Unit number, and ABC123 is an alphanumeric description of the Station. An example is 203BAX030, which is Region 2, Hydrologic Unit 03 and an abbreviated code to indicate "Baxter Creek – Baxter at Booker T. Washington Park".

See SWAMP **Planning Watersheds1.xls** in F:\Sc61\sc61.12\SWAMP stations for the Hydrologic Unit number that corresponds to the location of a given station. Planning Watersheds1.xls should also be consulted for the established and suggested alpha codes based on the Regional Board's (Region 2) Planning Watersheds.

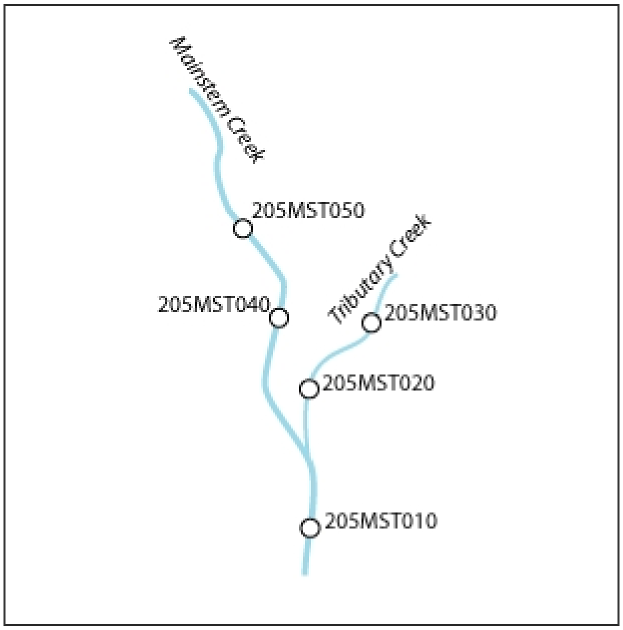
The following link shows a map of the San Francisco Bay Region: http://www.waterboards.ca.gov/sanfranciscobay/basinplan/web/fig_2-02.pdf. There are 7 Hydrologic Units within Region 2 and the map shows the boundaries of those Units. If a given station falls within the South Bay Basin, the first part of the Station ID will be 204 (Region 2 and Hydrologic Unit code 04).

When assigning station names to stations on creeks that have not yet been assigned SWAMP-compatible Station IDs, it is not necessary adhere to the planning watershed name alpha indicators established in Planning Watersheds1.xls file. One rule of thumb is that Water Bodies which drain directly into the San Francisco Bay Estuary or Ocean should have a unique alpha-indicator.

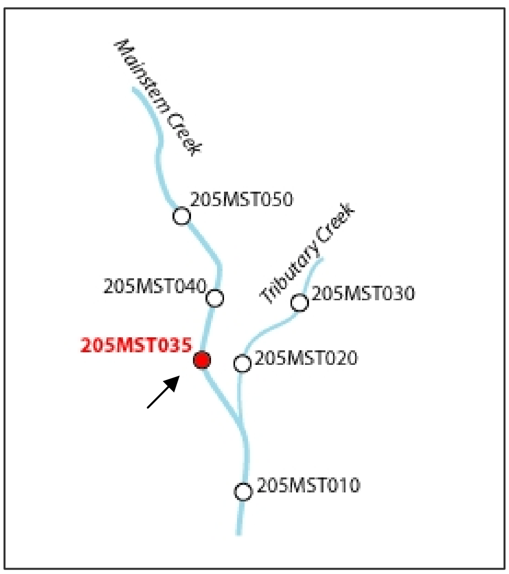
One reminder on choosing an alpha code for station numbering: it's ok to have more than one alpha code in the San Francisco region (e.g., ROD) as long as they are in different hydrologic units. (e.g., Rodeo Creek in Contra Costa and Marin). This is because each station ID includes the three digit hydrologic unit before the alpha characters. It is desirable to minimize this repetition by creating unique alpha codes: e.g., Permanente (PER) and Peralta (PRL). In such cases, the larger water body should get preferential naming treatment. This is why it is good to consult the **Planning Watersheds1.xls** in F:\Sc61\sc61.12\SWAMP stations for the suggested alpha codes, so that the main water bodies receive the most obvious alpha codes. Without question, Alameda Creek has to have ALA, Napa River has to have NAP, Sonoma Creek SON and Walnut Creek WAL. (this is why Walker Creek is WLK, by the way, it's smaller than Walnut Cr.).

IV. Assign the SWAMP ID to the Station

Working downstream to upstream, all the "likely sampling locations" are given a number, with each consecutive number increasing by 10 (e.g. 10, 20, 30). A "likely sampling location" is a location with public access or with permission to access granted by the landholder that can reasonably be expected to serve as a sampling location, based on the site's utility at capturing local and upstream influences (land use). When a tributary is encountered, numbering continues to increase from the bottom to the top of the tributary. Above the tributary, numbering continues to increase on the mainstem (see idealized drawing below). The alpha code that makes up the middle three characters of the entire Station ID (BAX for Baxter Creek, or MST for Mainstream Creek in the example below) does not change as numbering continues up a tributary with a different creek name (like Tributary Creek).



When assigning a Station ID to a creek location that lies upstream or downstream of established stations with SWAMP Station IDs, the final digit in the code reflects the relative distance between the upstream and downstream sites, and the potential for other sites to be located nearby. See idealized drawing below:



V. Station Definition

Provide written directions on station locations including obvious landmarks, street crossings, driving directions and exact on-foot station location directions. Obtain latitude and longitude coordinates in decimal degrees in either WGS84 or NAD83 (datum) to define stations. Riffles move and disappear, so location directions to 20 m accuracy is fine, which is what we get with GPS. If sites are clearly different locations within a reach (e.g. upstream and downstream of a bridge), they get different Station Codes. It is important to provide as much station location information as possible so that the data analyzer can decide whether or not to clump the data from different stations.

VI. Report new Station Information to SWAMP

In order to establish a Station ID using the SWAMP station-naming convention, it is critical that the new Station IDs are reported to SWAMP at the SF Bay Regional Board. Also, if it is a BMI sampling station, add the new station information to **Master SFBay IBI BMI Station List.xls** in F:\Sc61\sc61.12.

STANDARD OPERATING PROCEDURES
for
Ambient Creek Status Monitoring Site Evaluation
(SOP FS-12)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This standard operating procedure (SOP) is part of the RMC's regional coordination effort.

SOP Background and Application

The purpose of this document is to record standard operating procedures (SOPs) and guidance for evaluating sites selected for the probabilistic creek status ambient monitoring to be conducted by BASMAA RMC participants. Creek status monitoring is described in the RMC Monitoring Plan (BASMAA 2011) and is being conducted to comply with the monitoring requirements of the Municipal Regional Permit (MRP), specifically provisions C.8.c.

The goal of completing the site evaluation process outlined in this SOP is three-fold:

1. To confirm that the monitoring site of interest meets the RMC's site criteria;
2. To determine if the site is safely accessible; and,
3. To gain permission to access the site for sampling.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

Biological Assessment

References to Existing SOPs

This SOP is based on information developed by the California Department of Fish and Game:

Perennial Stream and Rivers Assessment Site Evaluation Guidelines, September 2011 (CDFG 2011).

Special Cautions and Considerations; Health and Safety

Take all precautions to ensure that the field crew has the appropriate vehicle, attire, equipment and supplies to safely access and sample sites (see Part II Materials).

Training in basic first aid is required. Crew chiefs are responsible for ensuring the safety of the crew and must use his or her discretion to end sampling if conditions become unsafe. When contacting water in areas of unknown water quality, especially in waters that are suspected to contain hazardous substances, bacteria, or viruses, it is preferable that at least one layer of gloves be of shoulder length, to limit skin contact with the source water.

Methods/Procedures

Ambient creek monitoring sites are evaluated through completing two sequential steps: 1) office site evaluation, and 2) field reconnaissance (if needed).

This document consists of five additional sections that discuss a standard protocol for conducting the site evaluations and completing the two evaluation forms. These sections address the following topics:

- Part I: Materials and procedures for completing office site evaluations, including how to complete Form 1: Site Evaluation (Office)
- Part II: Materials and procedures for completing field reconnaissance, including how to complete Form 2: Field Reconnaissance

Part I: Office Site Evaluation Procedures

Materials

All original documents, forms and related information should be stored onsite in a secure location. Copies of these documents can be made to take in the field or as necessary. High priority data outputs will be transferred to a spreadsheet following completion of the site evaluation and reconnaissance process. Dossiers should be made by each participating RMC agency and SWAMP to organize all paperwork, letters and forms. A form (FORM #1) has been created to document the site evaluation process.

Materials that may be needed to conduct the site evaluation phase in the office include:

- RMC sample draw site list for the year of interest - provided by the RMC Coordinator and will contain the following information relevant for the site evaluator:
    - Project and individual site codes
    - Site GPS coordinates
    - Geographic region (applicable Regional Water Quality Control Board region)
    - GIS Landcover Type (urban or non-urban)
    - Creek name (if available via NHD)

- Site Evaluation Form for each site (Form #1)
- Aerial or satellite imagery (Google Earth, LandVision, etc.)
- USGS topographic maps (paper or electronic)
- ESRI ArcGIS® software
- County assessor roll (Parcel Quest, Landvision, ArcView, County websites, etc.)
- Google or web based search engines
- Street Maps (DeLorme, Atlas, Thomas Guide, etc.)
- Other topographic maps (USFS, BLM, State Park, NPS, etc.)
- CDEC/USGS stream gage data http://waterdata.usgs.gov/ca/nwis/

- Resource managers and governmental agency phone numbers
- Locations of large stormdrain outfalls (Oakland Museum Creek Maps http://museumca.org/creeks/)

Completing the Site Evaluation Form (Form #1)

The Site Evaluation Form is completed in the office and requires no field visit.

STEP 1. Review sample draw (site list) with potential monitoring sites for year of interest

Each year, the RMC Coordinator or designee will provide you with a site list (sample draw) that will form the list of potential sites that may be monitored in a given year by your program. Once received, the individual(s) conducting the site evaluation phase should review the list and communicate with the RMC Coordinator or designee if there appear to be errors or if there are questions about the sample draw provided.
The list column headings are explained below:

- **Draw SiteID –** the RMC sample ID number
- **RMC Strata Site Order –** The consecutive, numerical order from the sample draw in which sites in that particular strata (county and land use) should be evaluated
- **State Comid –** the creek reach ID from the State's Perennial Stream Assessment sample frame
- **xcoord, xycoord –** latitude and longitude in NAD1983 – California Teale Albers
- **GIS Creek Name –** the name of the creek in the National Hydrography Dataset (NHD), from the Geographic Names Information System (GNIS)
- **fcode –** the type of NHD line work (channel type)
- **rmc_strata –** the code in the RMC sample frame including the county, regional board number and land use type of the site
- **County –** county in which the site lies
- **Regional Board –** the California Regional Water Quality Control Board region number
- **RMC Land Use –** the land use of the site (i.e., urban or nonurban)

VERY IMPORTANT: It is of critical importance to keep your sites in consecutive, numerical order from the sample draw, never leaving out a single site or groups of sites. If this rule is violated, the statistical power is diminished and problems will occur in the final results report.

STEP 2. Locate the site based on coordinates

Determine the location of sites in sample draw via Google Earth, GIS, or appropriate topographic map. It is often the most efficient to display all of the sites for the coming sampling season in a GIS or using Google Earth. A Google Earth file (KML) should have been forwarded to you with the sample draw site list to assist you in this step.

IMPORTANT: Site locations in the sample draw site list represent the most downstream point of the sample reach. Site locations can be moved up to a maximum of 300 meters by a RMC participant in order to meet sample criteria. When moving a site, a new latitude and longitude is required and should be reported to the Monitoring Coordinator. Rules for moving a site within the 300 meter limit are described in Section 2.

STEP 3. Complete site evaluation form

The site evaluation form (Form #1) is completed in the office using the following steps and requires no field visit.

Section I: Background Site Information

On Form #1, complete the fields listed below. Most of the information for this section can be gathered from the sample draw site list or the KML (Google Earth) file provided to you, and transposed to the form.

- Draw Site ID
- Evaluator Name
- Date of Evaluation
- Creek Name, Site Latitude and Longitude (NAD1983 – California Teale Albers)
- Site Location/Description
- City (Optional)County
- Region (Regional Water Quality Control Board Region)
- Land Use Type
- Sampling Agency

Section II: Site Status

For each site, select one of the two site status categories and check the proceeding box that best classifies the channel status.

Provisionally Meets Criteria: check this box if all information gained from Google Earth, maps, aerial photos and resource mangers etc. lead to the possibility that the site is a receiving water body and **MAY** be sampleable. The following criteria for checking the "Provisionally Meets Criteria" box on Form #1 are:

- Permission to access the site MAY be attainable
- The site MAY be physically accessible and entered safely

Assume that a site provisionally meets these criteria unless you have evidence to the contrary as indicated below.

Criteria Not Met: check this box if the evaluator is highly confident that the information gathered meets any of the following and the site cannot be moved up to 300 m (see text box below) to resolve these issues:

- **Watercourse Not Present** - after coordinates are entered into a mapping program or identified on a map, there is no obvious watercourse present at the site location (within 300 meters and within the same strata)
- **Pipeline** - site is located in a enclosed underground/aboveground pipe;
- **Impoundment** - site falls on a lake, reservoir or pond;
- **Tidally Influenced** - site is obviously influenced by brackish water at some point of time during a year (i.e., is downstream of the higher high water mark);
- **Aquaduct** – site is in an above-the-ground water conveyance designed to

transport drinking water;

- **Non-Wadeable** - site will obviously be greater than 1 meter deep in 50% or more of its length, or will obviously be unsafe for sampling during the spring monitoring event;
- **Inaccessible** – A site is inaccessible if you cannot safely walk to the site from your vehicle, sample and return from the site carrying samples and gear within a single day. Note: having a limited crew size is not a legitimate reason for checking this box.
- **Tributary/large storm drain within reach** – a tributary or a storm drain greater than 24" inch diameter discharges into the reach and the site cannot be moved to avoid it; (see text box below);
- **Other** – Includes sites located (Explanation needed on Form):
    - where any other obvious impediment prevents sampling; or
    - on a water conveyance that is not currently and never was a receiving water body. **IMPORTANT:** Only sites that have a significant weight of evidence, e.g., USGS quad maps, NHD, Bay Area Riparian Resource Inventory (BARRI) maps, Oakland Museum Creek Maps, and the San Francisco Bay Water Quality Control Plan (Basin Plan) supporting this determination can be included. Make sure to communicate with the RMC Coordinator before checking this box.

IMPORTANT: A site may be moved up to 300 meters upstream or downstream of the original site location to assist the evaluator in meeting the site evaluation criteria. Situations where a site may be moved up to 300 meters include:

- to allow for access, due to permission limitations by land owners;
- to avoid a tributary or large storm drain outfall (greater than 24 inches in diameter);
- to avoid a bridge or other grade control structure within the reach;
- to the extent possible, to maintaining homogenous channel morphology (e.g. all concrete or all natural channel);
- to avoid pipelines, aquaducts, tidally influenced areas, and non-wadeable reaches;
- to relocate a site that was placed outside the creek channel, within the nearest creek channel.

The reach length that must be available for sampling upstream of the site coordinates depends on the average wetted channel width: 0 – 10 m average wetted channel width requires a 150 m reach length; >10m average wetted channel width requires a 250 m reach length. If moving a site makes it sampleable but the full reach length is not accessible, the reach length may be decreased, but this should be avoided whenever possible. Other reasons to decrease reach length may include safety concerns or physical barriers. If the reach length is other than 150 m or 250 m, it should be noted and explained on the field forms. Under such circumstances field crews will still need to space bioassessment transects at equal distances within the decreased reach length.

Basis of Determination: All sites that have the "Criteria Not Met" box checked must have a justification or verifiable reason to reject these sites and not proceed further. Check the box that best fits the reason for determining that the criteria was not met. If "other" is checked or agency personnel or resource managers have been contacted, please list all relevant information in the "explanation" box in this section.

Information Source: Check the appropriate box identifying the source of information for the basis of determination described above. If "other" is checked, please describe the source of the information in the "explanation" box. Best professional judgment is abbreviated as BPJ and geographic information system is abbreviated as GIS.

Best Month to Sample: All sites that have the "Provisionally Meets Criteria" have the potential to be sampled. Bioassessment sampling has a specific index period when sampling is optimal (May 15 – July 15 and more than four weeks after the last substantial rainfall event. The index period for Bay Area creeks is spring, but may vary between sites depending on flow conditions allowing for safe entry during the spring season. For each site that "Provisionally Meets Criteria", provide a best estimate of the month that sampling would be optimal based on typical rainfall and flow patterns. As a rule, sites that exhibit lower and/or intermittent flow should usually be planned for sampling earlier than sites with higher and/or perennial flow.

Consideration: You may want to continue filling out Sections I and II for a number of sites in the sample draw before starting to obtain landowner information. Completing Sections I and II for a number of sites may improve the efficiency of the site evaluation process.

Section III: Site Ownership Information (Only Completed for sites Identified as "Provisionally Meets Criteria")

Step 1: Property ownership information must be determined and verified for ALL sites identified as "Provisionally Meets Criteria".

Permission from all land owners, land managers, or agencies must be obtained before entering any private property at or surrounding the site. Ownership must also be verified for public lands. There are often private land holdings inside national forest boundaries or other public lands. Crossing onto private land without permission is trespassing.

Ownership information can be obtained in either of the following ways alone or in combination:

1. Visit the county assessor office and utilize their resources.
   At each county assessor's office locate the county index map. The index map will have the UTM township/range grids located on it. The USGS topographical map will also have the township and range of a given site on the border of the map. Correlate the township and range of the site with that of the index map and locate the site. The site will lie in a region on the index map where ownership information can be assessed. This region or area of information can be found in the "plat" map book. The "plat" map book number represents a book of information that contains land parcels for a specific region on the index map. Plat maps also depict parcels, ownership boundaries, tax lot numbers, and the subsequent acreage contained within a tax lot number. Align the site on the topographic map with that of the plat map book. Record the name, mailing address, site address, and any additional information from the landowner at the site and any adjacent landowners that may provide access. Often multiple owners may need to grant permission in order to reach the site.

2. Use a certified map assessor program (Parcelquest, Landvision).

There are several companies that offer online services, or have parcel information on CD. These companies offer subscriptions or the ability to purchase information. These Assessor mapping programs offer a slight learning curve, but are much quicker and easier to use and offer greater usability than visiting the assessor's office.

3. Use up-to-date GIS data available from the county.
   GIS data may be obtained by contacting the individual counties and making arrangements to obtain relevant information. Information is generally offered in ESRI ARC GIS format with a database of APN numbers.

4. Online assessor information available from county websites.
   Online assessor information is available for ***some*** counties and is getting better with time and technology development. The assessor's office may be contacted by phone or by visiting the assessor's website to find the most current information available. The county assessor sites operate similarly to ParcelQuest/Landvision but are free on the World Wide Web.

Step 2: For each site identified as "Provisionally Meets Criteria", mark whether it is publicly owned, privately owned, mixed or other. If "other" is marked, please provide an explanation in the space provided.

Section III-1: Public Site Ownership Information

This section only applies if the "public" or "mixed" ownership is checked. During the process of gathering information about the site ownership it should be obvious which county, city, or agency will hold ownership and/or management roles of the creek or river. This information should be entered under "Organization". Potential monitoring sites that are not private and have no public access permission require an encroachment or collection permit to be obtained. It is important to contact the organization to determine whether or not a permit is required. The remaining lines in this section can be completed after contacting the appropriate personnel.

Note: If the land surrounding a site is owned entirely by a public organization, only the first page of Form #1 needs to be completed.

Section III-2: Private Site Ownership Information

For all private properties, each parcel number should be recorded in the specific county format if possible, as they are unique amongst counties. If there are contacts in addition to primary property owners, this may be noted in the "Contact information" box. This field is not necessarily mandatory and need only be used if 1) the space provided in the first line is inadequate to accommodate all contact information or 2) there is a manager or tenant.

Note: Duplicate the second page of Form #1 (Section III-2) if access is required for more than three properties. Remember that monitoring occurs in a 150 meter reach, and property owners along the entire reach and any additional access areas should be contacted.

Obtaining Permission to Access Site

After ownership information is obtained via the Site Evaluation, landowners or land managers are contacted to gain permission to access sites.

STEP 1: Permission packets are sent to the owners of ALL privately owned sites and any agency or company requesting a letter or information about sampling activities.

The permission packet includes:
- a cover letter with a brief description of project goals
- a permission form that the party completes,
- a self-addressed stamped envelope and
- a map of the site (optional).

Record that you sent a permission packet by checking the "sent" box in Form #1. **See Appendix A for the Standard RMC Cover Letter and Permission Form**.

For public ownership the proper agency and personnel must be contacted to determine if a permit, entry agreement or permission letter is needed. A complete effort needs to be made to determine who and what agency manages the water body where the site is located. Contact all possible agencies and land managers to inform them of sampling activities.

Access permission to sample **can be denied in the following ways**:

- The permission letter is returned denying access to the site, with the "no" permission granted box is checked, or
- Permission is denied over the phone or via email, or
- There is no response from the owners after two attempts to contact them, or
- The letter is returned with no response and a second attempt to contact them does not change this result, or
- The letter is returned unopened and a second attempt to contact them either does not result in permission to access site or contact is not possible.

If the site meets any of these criteria, check the "No" box in the "Access Granted" field on the Office Evaluation Form, stop evaluation of the site AND complete Sections I and II of the Field Reconnaissance Form (Form #2). It is possible for a site to be temporarily inaccessible and it is important to distinguish between temporary and permanent denials. Temporary denials must be kept on the list for the following year for further evaluation.

Consideration: In any of the last three situations, (no-response), the best option may be for the evaluator to follow up with the land owner(s) via telephone in an attempt to gain access permission. Often, the best route is to check the on-line White Pages to locate phone numbers of landowners.

Permission to sample **can be granted in the following ways**:

- The permission letter has been returned with a "yes" marked in the appropriate box, granting access to the site.
- A required permit has been submitted and approved by the agency that manages the water body at the location of the site.
- Permission has been granted over the phone or via email. The sample site has been thoroughly researched and confirmed to be managed by the person who has given the permission.

If the site meets any of the previous criteria, and permission to access the site is granted, the landowner may request further information identified in the site information fields.

If site entry permission is granted, complete the following information on the Site Evaluation Form:

- check the appropriate box in the letter status box in the
- check appropriate box for "wants data". Often the land owner or land manager requests copies of data after the sampling event occurs.
- Gate, key, or special requirements. This information needs to be transferred from the permission letter or from any phone calls. Follow any and all requests from land owners.

It is very important to contact land managers and private property owners to obtain as much information as possible. Most of the time spent in the office will be used making telephone calls and emailing information to scientists and resource managers. The more time spent acquiring office-based information results in less time spent on field reconnaissance, in turn, resulting in more sites being evaluated efficiently prior to the sampling season.

Note: *examples of agencies requiring entry permits are The National Park Service, State Parks, All county and city managed waterways in the state, Sanitation and Water districts, and Utility Districts etc.*

Agencies such as the California Department of Fish and Game are exempt from benthic macroinvertebrate collection. If collecting under University Foundation's or other entities per contract purposes, a permit will be required. Update all permit contact information in the spreadsheet to track which agency needs to be contacted.

All returned owner permission letters should be filed in a "permission returned" folder and a copy should be made and attached to the completed Site Evaluation Form.

Part II: Field Reconnaissance Procedures

Form #2: Field Reconnaissance must be completed for ALL sites that were identified as "Provisionally Meets Criteria" during the office evaluation process. Sites initially identified as Provisionally Meets Criteria will be further assessed during this step to confirm whether a site is sampleable or should be reclassified as "Criteria Not Met" based on additional information gained through the field reconnaissance process. Note that Form #2 may be completed without a new site visit if sufficient knowledge of the site exists to complete Form #2 from prior experience.

Materials

Materials that may be needed to conduct field reconnaissance include:

- Field reconnaissance form for each site (Form #2)
- Site dossiers with all available information to access sites, including copies of Form #1
- Map of area if available (e.g. USFS, BLM, EBRPD, State Park, County Park, Open Space District, City Park)
- Laptop with topographical or other useful maps (optional)
- Map ruler for 7.5 minute topographical maps (optional)
- Agency and landowner information and phone lists
- Geographical Position System (GPS) equipment
- Cell phone
- Digital camera
- Binoculars
- Personal and professional identification
- Proper hiking attire
- Safety and emergency equipment
- Appropriate permits (as needed)
- Private property entry permission letters

Preparing for Field Reconnaissance

STEP 1: Determine if Field Reconnaissance is Necessary

In most cases, a site visit is necessary to confirm site flow status, and if it is wadeable and accessible. Reconnaissance will confirm or contradict any office evaluation information received. Reconnaissance should attempt to get as close as possible to the site without trespassing. If entry permission has been obtained, the evaluator should attempt to visit the site if safety permits.

The following are common situations that require field reconnaissance:

- Contact persons are unknowledgeable of core data requirements found in primary and secondary evaluation forms and a site visit is the only method of determining if criteria are met.
- Digital aerial photos may not show seasonal variations and may be inaccurate

regarding the flow status at the site. A site visit in the fall prior to the first rains of the season will help clarify and confirm flow status.

- Insufficient data were obtained during the office evaluation, and a site visit is required to gain additional information.
- Entry to the site appears to be very complicated. A site visit is required to simplify and document the best way to enter to the site.
- Confirm any information received. Information received from land owners and managers may be incorrect and inaccurate.
- Coordinate a visit to local resource managers with a site visit if possible.

If enough information is known about the site to complete all sections of the Field Reconnaissance Form, then field reconnaissance is not needed. However, a Field Reconnaissance Form MUST be competed for each site that received a "Provisionally Meets Criteria" on the Site Evaluation Form (Form #1).

STEP 2: Organize Site Visits

For those sites that require field reconnaissance, complete the following steps:

STEP 2A: Determine the mode of travel (i.e., vehicle 4x4 or 4x2, foot, boat), or combination that is best for locating and reaching each site.

Most sites will be accessible with a vehicle. However, some sites may be very remote and require different forms of transportation to access them, such as hiking.

STEP 2B: Determine proper timing of the reconnaissance phase.

Site reconnaissance visits should be conducted prior to the first significant precipitation event, e.g., typically in August or September, in order to classify the site flow status. Some sites may require a second site visit closer to the scheduled sampling date to ascertain accessibility, wadability and safety conditions. However, <u>flow status determinations based on field reconnaissance may only be determined during the dry season, optimally, the August-September timeframe</u>.

STEP 2C: Determine if a site can be visited for reconnaissance without trespassing.

Every effort should be made to physically observe a stream or river without formal contact to the landowner. Targeting a bridge, adjacent road, cliff, or other vantage point near the site without crossing private land will eliminate the need (and save time) to request permission for access. Depending upon the distance from the site, binoculars might allow site classification.

If reconnaissance requires entering private property, make sure landowner permission has been obtained on or near the property that surrounds or abuts the site. The evaluator may call the land owner directly and informally request access to the site through the owner's property before the field visit. If contact cannot be made and every effort has been attempted to communicate with the landowner then the site must be considered "Meets Criteria – Not Sampleable."

STEP 2D: Plan a route for visiting multiple sites.

To maximize the efficiency of reconnaissance it is advisable to plan routes to visit multiple sites daily, including the 50% additional sites selected as backup sites. Such planning includes coordinating overnight accommodations, driving directions, obtaining keys, permits, and/or permission to access land, anticipating road closures due to weather conditions or construction, and estimating the time required to complete the trip into and out from the site.

Completing the Field Reconnaissance Form (Form #2)

A Field Reconnaissance Form (Form #2) MUST be competed for each site that received a "Provisionally Meets Criteria" on the Site Evaluation Form (Form #1).

Section I: Background Site Information

Using information completed on the Site Evaluation Form (Form #1), fill out all information in section I of the Field Reconnaissance Form.

Section II: Site Status

For each site, select one of the three site status categories and check the proceeding box that best classifies the site status.

Meets Criteria - Sampleable: check this box if all information gained from Site Evaluation and Field Reconnaissance processes identifies the site as sampleable. This box can ONLY be check if the following are true:

- Permission to access has been attained
- The site is physically accessible and can be entered safely at the time of sampling

Basis for Determination: If the site "Meets Criteria – Sampleable", indicate how the determination was made by checking the site visit or office evaluation box.

Site Visit Likely Needed in Spring: If the site "Meets Criteria – Sampleable", indicate whether an additional site visit is likely needed in the spring to reassess accessibility, wadability and safety.

Site Adjustments: To allow for flexibility in site access and relative homogeneity throughout the reach, sites may be moved up to 300 meters up- or downstream from the site location identified in the sample draw site list.

Meets Criteria – Not Sampleable: check the appropriate box if information gained from Office Evaluation and Field Reconnaissance processes identifies the site as sampleable, however, any one of the following are true:

- **Permission Denied**: the permission letter is returned denying access to the site, with the "no" permission granted box checked, or permission has been denied over the phone.
- **No Response**: The permission letter is not returned, returned with no response, or mailed back unopened.
- **Access Granted After Index Period**: any required permits are not

received in time to sample.

- **Temporarily Inaccessible**: The site is temporarily inaccessible but can likely be sampled during another year. This box should also be checked if it has not been possible to contact a landowner at least two times prior to field deployment.

If the site meets any of these criteria, check the appropriate box in the letter status field on the Office Evaluation Form (Form #1), stop evaluation of the site AND complete Sections I and II of the Field Reconnaissance Form (Form #2). Remember the sample location can be moved 300 m based on access, so it is feasible to move up or downstream if a single landowner does not give permission.

Important: If the "Access Granted After Index Period" or "Temporarily Inaccessible" boxes are checked, the site should be reconsidered during the next scheduled sampling year and be placed in the appropriate order of the sample draw site list for that next year.

Criteria Not Met: check this box if information gathered meets any of the following:

- **Watercourse Not Present** - after coordinates are entered into a mapping program or identified on a map, there is no obvious watercourse present at the site location (within 300 meters and within the same strata)
- **Pipeline** - site is located in a enclosed underground/aboveground pipe
- **Impoundment** - site falls on a lake, reservoir or pond
- **Tidally Influenced** - site is obviously influenced by brackish water content at some point of time during a year (i.e., is downstream of the mean high tidal mark)
- **Aquaduct** – site is an above-the-ground water conveyance designed to transport drinking water.
- **Non-Wadeable** - site will obviously be >1m deep in 50% or more of its length, or will obviously be unsafe for sampling during the spring monitoring event.
- **Inaccessible** – A site is inaccessible if you cannot safely walk to the site from your vehicle, sample and return from the site carrying samples and gear within a single day. Note: having a limited crew size is not a legitimate reason for checking this box.
- **No/Low Spring Flow** – A site may be rejected if, during the spring field visit, there is no flow or the flow is too low to completely sample using the standard operating protocols.
- **Other** – Includes sites located:
  - where any other obvious impediment prevents sampling; or
  - on a water conveyance that is not currently and never was a receiving water body. **IMPORTANT:** Only sites that have a significant weight of evidence, e.g., USGS quad maps, NHD, Bay Area Riparian Resource Inventory (BARRI) maps, Oakland Museum Creek Maps, and the San Francisco Bay Water Quality Control Plan (Basin Plan) supporting this determination can be included. Also, please communicate with the

RMC Coordinator before checking this box.

Explanation: all sites that have the "Criteria Not Met" box checked must have a justification or verifiable reason to reject these sites and not proceed further. Provide all relevant information in the "explain" box in this section.

Section III: Site and Access Information

This section should only be completed if the site received a "Meets Criteria – Sampleable" designation in Section II.

Site Accessible by Vehicle: denote whether a site is easily accessible by a vehicle by checking the Yes box. Checking the No box denotes that the site will likely require hiking to access for sampling.

Estimated Wetted Channel Width and Depth: based on a field visit to the site indicate whether the estimated wetted channel width during the spring Index sampling period will be/is 0 – 10 meters wide, or greater than 10 m wide. This information is useful to determine the reach length required to conduct bioassessments, e.g., for 0 – 10 m wetted channel widths, a 150 m reach length is appropriate; for > 10 m wetted channel widths, a 250 m reach length is appropriate. If field reconnaissance verifies that the available sampling reach is less than the required length, the available estimated length should be noted by checking the "other" box and recording the estimated available sampleable reach length. Estimated wetted channel depth may be useful to determine wadeability and whether a site may be safely accessed. Wetted channel depth should be estimated as an average depth of flow throughout the reach. Additional comments about channel depth, e.g., non-wadeable deep pools that may occur within a reach, may be noted in the Additional Comments section on page 2 of the Field Reconnaissance Form.

Flow Status: flow status is one of the most important pieces of information needed during the field reconnaissance portion of the site evaluation process. Based on observations during field reconnaissance conducted in August or September of the year prior to sampling, OR considerable knowledge about the flow status of the site based on frequent site visits in the past, check one of the following boxes:

- **Wet Flowing**: Continuously Wet or nearly so, flowing water throughout length and across most of streambed width
- **Wet Trickle**: Continuously wet or nearly so throughout length, with very low flow (trickle, <0.1 L/sec.) across partial streambed width
- **Substantially Wet**: Discontinuously wet, >25% (by length) of stream bed covered with water (isolated pools)
- **Minority Wet**: Discontinuously wet, <25% of stream bed (by length) covered with water (isolated pools)
- **No Water**: No surface water present

Note: if flow status is uncertain, visit the site again the following spring to confirm the flow status prior to sampling. If, during this visit, there is no/low flow, check the appropriate box in Section II under "Criteria Not Met."

Best Month to Sample: Bioassessment sampling has a specific index period when sampling is optimal. The index period for Bay Area creeks is spring, but may vary between sites depending on flow conditions allowing for safe entry during the spring season. Provide a best estimate of the month that sampling would be optimal based on typical rainfall and flow patterns. As a rule, sites that exhibit lower and/or intermittent flow should usually be planned for sampling before sites with higher and/or perennial flow.

Site Suitability for Sampling During Storm: A site may be chosen for water sampling during a storm event if it is accessible and water can be safety sampled during relatively large flows. Based on field reconnaissance, qualitatively determine whether the site appears to be accessible for sampling during a storm event and check either "yes" or "no" box.

Site Suitability for Bedded Sediment Sampling: A site may be chosen for bedded sediment sampling if the recently deposited fine material is present and can be sampled safely. Based on field reconnaissance, qualitatively determine whether the site appears to have fine sediment that was recently deposited on the bed of the creek/river and may provide a good site for sampling bedded sediment.

Directions to the Site and Additional Access Information: Provide directions to access the site and any information that will help the field crews find and access the site most efficiently. Make sure to include which side of the creek is best or the only way to enter. If street names apply please use them. Auto navigation units are very helpful at getting as close to the site as possible.

Use formal terms when writing down direction. For example, use "north", "south", "west" and "east" instead of "left "and "right" as those terms only work if you are heading in the same direction or are approaching the site in the same manner as the crew who may be sampling.

Other special needs such as gates and keys should be noted and written clearly, especially gate combinations. Please enter this info in the box provided.

Guidance: Be as specific as possible when filling out the form. The person performing the reconnaissance may not be the person who will return to sample the site. Giving detailed instructions and site information will help the returning team access the site quickly and efficiently and will be greatly appreciated by other crew members.

References:

BASMAA. 2011. Draft RMC Creek Status and Trends Monitoring Plan. Bay Area Stormwater Management Agencies Association. Prepared by EOA, Inc. July.

California Department of Fish and Game. 2011. Perennial Stream and Rivers Assessment Site Evaluation Guidelines. Sacramento, CA. 11 pp.

Attachment 1 – Office Site Evaluation Form

FORM #1: SITE EVALUATION (OFFICE)

BASMAA REGIONAL MONITORING COALITION (RMC)

CREEK STATUS AMBIENT (PROBABILISTIC) SURVEY

I. BACKGROUND SITE INFORMATION (FROM SAMPLE DRAW SITE LIST)

Draw Site ID:	Evaluator Name:	Date of Evaluation:

Creek Name:

Latitude:	Longitude:

Site Location/Description:	City:

COUNTY					REGION		LAND USE	
☐Alameda	☐ Contra Costa	☐ San Mateo	☐ Santa Clara	☐Solano	☐ Region 2	☐Region 5	☐ Urban	☐ Non-Urban

SAMPLING AGENCY

☐SWAMP	☐ACCWP	☐ CCCWP	☐ SMCWPPP	☐ SCVURPPP	☐FSURMP	☐Vallejo

II. SITE STATUS

☐ **Provisionally Meets Criteria**

COMMENTS:

☐ **Criteria Not Met**

Basis for Determination (Check all that apply)

- ☐ Watercourse not present within 300 meters
- ☐ Pipeline (underground/overground)
- ☐ Impoundment (e.g., Lake or Reservoir)
- ☐ Tidally Influenced
- ☐ Tributary/large storm drain within creek
- ☐ Aquaduct
- ☐ Non-wadeable
- ☐ Inaccessible
- ☐ Other (provide explanation below)

Information Source (Check all that apply)

☐BPJ ☐Evaluator Knowledge ☐Resource Managers (document)

☐GIS ☐Google Earth ☐Land Owner ☐Other

Explanation:

BEST MONTH TO SAMPLE ☐April ☐May ☐June ☐July ☐Unknown

III. SITE OWNERSHIP INFORMATION
(ONLY COMPLETED FOR SITES MARKED AS PROVISIONALLY MEETS CRITERIA ABOVE)

Ownership (check all that apply) ☐ Private ☐ Public ☐ Mixed ☐ Other (describe):

III-1. PUBLIC SITE OWNERSHIP INFORMATION

Name:	Organization:	Address:	Contact Information:

Access Granted	Call Before Entry	Gate, key, or special requirements	Wants Data
☐ Yes ☐ No	☐ Yes, phone number: ☐ No	☐ Yes, describe: ☐ No	☐ Yes ☐ No

PERMIT(S) NEEDED:

Comments:

Last Updated: 9/9/11

FORM #1: SITE EVALUATION (OFFICE)

BASMAA REGIONAL MONITORING COALITION (RMC)

CREEK STATUS AMBIENT (PROBABILISTIC) SURVEY

III-2.	PRIVATE SITE OWNERSHIP INFORMATION					
A Parcel Number:	Name(s):		Address:			
City:	State:	Zip:	Letter Status ☐ Returned ☐ Sent		Access Granted ☐ Yes ☐ No	Wants Data ☐ Yes ☐ No
Gate, key, or special requirements ☐ Yes, describe: ☐ No			Call Before Entry ☐ Yes, phone number: ☐ No			
Contact information (optional):				Date:		
Comments:						
B Parcel Number:	Name(s):		Address:			
City:	State:	Zip:	Letter Status ☐ Returned ☐ Sent		Access Granted ☐ Yes ☐ No	Wants Data ☐ Yes ☐ No
Gate, key, or special requirements ☐ Yes, describe: ☐ No			Call Before Entry ☐ Yes, phone number: ☐ No			
Contact information (optional):				Date:		
Comments:						
C Parcel Number:	Name(s):		Address:			
City:	State:	Zip:	Letter Status ☐ Returned ☐ Sent		Access Granted ☐ Yes ☐ No	Wants Data ☐ Yes ☐ No
Gate, key, or special requirements ☐ Yes, describe: ☐ No			Call Before Entry ☐ Yes, phone number: ☐ No			
Contact information (optional):				Date:		
Comments:						

Attachment 2 – Field Reconnaissance Site Evaluation Form

FORM #2: FIELD RECONNAISSANCE

BASMAA REGIONAL MONITORING COALITION (RMC)

CREEK STATUS AMBIENT (PROBABILISTIC) SURVEY

I.	BACKGROUND SITE INFORMATION (FROM FORM #1)	
Draw Site ID:	Evaluator Name:	Date of Evaluation:

Creek Name:

Latitude:	Longitude:

Site Location/Description:	City:

COUNTY					REGION		LAND USE	
☐Alameda	☐ Contra Costa	☐ San Mateo	☐ Santa Clara	☐Solano	☐ Region 2	☐Region 5	☐ Urban	☐ Non-Urban

SAMPLING AGENCY						
☐SWAMP	☐ACCWP	☐ CCCWP	☐ SMCWPPP	☐ SCVURPPP	☐FSURMP	☐Vallejo

II.	SITE STATUS

☐ **Meets Criteria - Sampleable**	☐ **Meets Criteria – Not Sampleable**	☐ **Criteria Not Met**
Basis for Determination: ☐ **Office Evaluation** (Site Visit Not Needed) ☐ **Site Visit** **Site Visit Likely Needed in Spring to confirm accessibility/wadeability?** ☐ YES ☐ NO **Site location required adjustment of up to 300 meters due to access issues? (New Lat/Long required)** ☐ YES ☐ NO ☐MAYBE If Yes, provide explanation in box to right.	**Basis for Determination:** ☐**Access Permission Permanently Denied** (i.e., permission letter is returned denying access to the site, permission denied over the phone). ☐**No Response after 2 Attempts to Contact** (Permission letter is not returned, returned with no response, or mailed back unopened) ☐ *__Access Granted After Index Period__ (i.e., required permits or permission is not received in time for sampling) ☐**__Temporarily Inaccessible__ (e.g., temporary closures due to conflicting management activities) ☐ **Other (Provide Explanation)** *Site should be sampled in following year **Site should be reconsidered for sampling in following year	**Basis for Determination** (Check all that apply) ☐ Watercourse not present within 300 meters ☐ Pipeline (underground/overground) ☐ Impoundment (e.g., Lake or Reservoir) ☐ Tidally Influenced ☐ Aquaduct ☐ Non-wadeable ☐ Inaccessible ☐ No/Low Spring Flow ☐ Other (provide explanation)
	EXPLANATION:	

III.	SITE AND ACCESS INFORMATION (Only Completed for Sites Marked as "Meets Criteria – Sampleable" Above)

Site Accessible by Vehicle: ☐ YES ☐ NO	**Est. Wetted Channel Width:** ☐0 – 10m ☐ > 10m	**Available Reach Length:** ☐150m ☐250m ☐Other:_________m	**Est. Wetted Channel Depth:**

Flow Status:	☐**Wet Flowing:** Continuously Wet or nearl so, flowing water	☐**Wet Trickle**: Continuously wet or nearly so, very low flow (trickle, <0.1 L/sec.)	☐**Majority Wet:** Discontinuously wet, >25% (by length) of stream bed covered with water (isolated pools)	☐**Minority Wet:** Discontinuously wet, <25% of stream bed (by length) covered with water (isolated pools)	☐**No Water:** No surface water present

Best Month to Sample:	☐April	☐May	☐June	☐July	☐Unknown

Last Updated: 10/26/11

FORM #2: FIELD RECONNAISSANCE

BASMAA REGIONAL MONITORING COALITION (RMC)

CREEK STATUS AMBIENT (PROBABILISTIC) SURVEY

Site access appears suitable for sampling water toxicity during storm events ☐YES ☐ NO

Site appears to have suitable amount of deposited sediment for sediment-related sampling ☐YES ☐ NO

DIRECTIONS TO SITE: (Include x-streets and landmarks, address for auto navigation)

Picture Numbers:

Ownership Verified?

Gate, keys, special needs: ☐ Yes, describe: ☐ No	Site Address/Coordinates:
Overnight accommodations required: ☐ Yes, describe options: ☐ No	Comments:

ADDITIONAL COMMENTS:

Last Updated: 10/26/11

STANDARD OPERATING PROCEDURES
for
Reports to RMC Program Managers
(SOP R-1)

Introduction

The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1

This SOP applies to the following activities from MRP Table 8.1:

- Biological Assessment
- General Water Quality
- Chlorine
- Temperature
- Toxicity – Water Column
- Toxicity – Bedded Sediment, Fine-Grained
- Pollutants – Bedded Sediment, Fine-grained
- Pathogen Indicators
- Stream Surveys

SOP Background and Application

Consistent with the RMC programmatic QAPP (reference) and in order to ensure SWAMP comparability, RMC participants must prepare and submit a number of reports to management. These reports can be separated into two main categories: (1) reports prepared for internal use in assessing compliance with the QAPP, and (2) reports prepared for submittal to the Water Board that reports results of specific monitoring activities. This SOP details reports prepared as part of the former.

References to Existing SOPs

QA/QC protocols are also referenced in the associated RMC QAPP for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety

None

Methods/Procedures

There are three main types of reports prepared that fall within the category of internal reports: (1) readiness reviews, (2) post sampling event reports, and (3) field activity audits.

READINESS REVIEWS

PMLs will review all field equipment, instruments, containers, and paperwork to ensure that everything is ready prior to each sampling event. All sampling personnel will be given a brief review of the goals and objectives of the sampling event and the sampling procedures and equipment that will be used to achieve them. All equipment will be checked to make sure that it is in proper working order. Equipment maintenance records will be checked to ensure that all field instruments have been properly maintained and that they are ready for use. Adequate supplies of all preservatives, bottles, labels, waterproof pens, etc. will be checked before each field event to make sure that there are sufficient supplies to successfully support each sampling event, and, as applicable, are within their expiration dates.

In the event that a problem is discovered during a readiness review it will be noted in the field log book and corrected before the field crew is deployed. The actions taken to correct the problem will also be documented with the problem in the field log book. This information will be communicated by the PML to the CQAO prior to conducting relevant sampling. The CQAO will track corrective actions taken, and as appropriate, communicate this information to other Stormwater Programs for whom it may be relevant. Readiness review templates associated with each monitoring activity are compiled in Attachment 1.

POST SAMPLING EVENT REPORTS

PMLs will be responsible for post sampling event reviews. Any problems that are noted will be documented along with recommendations for correcting the problem. Post sampling event reviews will be conducted following each sampling event in order to ensure that all information is complete and any deviations from planned methodologies are documented. Post sampling event reviews will include field sampling activities and field measurement documentation in order to help ensure that all information is complete. The reports for each post sampling event will be used to identify areas that may be improved prior to the next sampling event. A combined post sampling event report, identifying any deficiencies and corrective actions taken, will be an integral part of the final report on this proposed project. A template for preparation of post sampling event reports is presented in Attachment 2.

FIELD ACTIVITY AUDITS

Field activity audits will assess the sample collection methodologies, field measurement procedures, and record keeping of the field crew in order to ensure that the activities are being conducted as planned and as documented in this QA Plan. In the event that a problem is discovered during a field audit, it will be corrected as soon as possible so that all subsequent samples and field measurements collected are valid. The problems and the actions taken to correct them will become a part of the field audit report. Any field sampling team member has authority to stop any sampling or field measurement activity that could potentially compromise data quality.

Due to the specialized nature of bioassessment work being performed, it is anticipated that CDFG will be responsible for conduct of field activity audits. At least one month prior to initiation of field bioassessments, the MCC will notify CDFG of the planned monitoring activities, and as requested, will coordinate activities with audit staff availability. The standard field audit form used by CDFG, 2010 revision, is included as Attachment 3. Although field activity audits will not be performed by RMC personnel, review of the standard audit form is recommended for all field crews performing bioassessment work.

The RMC CQAO will be responsible for performance of field activity audits for targeted creek status monitoring components. This will again be performed on at least a biennial basis for individual field crews. The audit results will be delivered to the PM. A template for use with the audits is provided in Attachment 4.

Quality Assurance / Quality Control

Readiness reviews are one tool to be employed by local programs to ensure that all monitoring is conducted in an efficient, SWAMP comparable manner consistent with the programmatic QAPP. Questions or findings raised about procedures implemented at the local level are communicated to CQAO for discussion and resolution. In this way, the three required internal reports form part of a feedback loop between local programs and central RMC organization to communicate and resolve local issues throughout the program in a consistent, SWAMP comparable fashion.

References

None

Attachment 1 – Template for RMC Readiness Reviews

RMC Targeted Sampling

Post-event Sampling Report

LOCAL PROGRAM ______________________________________

MONITORING ACTIVITY ______________________________________

FIELD TEAM ______________________________________

DATE ______________________________________

ITEM	Y	N	N/A	COMMENTS
MOBILIZATION				
Readiness Review – was a readiness review conducted				
Equipment – was the appropriate equipment available in the field, in good working order and calibrated				
Paperwork – was all required paperwork (e.g., datasheets, SOPs, permits, maps, etc.) on-hand				
Decontamination – did the field crew previously decontaminate all equipment, including boots and waders for invasive species				
MONITORING				
Equipment – were there any problems with equipment				
Sample Containers – were the appropriate containers used for the analyses				
Labeling of Samples – were the sample containers labeled according to the SOP and legible				
Sample Handling – were appropriate sample handling techniques employed, consistent with SOP and QAPP				
Photo-Documentation – did the field crew properly record the photo code for all photographs				
Quality Assurance – were there any quality assurance concerns of field crew?				
POST SAMPLING ACTIVITIES				
Sample Handling – were samples transferred to the laboratory in a manner consistent with SOPs and QAPP				

ITEM	Y	N	N/A	COMMENTS
Sampling Team Debriefing – did the field team meet to discuss the post sampling activities and responsibilities				
Field Data Sheets – did the field crew completely and correctly fill out the field forms				
Verification and Agreement – did the field crew resolve all data disputes and discrepancies or record questions to be resolved later				
Chain of Custody Form – was a COC form used correctly				
Aquatic Invasive Species Decontamination – was the equipment, including boots and waders, decontaminated according to the field crew's SOP				
Follow-up – are there any issues that need to be communicated to LQAO and CQAO				

ADDITIONAL COMMENTS

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FOLLOW-UP REQUIRED

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PREPARED BY:

______________________________ __________________

SIGNATURE **DATE**

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NAME

Attachment 2 – Template for RMC Post Event Sampling Reports

RMC Targeted Sampling

Post-event Sampling Report

LOCAL PROGRAM ____

MONITORING ACTIVITY ___________________________________

FIELD TEAM ____

DATE ____

ITEM	Y	N	N/A	COMMENTS
MOBILIZATION				
Readiness Review – was a readiness review conducted				
Equipment – was the appropriate equipment available in the field, in good working order and calibrated				
Paperwork – was all required paperwork (e.g., datasheets, SOPs, permits, maps, etc.) on-hand				
Decontamination – did the field crew previously decontaminate all equipment, including boots and waders for invasive species				
MONITORING				
Equipment – were there any problems with equipment				
Sample Containers – were the appropriate containers used for the analyses				
Labeling of Samples – were the sample containers labeled according to the SOP and legible				
Sample Handling – were appropriate sample handling techniques employed, consistent with SOP and QAPP				
Photo-Documentation – did the field crew properly record the photo code for all photographs				
Quality Assurance – were there any quality assurance concerns of field crew?				
POST SAMPLING ACTIVITIES				
Sample Handling – were samples transferred to the laboratory in a manner consistent with SOPs and QAPP				

ITEM	Y	N	N/A	COMMENTS
Sampling Team Debriefing – did the field team meet to discuss the post sampling activities and responsibilities				
Field Data Sheets – did the field crew completely and correctly fill out the field forms				
Verification and Agreement – did the field crew resolve all data disputes and discrepancies or record questions to be resolved later				
Chain of Custody Form – was a COC form used correctly				
Aquatic Invasive Species Decontamination – was the equipment, including boots and waders, decontaminated according to the field crew's SOP				
Follow-up – are there any issues that need to be communicated to LQAO and CQAO				

ADDITIONAL COMMENTS

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FOLLOW-UP REQUIRED

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PREPARED BY:

____________________________ ________________

SIGNATURE **DATE**

____

NAME

Attachment 3 – Template for RMC Field Activity Audits, Bioassessment

2010 SWAMP Bioassessment Procedure
Biological and Physical Habitat Field Audit

Field Team:____

Field Location:____

Date of Audit:____

Background of Group and Audit Objectives:

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Item	Y	N	N/A	Comments
Field Day and Sampling Site Preparations				
Sampling Team Briefing – did the field crew meet to discuss the project objectives, field conditions, safety procedures and any special situation associated with the site				
Quality Assurance Project Plan – was the field crew familiar with the project QAPP and the assigned QA Officer				
Permits – did the field crew have copies of DFG sampling MOU and LAI				
Permits – did the field crew have a copy of the landowner permission letter				
SOP – did the field crew have a copy of the most recent SWAMP Bioassessment Protocol				

SOP – did the field crew have a project specific SOP which lines out the assignments for all crew members				
SOP – did the field crew have a system for adding, updating, and retiring the SOP, as necessary				
Equipment Inspection – did the field crew ensure that all the field equipment was present and in working order				
Equipment Calibration – did the field crew ensure that all equipment was calibrated according to SOPs and/or manufacturer instructions				
Field Data Sheets – did the field crew have the most recent copy of the SWAMP Bioassessment Field Forms				
Reach Documentation – did the field crew fill in this section of the field forms before starting the actual field work				
Reach Documentation – did the field crew determine the Latitude and Longitude at the proper reach location and record the proper units and type of device use				
Reach Documentation – did the field crew get SWAMP site codes from the Regional SWAMP coordinator				
Reach Length – did the field crew determine the average stream width, decide the reach length according to the SOP and record any discrepancies from the required reach length				
Notable Field Conditions – did the field crew check the appropriate boxes and if necessary obtain the information from outside the reach area				
Decontamination – did the field crew previously decontaminate all equipment, including boots and waders for Aquatic Invasive Species (AIS)				

Describe the Field Team Coordination (number of field personnel, how data is recorded, how the data collection is split among field personnel, how disputes or uncertainties in the data collection are dealt with, etc.):

Item	Y	N	N/A	Comments
Ambient Water Quality Measurements				
Temperature – did the field crew measure the water temperature at the A transect and record the type of equipment used				
pH – did the field crew measure the pH at the A transect and record the type of equipment used				
Alkalinity – did the field crew measure the alkalinity at the A transect and record the type of equipment used				
Dissolved Oxygen – did the field crew measure DO at the A transect and record the type of equipment used				
Specific Conductance – did the field crew measure conductivity at the A transect and record the type of equipment used				
Equipment – when using colorimetric kits, did the field crew inspect the reagents for expiration dates				
Additional Chemical Measures – when collecting samples for additional chemicals, did the field crew have a copy of the appropriate SWAMP SOP				
Holding Times – was the field crew aware of all appropriate holding times for the additional chemical measures				

Item	Y	N	N/A	Comments
Invertebrate Collection - Reach Wide Benthos Procedure				
Collection Location – did the field crew member properly determine where the net should be placed in relation to the transect				
Net Placement – did the field crew member place the sampling net correctly in the substrate and perpendicular to flow				
Substrate Excavation – did the field crew member adequately disturb and scrub the substrate to collect the invertebrates				
Substrate Excavation Duration – did the field crew member disturb the substrate for a consistent duration (1-3 minutes) and in accordance with the type of substrate				
Substrate Excavation Depth – did the field crew member excavate the substrate to a depth (4-6 inches) adequate to collect all the invertebrates				
Excavated Material Cleaning – did the field crew member take precautions that no invertebrates were lost when removing large material from the net				
Handling of Excavated Material – did the field crew member take precautions that no invertebrates were lost when transporting the net between collection locations				
Compositing of Excavated Material – did the field crew member take precautions that no excavated material was lost when compositing and placing material in jars				
Labeling of Samples – were the invertebrate collection jars labeled according to the SOP				
Collection of Duplicates – when collecting duplicate samples, did the field crew member determine the proper location and ensure the samples were not cross-contaminated				
Sample Integrity – were the sample jars kept out of direct sunlight, away from heat, and protected from desiccation during sampling, sample processing and sample storage				

Item	Y	N	N/A	Comments
Reach-Wide Physical/Habitat Measurements				
Discharge Measurements – when using the Velocity Area Method or Buoyant Object Method (circle one), did the field crew choose an appropriate channel section and record all required measurements				
Additional Cobble Embeddedness Measurements – did the field crew record any additional cobble embeddedness measures to equal a total of 25 and was a random method used to obtain the cobbles				
Slope and Bearing – did the field crew use an auto-level for low gradient channels or a clinometer for high gradient channels and record information for each transect starting at K				
Slope and Bearing – did the field crew record the bearing in degrees on the center of the transect starting at K				
Slope and Bearing – did the field crew understand how and when to use the Supplemental Segment section of the form				
Channel Alteration Visual – did the field crew assess channel alteration for the entire reach and discuss the assessment to come to an agreement on the final estimate				
Sediment Deposition Visual – did the field crew assess sediment deposition for the depositional zones of the entire reach and discuss the assessment to come to an agreement on the final estimate				
Epifaunal Substrate/Cover Visual – did the field crew assess epifuanual substrate/cover for the entire reach and discuss the assessment to come to an agreement on the final estimate				

Item	Y	N	N/A	Comments
Transect Based Physical/Habitat Measurements				
Wetted Width – did the field crew determine the wetted width measurement accurately				
Bankfull Width and Height – did the field crew determine the bankfull width and height measurement accurately				
Depth and Substrate Measurements – did the field crew measure the depth and pick up the substrate in a systematic, unbiased manure				
Transect Substrate Measurements – did the field crew measure the substrate particle properly and use the correct size class categories				
Cobble Embeddedness – did the field crew recognize cobble sized substrate and determine the percent embeddedness accurately				
CPOM – did the field crew recognize the correct material and location in relation to the substrate				
Microalgae Thickness – was the field crew able to determine microalgae presence and correct thickness code				
Macroalgae – was the field crew able to determine the difference between attached and unattached macroalgae presence				
Canopy Cover – was the field crew able to properly use the modified densiometer and obtaining measurements correctly				
Bank Stability – did the field crew estimate the bank stability categories properly and for the correct bank zone				
Riparian Vegetation – did the field crew understand and properly estimate the three canopy categories for the correct area and elevation zones				
Instream Habitat Complexity – did the field crew understand and properly estimate the nine habitat categories for the correct channel area				
Human Influence– did the field crew understand and properly estimate the fourteen human influence categories for the correct zones relative to the channel				

Inter-Transect Substrate Measurements – did the field crew collect all the measurement similar to the major transects				
Flow Habitats – did the field crew recognize all the flow habitat categories and the definition of fast/slow and shallow/deep				
Photo-Documentation – did the field crew take photographs at the A, F and K transect and in the proper orientation to the channel				
Photo-Documentation – did the field crew properly record the photo code for all photographs including any supplemental pictures of the sampling reach				

Item	Y	N	N/A	Comments
Post Sampling Activities				
Sampling Team Debriefing – did the field team meet to discuss the post sampling activities and responsibilities				
Field Data Sheets – did the field crew completely and correctly fill out the field forms				
Verification and Agreement – did the field crew resolve all data disputes and discrepancies or record questions to be resolved later by the ABL				
Invertebrate Sample Integrity – were the invertebrate samples inspected for proper alcohol level, labels and secured for travel				
Chain of Custody Form – was a COC form used for invertebrates samples and was it properly filled out				
Additional Chemical Measures – if samples were collected for additional chemicals, did the field crew ensure the samples were labeled and stored properly for transportation to the Lab according to the appropriate SOP				
Equipment Count – did the field crew account for all the equipment				
Aquatic Invasive Species Decontamination – was the equipment, including boots and waders, decontaminated according to the field crew's SOP				

I CERTIFY THAT THIS FIELD TEAM HAS ADEQUATELY FULLFILLED ALL REQUIRMENTS OF THE FIELD AUDIT FOR THE SWAMP BIOASSESSMENT PROCEDURE

____

James M. Harrington
Staff Environmental Scientist
California Department of Fish and Game

COMMENTS:

Attachment 4 – Template for RMC Field Activity Audits, Targeted Sampling

RMC Targeted Sampling Field Audit

LOCAL PROGRAM ____

FIELD TEAM ____

AUDIT LOCATION ____

DATE ____

AUDITOR ____

BACKGROUND AND OBJECTIVES OF AUDIT ___________________________

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ITEM	Y	N	N/A	COMMENTS
MOBILIZATION				
Sampling Team Briefing – did the field crew meet to discuss the project objectives, field conditions, safety procedures and any special situation associated with the site				
Quality Assurance Project Plan – was the field crew familiar with the project QAPP				
SOP – did the field crew have a copy of the most current SOP				
Equipment Inspection – did the field crew ensure that all required field equipment was present, calibrated, and in working order				
Field Data Sheets – did the field crew have the most recent copy of the field forms				
Decontamination – did the field crew previously decontaminate all equipment, including boots and waders for invasive species				
MONITORING				
Sampling Order – did the field crew conduct monitoring activities in the appropriate order				
Equipment – did the field crew use appropriate equipment for collection of samples / measurements				

ITEM	Y	N	N/A	COMMENTS
Sample Containers – were the appropriate containers used for the analyses				
Labeling of Samples – were the sample containers labeled according to the SOP				
Holding Times – was the field crew aware of all appropriate holding times for the additional chemical measures				
Sample Integrity – were the sample jars kept out of direct sunlight, away from heat, and protected from desiccation during sampling, sample processing and sample storage				
Photo-Documentation – did the field crew properly record the photo code for all photographs				
Housekeeping – did the field crew conduct sampling in a manner to minimize disruption to natural environment				
POST SAMPLING ACTIVITIES				
Sampling Team Debriefing – did the field team meet to discuss the post sampling activities and responsibilities				
Field Data Sheets – did the field crew completely and correctly fill out the field forms				
Verification and Agreement – did the field crew resolve all data disputes and discrepancies or record questions to be resolved later				
Chain of Custody Form – was a COC form used correctly				
Aquatic Invasive Species Decontamination – was the equipment, including boots and waders, decontaminated according to the field crew's SOP				

ADDITIONAL COMMENTS

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CONDUCTED BY:

__________________________ _______________

SIGNATURE **DATE**

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NAME

STANDARD OPERATING PROCEDURES
for
Reports to RWQCB
(SOP R-2)

Introduction
The Municipal Regional Stormwater NPDES Permit (MRP) was adopted by the San Francisco Bay Regional Water Quality Control Board on October 14, 2009. The Regional Monitoring Coalition (RMC) provides coordination and oversight of monitoring activities conducted in compliance with Provision C.8 (Water Quality Monitoring) of the MRP. The RMC is comprised of those Bay Area Stormwater Management Agencies Association (BASMAA) participants subject to monitoring requirements in the MRP. This SOP is part of the RMC's regional coordination effort.

MRP Requirements from Table 8.1
This SOP applies to the following activities from MRP Table 8.1:

- Biological Assessment
- General Water Quality
- Chlorine
- Temperature
- Toxicity – Water Column
- Toxicity – Bedded Sediment, Fine-Grained
- Pollutants – Bedded Sediment, Fine-grained
- Pathogen Indicators
- Stream Surveys

SOP Background and Application
Consistent with the RMC programmatic QAPP (reference) and in order to ensure SWAMP comparability, RMC participants must prepare and submit a number of reports to management. These reports can be separated into two main categories: (1) reports prepared for internal use in assessing compliance with the QAPP, and (2) reports prepared for submittal to the Water Board that report results of specific monitoring activities (permit-related reports). This SOP details reports prepared as part of the latter.

References to Existing SOPs
This SOP is adapted from information provided in the MRP. Relevant QA/QC protocols are also referenced in the associated RMC QAPP for bioassessment and water quality monitoring: [PROVIDE LINKS/REFERENCES WHEN AVAILABLE]

Special Cautions and Considerations; Health and Safety
None

Methods/Procedures

There are four main types of reports prepared that fall within the category of permit-related reports: (1) Water Quality Standard Exceedance Reports, (2) Status and Trend Electronic Data Reports, (3) Urban Creeks Monitoring Report, and (4) Integrated Monitoring Report. Each of these reports are summarized in the sections below, and described in more detail within MRP Section C.8.g (SFRWQCB, 2009). The standard content for each report is described as follows:

- The purpose of the monitoring and briefly describe the study design rationale.
- Quality Assurance/Quality Control summaries for sample collection and analytical methods, including a discussion of any limitations of the data.
- Brief descriptions of sampling protocols and analytical methods.
- Sample location description, including waterbody name and segment and latitude and longitude coordinates.
- Sample ID, collection date (and time if relevant), media (e.g., water, filtered water, bed sediment, tissue).
- Concentrations detected, measurement units, and detection limits.

Permittees who do not participate in the Regional Monitoring Group or in a stormwater countywide program must submit an individual Integrated Receiving Water Impacts Report.

- Assessment, analysis, and interpretation of the data for each monitoring program component.
- Pollutant load and concentration at each mass emissions station.
- A listing of volunteer and other non-Permittee entities whose data are included in the report.
- Assessment of compliance with applicable water quality standards.
- A signed certification statement.

WATER QUALITY STANDARD EXCEEDENCE REPORT

If RMC data indicate that discharges are causing or contributing to an exceedance of an applicable water quality standard (WQS), the applicable PML shall notify the Water Board within 30 days and submit a follow-up report. The report shall describe BMPs that are currently being implemented, and the current level of implementation, and additional BMPs that will be implemented, and/or an increased level of implementation, to prevent or reduce the discharge of pollutants that are causing or contributing to the exceedance of WQSs. The report shall constitute a request to the Water Board for amendment of the MRP. The report and application for amendment shall include an implementation schedule.

STATUS AND TRENDS ELECTRONIC DATA REPORT

The CIMC shall submit an Status and Trends Electronic Data Report to the Water Board no later than January 15 of each year, reporting on all data collected during the foregoing October 1–September 30 period. These reports shall be in a format compatible with the SWAMP database, as described within SOP DM-1 (Field Measurement Data Management), DM-2 (Continuous Monitoring Data Management), and DM-3 (Lab Data Management). Water Quality Objective exceedances shall be highlighted in the Report.

Electronic data shall also be submitted during the same timeframe to SFEI for entry into the California Environmental Data Exchange Network (CEDEN).

URBAN CREEKS MONITORING REPORT

The RP shall prepare and submit a comprehensive Urban Creeks Monitoring Report no later than March 15th of each year, reporting on all data collected during the preceding October 1st through September 30th period. The initial report is due March 15, 2013. Each report shall contain summaries Status, Long-Term, Monitoring Projects, and Pollutants of Concern Monitoring including, as appropriate, the following:

- Maps and descriptions of all monitoring locations;
- Data tables and graphical data summaries; Constituents that exceed applicable water quality standards shall be highlighted;
- For all data, a statement of the data quality;
- An analysis of the data, which shall include the following:
- calculations of biological metrics and physical habitat endpoints;
- comparison of biological metrics to: (1) each other, (2) applicable reference sites, (3) applicable IBIs, and (4) physical habitat endpoints.
- A discussion of the data for each monitoring program component, which shall: (1) discuss monitoring data relative to prior conditions, beneficial uses and applicable water quality standards as described in the Basin Plan, the Ocean Plan, or the California Toxics Rule or other applicable water quality control plans; (2) where appropriate, develop hypotheses to investigate regarding pollutant sources, trends, and BMP effectiveness; (3) identify and prioritize water quality problems; (4) identify potential sources of water quality problems; (5) describe follow-up actions; (6) evaluate the effectiveness of existing control measures, and (7) identify management actions needed to address water quality problems.

INTEGRATED MONITORING REPORT

No later than March 15, 2014, the RP shall be responsible for preparation and submittal of an Integrated Monitoring Report for the RMC. This report shall be in lieu of the Annual Urban Creeks Monitoring Report due on March 15, 2014.

The report shall include a comprehensive analysis of all data collected through the RMC, and may include other pertinent studies. For Pollutants of Concern, the report shall include methods, data, calculations, load estimates, and source estimates for each Pollutant of Concern Monitoring parameter. The report shall include a budget summary for each monitoring requirement and recommendations for future monitoring.

SCHEDULE

Table 1 – Schedule for Preparation of RMC Reports to Water Board

Type of Report	Frequency	Projected Delivery Dates(s)	Person Responsible	Report Recipients
WQ Exceedance	Trigger-based	Vary	PML	WB
S&T Electronic Data	Annually	January 15	CIMC	WB, SFEI
Urban Creeks Monitoring	Annually	March 15	RP	WB
Integrated Monitoring	End of permit	March 15, 2014	RP	WB

Quality Assurance / Quality Control

The measures adopted by the RMC to assure quality of data deliverables are described in detail in the following documents:

- RMC programmatic QAPP (reference when available)
- SOP DM-1 (Field Measurement Data Management)
- SOP DM-2 (Continuous Monitoring Data Management)
- SOP DM-3 (Lab Data Management)

All narrative reports prepared by the RMC or by local programs will be subject to an editorial review process wherein either the PM (for programmatic deliverables) or PML (for local stormwater program deliverables) performs an editorial review of draft materials provided by report preparer(s) and certifies validity of those deliverables.

References

California Regional Water Quality Control Board San Francisco Bay Region, 2009. Municipal Regional Stormwater NPDES Permit Order R2-2009-0074 NPDES Permit No. CAS612008. October 14, 2009.

B4

Small Tributaries Loading Strategy Multi-Year Plan

Contents

Acknowledgments

This document was developed collaboratively by the Small Tributaries Loading Strategy Local Team of the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP):

- Lester McKee, Alicia Gilbreath, Ben Greenfield, Jennifer Hunt, Michelle Lent, Aroon Melwani (SFEI)
- Arleen Feng (ACCWP) and Chris Sommers (EOA/SCVURPPP) for BASMAA
- Richard Looker and Tom Mumley (SFRWQCB)

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Additional technical advice to the STLS Work Group was provided in early meetings by Mike Stenstrom (UCLA) and Eric Stein (SCCWRP), who also participated in reviews by the RMP Sources Pathways and Loadings Workgroup.

Members of the BASMAA Monitoring and Pollutants of Concern Committee and stormwater program staff also participated in development and review of the Multi-Year Plan, especially Jamison Crosby (Contra Costa Clean Water Program) and Jon Konnan (San Mateo Countywide Water Pollution Prevention Program).

Introduction

The Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) was established to provide the scientific information needed to support water quality management. In the 21st century, the RMP's activities are shifting to provide more direct support for answering specific Management Questions through multi-year Strategies consisting of coordinated activities centered on particular pollutants or processes. The Small Tributaries Loading Strategy (STLS, SFEI 2009) presented an initial outline of potential activities to address four key Management Questions regarding local watershed contributions of Pollutants of Concern to San Francisco Bay. The objective of this Multi-Year Plan (MYP) is to provide a more comprehensive description of the suite of activities to be included in the STLS over the next 5-10 years. It provides a detailed rationale for the methods and locations of proposed activities, including watershed monitoring of local tributaries.

Some of these activities will be conducted by stormwater programs to fulfill the requirements of the Municipal Regional Stormwater Permit (MRP, SFRWQCB 2009) for Pollutants of Concern (POC) loads monitoring[1]; this MYP supports development of an improved alternative monitoring approach for addressing these MRP needs that will be integrated with the RMP-funded activities.

The MYP includes continuing development of the Regional Watershed Spreadsheet Model as a tool for estimating regional loads. It also clarifies the linkage between the STLS and the RMP's developing Modeling Strategy for pollutant fate and transport in the Bay as a whole and also in the Bay margins which are a vital link between the local watersheds and the Bay.

The first version of the MYP (Version 2011) was prepared in September 2011. The updated Version 2012A incorporated additional information and STLS activities through mid-January 2012, including:

- Progress on the Regional Watershed Spreadsheet Model including preliminary explorations and recommendations for developing Event Mean Concentrations to parameterize the model for priority POCs.
- Setup of 4 watershed monitoring sites, preparation of draft QAPP and Field Manual, and coordination among field crews.
- Coordination of laboratory contracting and management and QA/QC of watershed monitoring data

Version 2012 B incorporates additional information and STLS activities through June 2012, including:

[1] Described in Provisions C.8.e and its sub-provisions i, iii, iv and v. Sub-provisions vi and vii are also related to the same objectives, see Appendix A.

- Review of lessons learned from the first year of watershed monitoring
- Selection of two additional watershed monitoring sites in addition to the four previously selected.

Version 2012A involves no updates to the Appendices provided with MYP Version 2011[2]. Updated or new versions of some Appendices will be provided in the future.

Background

Based on data collected by the RMP and others, the San Francisco Regional Water Quality Control Board (Water Board) has determined that San Francisco Bay is impaired or potentially impaired by a number of POCs. For some of these, the Water Board has adopted water quality attainment strategies including Total Maximum Daily Loads (TMDLs) for mercury and PCBs (SFRWRCB 2006, 2008) due to their persistence in the environment and accumulation in aquatic food webs that pose threats to wildlife and human consumers of fish from the Bay.

Each TMDL identifies sources and pathways contributing to the impairment or detrimental effects associated with the subject pollutant, as illustrated for PCBs (Figure 1). The sizes of the arrows on the figure illustrate, conceptually, the importance of each source, pathway or process. For PCBs, urban runoff, deposition of associated sediment, and transfer from sediment up through the food chain are the important pathways and processes. For each source, the TMDL estimates current annual loads and identifies reductions in those loads that would be required to eventually eliminate the impairment. Each TMDL is adopted along with an implementation plan consisting of management actions to be taken by various discharger groups in order to achieve these load reductions.

Urban runoff from local watersheds is a significant pathway for many pollutants of concern into the Bay, and the MRP contains several provisions requiring management actions and studies to address mercury and PCB its (see Appendix A for details). The MRP's monitoring provisions also include other pollutants for which storm water data are needed. The MRP also encourages coordination of storm water program activities with the RMP are other regional collaborative groups.

[2] On behalf of MRP Permittees, the Bay Area Stormwater Management Agencies Association (BASMAA) provided MYP Version 2011 and available Appendices A, C, D, E and F to the San Francisco Regional Water Quality Control Board as attachments to a Monitoring Status Report (Part B of a composite document that also included a Regional Pollutants of Concern Report for required annual reporting); these documents are available on the Internet at
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/MRP/2011_AR/BASMAA/index.shtml
In March 2012, MYP version 2012 A was attached to another semiannual Monitoring Status Report, but without any revisions to the appendix list.

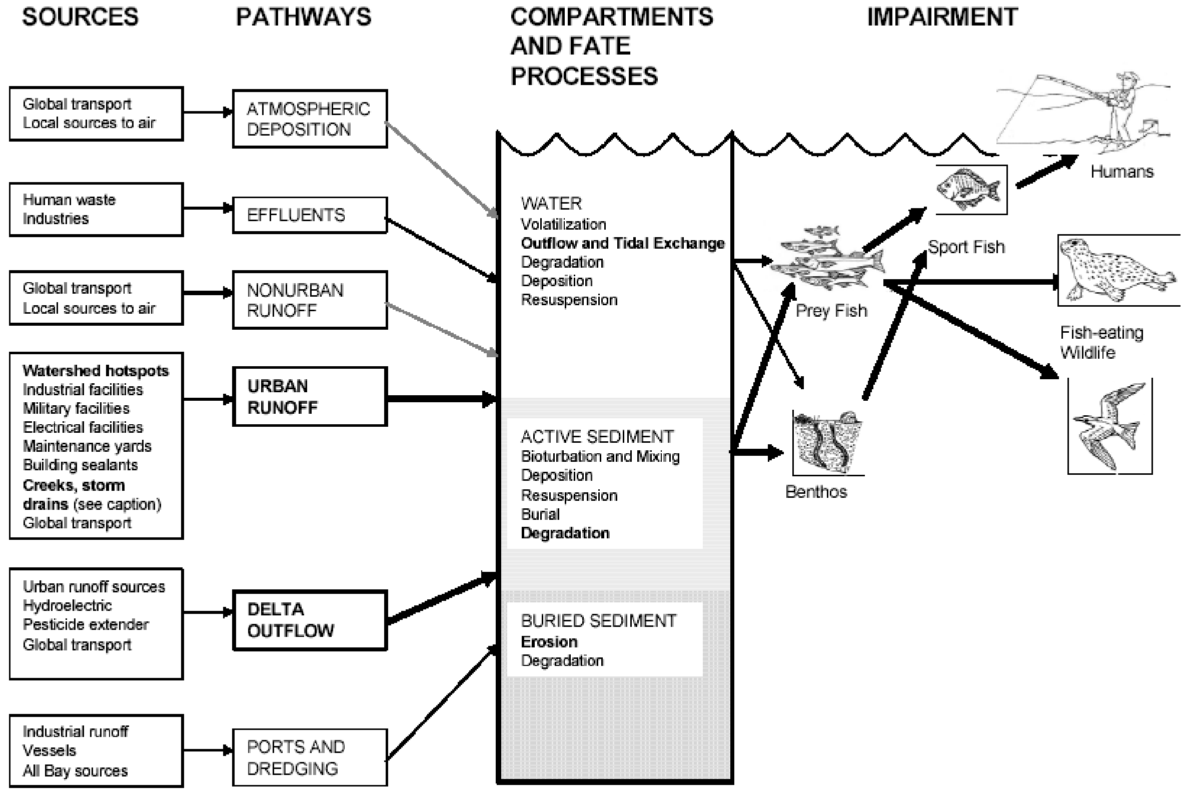

Figure 1. Conceptual Model of PCBs in San Francisco Bay (from Davis et. al 2006)

The STLS MYP is a major component of the RMP Multi-Year Plan, which integrates the efforts of many workgroups and strategy teams to develop five-year plans addressing the highest priority management information needs identified by the RMP stakeholders. The intent of the Multi-Year Plan is to anticipate regulatory or management decisions and policies that are on the horizon, so that the specific scientific knowledge needed to inform the decisions will be available at the required times.

The RMP's Multi-Year Planning Process, initiated as the "Master Planning Process" in 2010[3], articulates several "strategies" which coordinate studies across the pre-existing process-oriented work groups (see Appendix A). The STLS is a major strategy with linkages to other strategies for mercury, PCBs and forecasting/ modeling. The Water Board has given a high priority to refining and tracking load estimates of PCBs and mercury to assess progress towards the reductions in the TMDLs. Initial estimates of stormwater contributions to annual loads of mercury and PCBs to the Bay were based on limited data and one of the RMP's goals has been to improve both data collection and the conceptual framework for developing load estimates. Understanding trends from individual watersheds will also be important, whether in response to general demographic

[3] RMP activities are planned on a calendar year basis, while BASMAA and most of its member agencies operate on a Fiscal Year that begins on July 1.

and climatic changes or targeted management actions to reduce local discharges of PCBs and mercury.

Depending on the state of existing knowledge and potential impairment status, loading information needs may be a somewhat lower priority for other POCs such as copper (for which the highest priority information gaps are about effects and not loading) or legacy organochlorine pesticides (for which the monitoring objective may be tracking a long-term “recovery” curve of diminishing concentrations in the Bay). A third group of POCs are present in the Bay at concentrations that cause concern; since existing data are insufficient to assess the amount of contribution from stormwater conveyance, initial STLS work will contribute to a general characterization of spatial occurrence and ranges of concentrations. This differential prioritization is reflected in the MRP’s partitioning of required stormwater monitoring parameters into two groups with different levels of minimum sampling frequency:

- Category 1 (minimum 4 events per year): Total and Dissolved Copper; Total Mercury; Methyl Mercury; Total PCBs; Suspended Sediments (SSC); Total Organic Carbon; Water Column Toxicity; Nitrate as N; Hardness.
- Category 2 (minimum 2 events in alternate years): Total and Dissolved Selenium; Total PBDEs (Polybrominated Diphenyl Ethers); Total PAHs (Poly-Aromatic Hydrocarbons); Chlordane; DDTs (Dichloro-Diphenyl-Trichloroethane); Dieldrin; (Nitrate as N –duplicate?); Pyrethroids - bifenthrin, cyfluthrin, beta-cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin; Carbaryl and fipronil; Total and Dissolved Phosphorus.

The RMP Sources Pathways and Loadings Work Group (SPLWG) was initiated in 1999 to address pollutant loading to the Bay. It has overseen monitoring studies of high-priority POCs in small tributaries at the Guadalupe River (McKee et al., 2004; 2005; 2006) and at Zone 4 Line A (a small flood control channel in Hayward) (McKee et al., 2009; Gilbreath et al., in review) as well as at Mallard Island (Leatherbarrow et al., 2005; McKee et al., 2006; David et al., 2009, David et al., in review) where the Sacramento River enters the region.

Development of the draft MRP led to an RMP initiative in 2007 to develop the STLS as a framework for coordinating stormwater requirements and RMP activities. In recognition of those discussions already initiated prior to its adoption, the MRP allows Permittees to pursue an alternative approach to answer the same information needs underlying the STLS. The STLS Work Group, a subgroup of SPLWG, includes representatives from BASMAA and Water Board staff to ensure close coordination, as well as SFEI staff and technical advisors recruited through the RMP. A series of meetings during 2008 and 2009 and associated meeting support materials led to the finalization of the draft Strategy (SFEI, 2009). In 2009 and 2010 SFEI provided further planning support through the completion of several data synthesis reports (Greenfield et al., 2010; Melwani et al., 2010). An initial draft MYP presented the STLS Work Group’s recommended approach for implementing the STLS, was reviewed by the SPLWG at its May 2011 meeting, followed by brief review of the completed Version 2011 at its meeting on October 25, 2011; at this meeting the SPLWG agreed to a communications strategy for informing the SPLWG of further MYP updates produced by the STLS Work Group.

This 2012 B version reviewed the status of planning and implementation for coordinated watershed monitoring beginning October 1, 2011[4]. This 2012 B version updates the status of the first season of monitoring and selection of two additional watershed monitoring sites to be phased in beginning October 2012. Further details and documentation of watershed monitoring and other work plan activities for later years will be added in future MYP versions in 2013 (see Adaptive Updates below).

Management Questions and Strategy Elements

The stakeholder process established the following Management Questions for the STLS:

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.

STLS technical activities are grouped into three Elements, listed with their sub-elements in Table 1. Figure 2 shows the main linkages between Management Questions and individual Elements; some Elements also support each other, as suggested by the dotted lines and described in the following MYP sections. Other activities outside the scope of the STLS also have bearing on these Management Questions; see Appendix A for background and context of regional projects to evaluate the potential effectiveness of management actions to reduce PCB and mercury loads to the Bay.

[4] The Water Year designation used by USGS begins on October 1, which is the nominal start of the wet weather monitoring season. Stormwater monitoring beginning in October is customarily budgeted by the RMP with funds for the following calendar year and by BASMAA with funds for the FY beginning the previous July.

Table 1. Small Tributaries Loading Strategy Elements and projected implementation roles.

Element	RMP	Stormwater Programs
1. Watershed and associated Bay Modeling		
A. Regional Watershed Spreadsheet Model	X	
B. Coordination with Bay Margins Modeling	X	
C. HSPF dynamic modeling (potential)	(X)	
2. Source Area Runoff Monitoring and EMC Development	X	
3. Small Tributaries Monitoring		
A. Monitor Representative Small Tributaries	X	X
B. Monitor Downstream of Management Actions		X

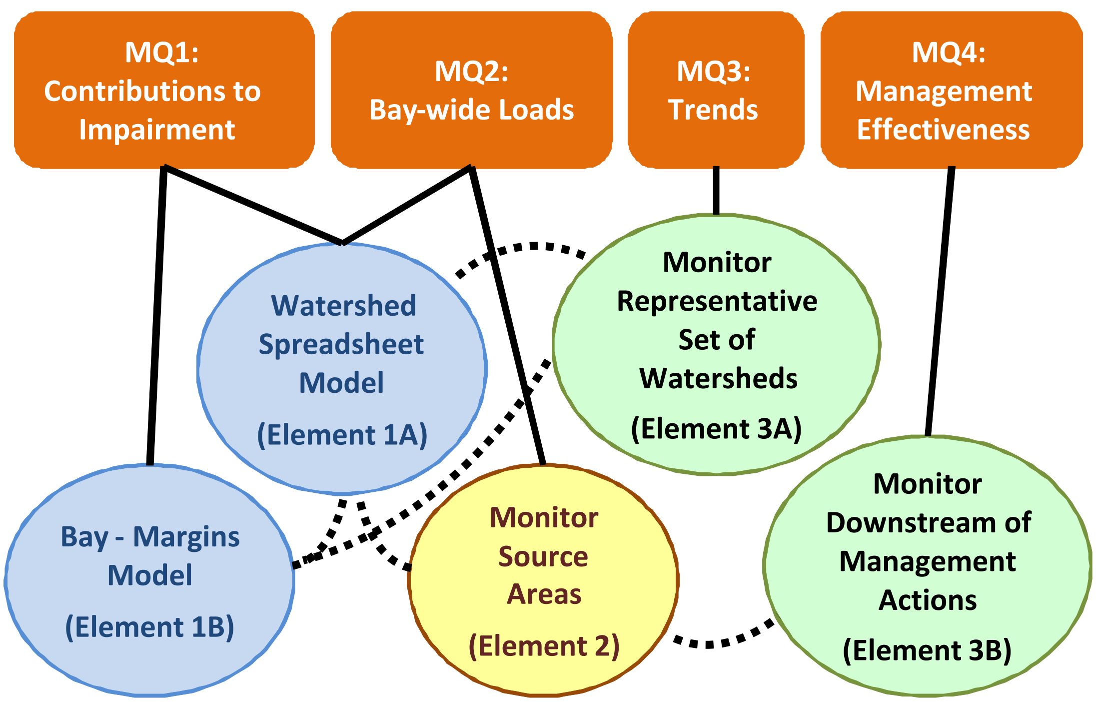

Figure 2: Primary relationships between Small Tributaries Loading Strategy management questions and Elements.

The first element, Modeling, includes a watershed spreadsheet model specifically designed to estimate Bay-wide loads of POCs (Management Question 2) which will also clarify the relative contribution of small tributary loads to the overall Bay impairment for each pollutant (Management Question 1). The spreadsheet model will provide estimates of relative load contributions from individual watersheds around the Bay and will help to identify high-leverage watersheds or more likely clusters of watersheds that may be having a greater local impact to sensitive reaches of the Bay margin[5]. However, the model is of limited use for this question without comparable understanding of the spatial variation within the Bay and local contributions from non runoff sources; these will be provided through a Bay margins model being developed by the RMP as part of a separate Forecasting or Modeling Strategy. In the future, dynamic modeling of one or more individual watersheds may be useful to deepen the understanding of underlying mechanistic behavior not captured by the spreadsheet model. The finer temporal scale of dynamic models may also be helpful in linking the tributary loads to the time scales of biological processes represented in the Bay margins model.

The second element, Monitor Source Areas, is intended to provide Event Mean Concentrations (EMCs) of targeted POCs to parameterize the watershed loadings spreadsheet model. Such monitoring would require catchments that are relatively homogenous in terms of land use or other source area characteristics, which would differ from the watersheds selected for Element 3. The STLS is exploring a number of desktop approaches to estimate EMCs for initial work on the Regional Watershed Spreadsheet Model. Understanding that is gained through this element about the range of EMCs and the factors that affect them can also inform the approach to monitoring downstream of management actions. Element 3, Watershed Monitoring, has two sub elements to address Management Questions 3 and 4.

Strategy Elements

Load Estimation and Modeling

The Regional Watershed Spreadsheet Model (RWSM) will be the primary tool for estimation of overall loads to the Bay. Spreadsheet runoff models are based on the simplifying assumption that unit area runoff for each homogenous subcatchment can be represented by a constant concentration for each POC. Given the large number of small tributaries, initial STLS Work Group discussions indicated this is more suitable as a

[5] Another group of spreadsheet models is being used by the stormwater programs to address Management Question 4 by providing quantitative scenarios of PCB and mercury load reductions from implementation of source control measures in local watersheds. Monitoring data from pilot projects begun in 2010 to refine and test these “desktop evaluation” models is also likely to provide useful input for running scenarios on the RWSM. See Appendix A.

framework for regional load estimation than simulation models such as 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 uses recent local data on land use based concentrations collected in the Bay Area and augmented using data and information extracted from recent stormwater literature. These runoff concentration coefficients can be updated periodically as new data become available through the monitoring elements of the STLS or related compatible efforts.

RWSM Development

This section summarizes the details and development of the RWSM which are described in draft reports under review by the SPLWG, which will be provided as Appendix B in the 2012B version of the MYP. The model's spatial extent covers the entire region overseen by the Region 2 Water Board boundary (corresponding closely to the Calwater outline in Figure 3). Within this region, the spatial resolution of individual watershed areas is provided by several data sources:

- Watershed boundaries for Central and South Bay. The urban portions of this dataset are based on compilations by the Oakland Museum of California (OMC) Creek and Watershed Mapping Project (a long term collaboration between William Lettis and Associates, OMC, and SFEI funded by cities and counties http://www.sfei.org/content/gis-data). Begun in 1993, and largely completed in 2008 through a state bond-funded Proposition 13 grant awarded to SFEI, this dataset incorporates further corrections by stormwater managers and is provides a fairly accurate depiction of urbanized catchments, although many of the smaller catchments have been arbitrarily aggregated and the dataset is not fully conformant to data standards of the National Hydrography Dataset.
- Contra Costa Flood Control District's watershed boundaries to fill in the eastern portion of Contra Costa County (Water Atlas cite)
- Provisionally, Calwater Hydrologic Areas are used to fill in remaining portions of the North Bay, Contra Costa, SF & coastal peninsula. Later versions of the RWSM could use increased spatial resolution provided by NHD or other sources if needed.

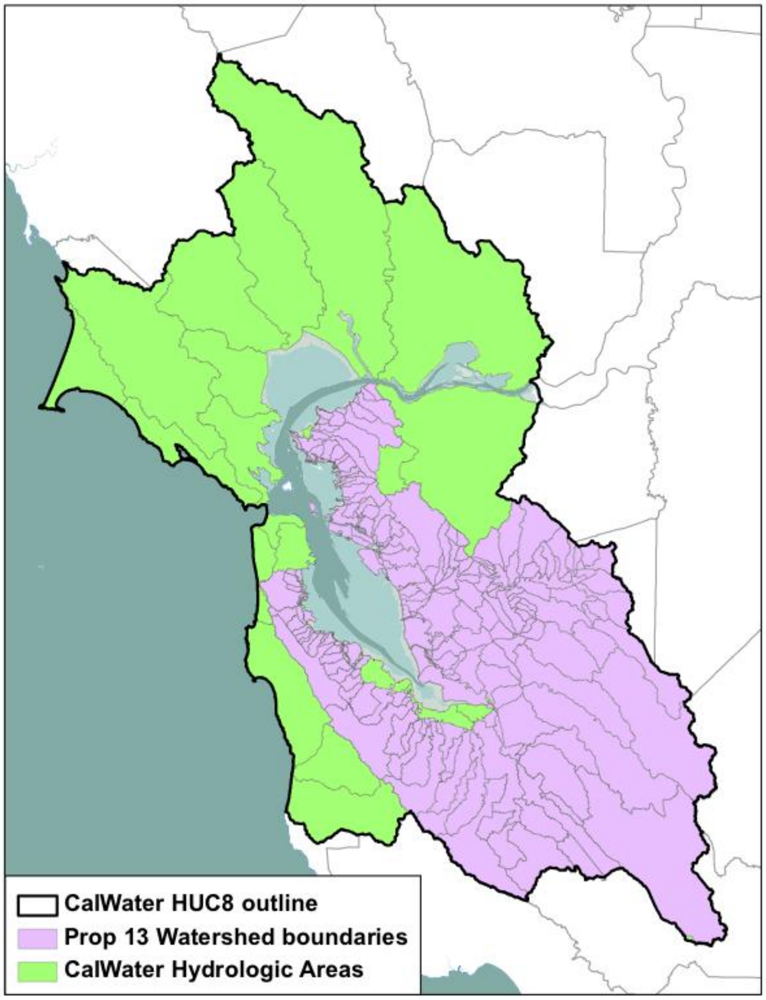

Figure 3: Spatial extent of RWSM and detailed watershed boundaries[6]

The outcomes of the first year 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. Preliminary loads of suspended sediment were also generated but the loads generated were quite different from the empirical observations (of which there are many).

An available land use dataset for the Bay Area (ABAG, 2005) is based on a combination of remote sensing and local assessor's parcel information. The first construction of the RWSM used the land use categories of Ha and Stenstrom (2008), with Event Mean

[6] Watershed boundaries based on the Oakland Museum of California Guide to San Francisco Bay Area Creeks (http://museumca.org/creeks/GIS/index.html) and compiled and improved through a Proposition 13 grant awarded to SFEI (http://www.sfei.org/content/gis-data).

Concentrations (EMCs) in initial runs taken from literature. Other categories could be substituted following further analyses from Element 2 studies to develop a framework for specific loads based on land use or other source area characteristics such as age or condition of development.

Work for the RWSM in 2011 included preparation of the Year 1 report (Lent and McKee 2011, in review) and follow-up on several of its recommendations to refine the hydrology model by:

- Adding several calibration watersheds to ensure watershed characteristics that span a wider range of imperviousness. Since the original calibration data set used in the RWSM year 1 model lacked representation at the high end of the imperviousness range, three high imperviousness catchments were added to the calibration data set. All three of these catchments drain to pump stations and required conversion of pump logs to estimated flow; these records were only available for short periods.
- Removing gage records for some watersheds and time periods with pre-development land use / impervious characteristics differing significantly from present conditions
- Refining land use categories with the updated ABAG 2005 dataset used as base. This improved the consistency of the spatial dataset among counties, particularly in the treatment of transportation land uses which are highly impervious.

The Year 2 progress report (Lent et al 2012) describes these model refinements and is attached as part of Appendix B, The year 2 tasks served to correct or reduce errors and biases in the hydrological model that were noted in the year 1 report. The hydrologic model will need to be re-visited, in the context of further model development such as calibrating the sediment model or the contaminant models, which are the recommended focus of RWSM work in year 3 (See Appendix B).

Each pollutant has a unique set of properties that determines its uses, the resulting products and environmental attributes such as in-use spatial distribution, potential for reuse, and mechanisms of inadvertent environmental pollution. A series of "contaminant profile" fact sheets will summarize these properties and frame conceptual models of source areas and other information needed to build each POC specific model using the RWSM. The initial version of the RWSM focuses on load estimates for sediment, mercury and PCBs. The year 1 report presents the available information and proposed modeling approaches for the highest priority POCs, along with discussion of data gaps:

- There is little direct EMC information about PCBs, so the sediment surrogate will initially be used to understand the potential range of loadings. Refining the spatial characterization of the particular types of land uses and source areas for PCBs is a high priority.
- The sediment model does not have the same structure as other POCs and will be represented as a hybrid of available USGS datasets for larger mixed-use

watersheds and a more land use oriented source area model for highly urbanized watersheds which are generally smaller.
- Mercury will follow a similar conceptual model to the sediment model.

Copper is also being included in the first round of RWSM development because extensive data are available both from the Bay Area and in the world literature, and also because as a primarily dissolved constituent it serves to define the limitations of the hydrologic model alone and helps to set up realistic definitions for success for the other more difficult contaminants.

In March 2012 the STLS Work Group reviewed a draft multi-year planning matrix for RWSM-related activities, which is included in the Year 3 and RWSM multi-year work plan in Appendix B.. The planning matrix includes all tasks and POCs that are of interest to the STLS, BASMAA and other RMP strategies, which are potential funding sources for specific tasks. The draft matrix projects construction of a version 2 model for each of the above POCs in 2012. Contaminant profiles will also be drafted for the next tier of POCs to be examined, which were selected based on MRP priorities with the concurrence of Water Board staff.as described in the next section. Work plan details will be updated as findings of further model testing and calibration are incorporated in future versions of Appendix B. These updates will also describe recommendations for further testing and verification, for example selection of monitoring locations that would be supportive for improving model weaknesses; EMC-related data needs and proposed future activities will be detailed in Appendix G for future versions of the MYP.

RWSM Uses

In 2011 and 2012 the RWSM framework contributed to the watershed monitoring design and influenced the selection of the fifth and sixth watershed monitoring sites. When coupled with monitoring data in the near future, it will provide improved estimates of current loading. Other near-term functions will be as a tool to help stormwater programs address two related MRP requirements:

- Provision C.8.e(vi) requires developing a design for a robust sediment delivery estimate/sediment budget in local tributaries and urban drainages. RWSM model coefficients will also be developed for sediment, which will provide an alternative perspective to regional load estimates previously developed by Lewicki and McKee (2009).
- Provision C.14.a(v) requires developing information required to compute loads to San Francisco Bay of PBDEs, legacy pesticides, and selenium from urban runoff conveyance systems throughout the Bay. The RWSM will provide the framework for initial load characterization with available data from RMP and STLS monitoring, and to develop recommendations for additional studies as needed to improve these initial estimates.

Water Board staff have indicated that the RWSM is an appropriate tool for addressing these provisions, and BASMAA has approved regional project budgets to support work on sediment, PBDEs and the legacy pesticides chlordane, dieldrin and DDTs[7]. These budgets are incorporated in the workplan Table 11 and will be integrated with the RWSM multi-year planning matrix that is presented in Appendix B. In particular the sediment modeling work in 2012 will address both the MRP requirements and also may improve the calibration of the hydrological model to support development of the PCB and mercury models.

A related model that was discussed in the STLS but is not part of the STLS workplan is a desktop model for evaluating the effectiveness of management options to reduce loads of POCs from local watersheds (see description of Proposition 13 products in Appendix A). As storm water programs collect monitoring data from sites of pilot management projects, these can be used in conjunction with existing EMC information to run scenarios for wider application of various management strategies and predict regional load reductions using the RWSM. Other medium and long term uses will be determined by the STLS Work Group, which will provide ongoing stakeholder discussion forums to update priorities as described in Adaptive Updates below.

Coordination with Bay Modeling and Other Modeling Efforts

The RMP is also developing a Bay Margins Conceptual Model as part of a separate Bay Modeling Strategy overseen by the Contaminant Fate Work Group (CFWG). The initial draft (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. Until the RMP Modeling Strategy is developed to a point that offers practical guidance on characterizing the relationship of specific tributaries or groups of tributary POC sources to contaminant fate in local portions of the Bay margin, working versions of the RWSM will not apply special weighting or other spatial considerations when estimating individual tributary inputs.

Dynamic Watershed Modeling (Potential)

The SPLWG supported development of a dynamic watershed model for the Guadalupe River Watershed as a pilot effort with funds from 2008 and 2009. This watershed is the subject of a separate TMDL for legacy mercury from the historic New Almaden Mining district. An abundance of local water, sediment, and contaminant data made this watershed a logical place for an initial exercise in mechanistic modeling using Hydrologic Simulation Model-Fortran (HSPF). The basic proof-of-concept Guadalupe watershed model for hydrology was completed (Lent et al., 2009). The final report is presently being completed (Lent et al, in review)

Further dynamic modeling work for the Guadalupe River watershed, or initiation of modeling for other watersheds, may be recommended in the future depending on specific information needs of the STLS or Bay Modeling Strategy. STLS need for detailed watershed modeling would be identified through the Adaptive Update process.

[7] Lent and McKee (2011) also includes a contaminant profile for selenium.

Watershed Monitoring

This MYP element outlines a cost-effective and flexible approach to watershed monitoring that can be implemented in the context of both the RMP Multi-Year Plan and MRP permit requirements. As part of STLS development, the RMP conducted several related projects in 2010 through 2011 to evaluate potential design considerations:

- Desktop methods optimization study
- Preliminary watershed classification
- Watershed characterization sampling study

Results of these studies were evaluated along with several other considerations, including analytical sensitivity and cost, to develop several alternative scenarios for implementation of the MYP watershed monitoring element.

Table 2 shows the six STLS watershed monitoring stations and their phasing for start-up during the first two years of sampling, beginning in Water Year (WY) 2011-12. The assignment of responsibilities for operation of the stations were based onfunding sources and availability of staffing by SFEI and BASMAA consultants. The rest of this section summarizes various aspects of the watershed monitoring and the discussions that informed the decisions made by the STLS Work Group.

In 2011, frequent STLS meetings and communications focused on decisions regarding site selection and procedures for setup and operation of the first four (Phase 1) watershed monitoring stations. In the WY 2011-12 wet season SFEI operated two stations for the RMP and one station (Guadalupe River) under contract to the Santa Clara Valley Urban Runoff Pollution Prevention Program, while the fourth site is operated by contractors for the Contra Costa Clean Water Program. The STLS work group continued to coordinate details of setup and monitoring through the first part of 2012.

BASMAA has supported preparation of a draft Quality Assurance Project Plan (QAPP) and BASMAA and RMP funds were used to develop a Field Manual to document standard procedures for field sampling and Quality Assurance. These documents will address the MRP requirement for protocols and data quality comparable to the Surface Water Ambient Monitoring Program. The QAPP and Field Manual will be finalized and incorporated in the MYP later in 2012, to include the lessons of the first field season.

Table 2. Watershed Monitoring Stations for the STLS

Station Name (County)	Funding source WY 2011-12	Funding source WY 2012-13
Phase 1		
Lower Marsh Creek (Contra Costa County)	CCCWP in-kind	CCCWP in-kind
San Leandro Creek (Alameda County)	ACCWP in-kind (setup) RMP (operation & maintenance)	ACCWP in kind
Guadalupe River - (Santa Clara County)	SCVURPPP in-kind (SFEI contract)	SCVURPPP in-kind
Sunnyvale East Channel (Santa Clara County)	RMP	RMP
Additional Phase 2		
North Richmond Pump Station (Contra Costa County)	N/A	RMP
Pulgas Creek Pump Station [c] (San Mateo County)	N/A	SMCWPPP in-kind

Monitoring Methods

A standard approach for stormwater monitoring is composite sampling in which multiple discrete samples from one storm event are combined into one sample for analysis. This concept is the basis for basic requirements in 40CFR121.21(7)(g)(ii), referenced in the MRP as the default procedure to be used. A common practice for collecting stormwater samples is to use automated samplers with onset of the storm event sampling triggered by increase in flow (as indicated by a change in stage height of the monitored channel or conveyance) with subsequent discrete aliquots sampled at pre-programmed intervals that may represent equal increments of elapsed time or of discharge volume.

The SPLWG oversaw RMP load studies on the Guadalupe River in water years (WYs) 2003-06, 2010, and at Zone 4 Line A (Z4LA) in WYs 2007-10, collecting multiple discrete depth integrated point samples (loosely referred to as grab samples for STLS purposes) during many storm and base flow events. These studies were based on the use of continuous turbidity monitoring as a more sensitive way to identify the onset of storm discharge, as well as for characterizing the within-storm variations in transport of sediments and POCs associated with fine sediments. The turbidity record was used as a surrogate for continuous estimation of finer fractions of SSC and the associated POCs to generate highly accurate and precise load estimates at 5-15 minute intervals which could then be summed to any other desired time interval (e.g. event, day, month or season).

Using the Guadalupe and Z4LA datasets, an optimization study was conducted to recommend sampling methods and style of sampling that would be useful for assessing loads and determining trends. Using methods similar to those outlined in Leecaster et al (2002) and Ackerman et al. (2011), a series of analyses were performed to assess the optimal number of samples and style of sampling for SSC, PCBs and mercury within storms as well as approaches for choosing which storm events to sample. Detailed methods and results are presented in Appendix C. Results differed somewhat for Guadalupe vs. Z4LA and for PCBs vs. mercury, but preliminary review of tested scenarios suggested the following:

- Turbidity triggering was slightly better than flow for defining the start of the storm, but no particular trigger strategy for within-storm sampling was identified that was consistently more accurate for characterizing the POC loads of a particular event.
- To use regression on the turbidity surrogate records for estimating annual loads, at least 10 but ideally 16 samples per year should be collected at each site; however focusing this number of samples on just a few randomly selected storms would likely cause spurious loads estimates of poor accuracy and precision.
- Strategies for selecting a more representative set of storms to sample (e.g. first flush + a larger storm + several random, first flush + several random, vs. all random) were evaluated. From the analysis it appears that scenarios that include first flush and one of the largest storms of the year provide more robust loads estimates than random sampling alone.
- Power for detecting trends appeared to be possible with just 10 samples collected per year, based on a preliminary scenario in which the samples were randomly selected and did not confirm to any of the tested sampling designs

While the optimization assessment focused on PCBs and mercury, the findings should be generally applicable to other sediment-associated pollutants and probably more than adequate for dissolved constituents since dissolved concentrations generally vary much less with flow. They may not be as relevant for methylmercury since the intent of the permit is to investigate a representative set of drainages and obtain seasonal information and to assess the magnitude and spatial/temporal patterns of methylmercury concentrations. It may also not be particularly good for water toxicity since toxicity response is a function of both concentration and cumulative duration of exposure.

Taking into consideration recent automated sampling experiences at other Bay Area sites, the final sampling design for WY 2011-12 was modified to include manual grabs for mercury and methylmercury, and both discrete and composite samples using autosamplers as shown in Table 10. Discrete samples collected with a D94 or DH84 FISP sampler are depth-integrated. Samples collected using ISCOs are considered mid depth relative to flow, and samples collected using hand dipping methods (Marsh Creek only) will be reported as collected 25 cm below water surface. This hybrid approach was estimated to be roughly equivalent or slightly lower in cost than using autosamplers for all samples; other advantages include reducing the likelihood of false starts and more flexibility in sampler configuration.

The STLS Work Group decided all sites will use a new high-range model of turbidity probe based on turbidities observed during the WY 2010-11 characterization study. However delays in delivery of the probes caused a delay in completing the site set-up. At Guadalupe River, logistical problems prevented completion of composite sampler installation prior to the WY 2011-12 sampling season so monitoring during WY 2011-12 is being conducted using manual grabs (a D95 FISP) water quality sampler and 4-wheel boom-truck assembly.

Categories of watersheds

From its early days, the SPLWG has recommended stratifying the numerous watersheds of Bay Area small tributaries into general categories to provide a rationale for systematic sampling of a subset of watersheds in selected categories (Davis et al., 2000). These categories are needed to answer two key questions for the design of the STLS 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 address the first question, SFEI conducted a preliminary characterization study using ordination and cluster analysis, exploratory statistical techniques designed to visualize patterns on complex multivariate data sets (see background in Appendix C preliminary discussion "Categorization of watersheds for potential stormwater monitoring in San Francisco Bay"). The study aimed for an initial classification of Bay Area small tributary watersheds into a small number (<10) of classes, relevant for loads monitoring and Bay margin impacts. Statistics were generated for 18 attributes on each of the watersheds to form the basis for analyses. Table 3 summarizes a scheme consisting of eight clusters or classes which appeared robust and meaningful for the STLS purposes.

The descriptions in Table 3 include those attributes that seemed most influential in discriminating among the clusters (all attributes were assigned equal weight in the analyses). Clusters 1, 2, and 3 are similar to each other in all having relatively high residential, commercial, and industrial land cover and consequently, high surface imperviousness. Combined, these clusters include 119 watersheds, and could therefore be described as typical watersheds for the study area. These clusters generally include densely populated, low-lying areas that drain into South Bay and Central Bay
In the remaining groupings, Cluster 6 watersheds are distinguished by their large size while the rest seem to fall into smaller, more specialized clusters.

Table 3. Description of eight preliminary watershed clusters generated using Bray-Curtis distance with Ward's linkage method.

Cluster No.	Number of watersheds	Description
1	41	High commercial and residential land cover and imperviousness. High historic industry and railroads. No PG&E facilities. Moderate area.
2	43	High commercial and residential land cover and imperviousness. High historic industry and railroads. One to four PG&E facilities. Large area.
3	35	High commercial and residential land cover and imperviousness. Low historic industry or railroads. Smaller area.
4	11	Small, sparsely populated, predominantly industrial, highest historic industrial and imperviousness. Located around San Francisco Airport and Brisbane.
5	11	Sparsely populated, low development, high open land cover, no railroads, "green space." Located adjacent to Bay or in undeveloped uplands.
6	22	Largest watersheds, with moderate population density, high open land cover, and low imperviousness.
7	17	High agricultural land cover, lower rainfall, draining to Carquinez Strait and Suisun Bay.
8	5	Small, sparsely populated, predominantly open, containing historic railroad, and draining to Carquinez Strait.

After reviewing the preliminary watershed classification the STLS agreed that further information was needed to select watersheds for future STLS monitoring. RMP resources for WY 2010-11 monitoring were redirected to a characterization study consisting of storm water grab samples from 16 of the candidate watersheds for which there were little or no existing PCB or mercury concentration data[8].

Table 4 shows the watersheds selected for the characterization study, along with a summary of some of their key attributes. Criteria for the composition of the sampling list included the following:

[8] This redirection is allowed by MRP Provision C.8.a, which indicates that initiation of the required POC loads monitoring can be deferred to October 2011 if the stormwater Permittees are participating in a regional collaborative process to plan and conduct the monitoring.

- Multiple representatives of the most common small to medium sized watershed classes 1-3, distributed throughout the four counties (Contra Costa, Alameda, Santa Clara, and San Mateo) where loads monitoring is required by the MRP.
- A few representatives of the medium to large watershed classes.
- Smaller catchments, generally heavily urban with industrial land uses, where stormwater programs are planning enhanced management actions to reduce PCB and mercury discharges.
- Other watersheds with distinctive histories of mercury or PCB occurrence, or related management concerns.

Figure 3 shows the general locations of the study watersheds and the drainage areas above the initially selected monitoring locations. Some of the monitoring station locations were adjusted after field reconnaissance. Table 5 lists watersheds considered but not selected for the study, and also watersheds excluded from the study because of the availability of significant amounts of previously collected PCB and mercury data. Appendix E provides details of the study design, methods and preliminary results, which will be updated with a more complete analysis later in 2012.

In June 2011 the STLS Work Group reviewed the results of the WY 2011-12 sampling. Analytes measured at each sampling site varied depending on budget and Water Board management questions (Table 6). Between 4-7 PCB, total mercury, SSC and organic carbon samples were collected at each site. PBDE and PAHs were collected at a subset of sites chosen based on logistics (essentially randomly from a water quality perspective). Selenium data were only measured at Contra Costa sampling locations.

Table 4. Watersheds sampled during reconnaissance characterization study of Water Year 2011.

Watershed/ station	Area (km^2)	Prelim, Cluster No.	Percent Impervious	Percent Old Industrial	Reconnaissance Feasibility/ Safety	PCB-Hg attributes
Ettie Street Pump Station	4.0	1*	73.4**	28.60**	Good/Good	PCB P13 Cluster, CW4CB pilot watershed
Pulgas Creek	7.1	2	28.2		Good/Good	CW4CB pilot watershed
Sunnyvale East Channel	18.0	2	59.7	3.47	Good/Good	PCB P13 Cluster
Santa Fe Channel	2.64	2	70.3	3.6	Poor-Medium/ Good	Confirm proposed station vs. locations of CW4CB pilot watersheds
Lower San Leandro Creek	8.9	2	37.5	2.96	Good/Good	PCB spill into creek in 1995
Stevens Creek	73.7	6	15.8	0.24	Good/Good	Within airshed of Lehigh-Hanson Cement Manufacturer
Zone 5 Line M	8.1	*	33.5	3.15	Good/Good	Hg P13 Cluster
Lower Marsh Creek	97.5	?	14.7		Good/Good	Drains historic Hg mine
San Lorenzo Creek	124.8	6	13.2	0.50	Medium/Good	
Walnut Creek	318.7	7	16.6	0.72	Good/Good	
Lower Penitencia Creek	12.0	*	67.1	7.14	Good/Good	
Belmont Creek	7.2	2	27.4	0.00	Medium/Good	
Borel Creek	3.2	2	31.4	1.57	Medium/Good	
Calabazas Creek	52.9	1	45.6	0.44	Good/Good	
Glen Echo Creek	5.4	3	39.3	0.80	Good/Good	Hg P13 Cluster
San Tomas Creek	114.1	1	34.4	0.35	Good/Good	

***** Catchment does not correspond to a polygon used in cluster analyses
****** Estimated for larger polygon used in cluster analyses

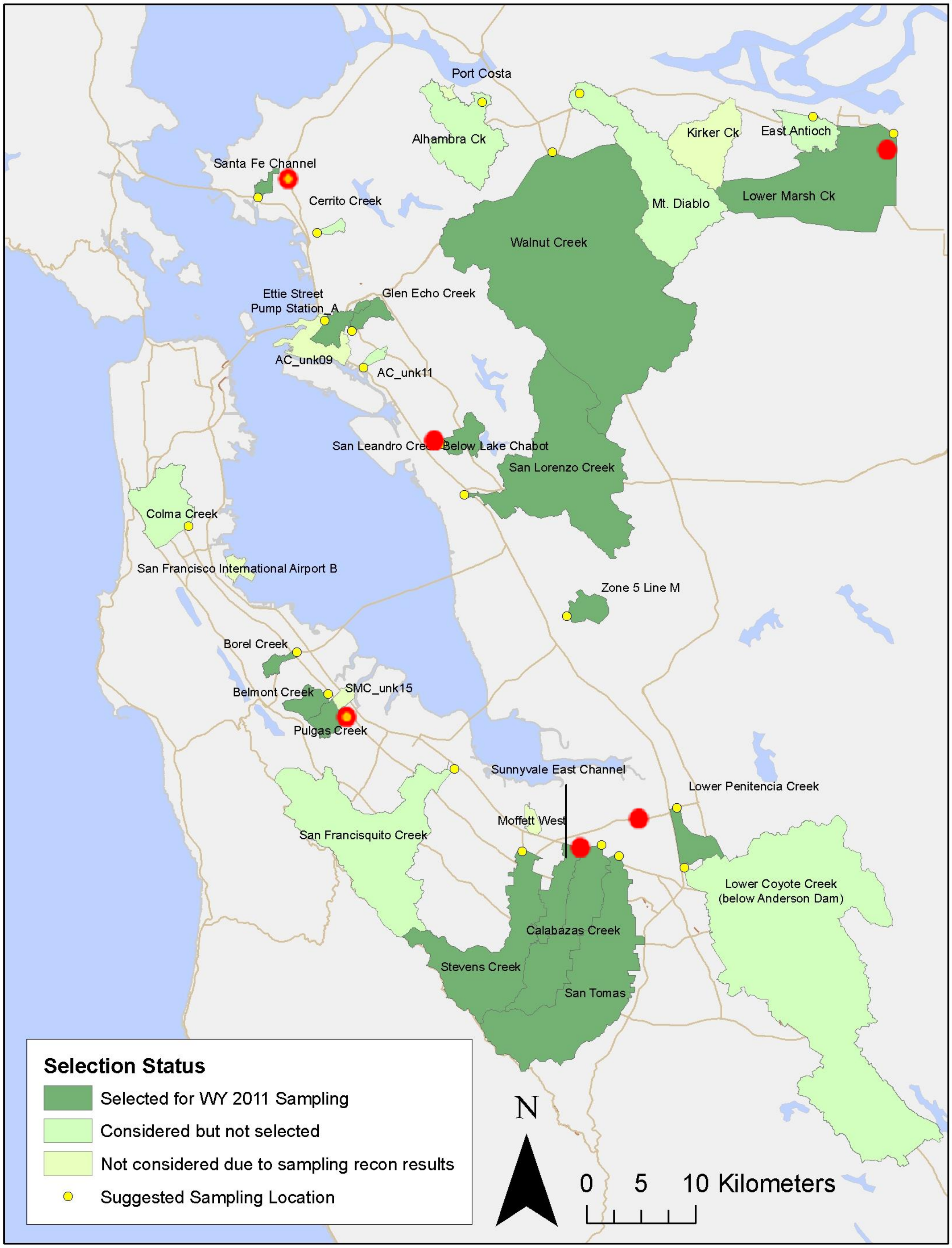

Figure 4. Watersheds sampled in Water Year 2010-11 reconnaissance characterization study. Red circles indicate approximate locations of six watershed monitoring stations for WY 2012-13.

Table 5. Potential candidate watersheds, not selected for reconnaissance characterization sampling during WY 2010-11.

County	Watershed	Area (km^2)	Prelim, Cluster No.	Percent Impervious	Percent Old Industrial	PCB-Hg attributes
San Mateo	Colma Creek	28.0	2	37.5	2.18	PCB P13 Cluster, CW4CB pilot watershed
Contra Costa	Alhambra Creek	41.0	6	6.0	0.01	
Alameda & Contra Costa	Cerrito Creek	1.9	2	35.8		
Contra Costa	East Antioch	14.4	7	41.4	1.31	
Contra Costa	Mt Diablo Creek	80.2	6	10.5		
Alameda	Oakland, East of Lake Merritt	2.1	2	67.3	6.18	PCB P13 Cluster
Alameda	Zone 4 Line A	8.78*	1	67.6	10.1	
Santa Clara	Lower Coyote Creek (below Anderson Dam)	318.6	6	21.1	0.38	PCB P13 Cluster
Santa Clara	Guadalupe River	226	6	32.5	2.7	Hg TMDL
San Mateo & Santa Clara	San Francisquito	111.8	6	7.3	0.27	

Table 6. Summary of analytes collected during the water year 2010-11 reconnaissance characterization study.

Analyte	MRP Category	Number of Samples
PCB	Category 1	91
Total Mercury	Category 1	91
SSC	Category 1	91
Total Organic Carbon	Category 1	91
PBDE	Category 2	22
PAH	Category 2	22
Total Selenium	Category 2	30
Dissolved Selenium	Category 2	30

Table 7 shows that while maximum concentrations of total mercury varied from 19-1740 ng/L (about 100x) between sites in relation to suspended sediment concentration and watershed characteristics, maximum PCB concentrations varied from 1,851 - 467,696 pg/L a variation of about 250x. Methylmercury did not relate directly to maximum total mercury observed at each site. Normalizing mercury and PCB data to SSC and turbidity respectively (see Appendix E for discussion) resulted in a different pattern and rankings of the sampled watersheds, as shown in Table 8.

Table 7. Maximum concentrations of mercury and PCBs for the Water Year 2010-11 reconnaissance characterization study.

Watershed	Max HgT (ng/L)	Max. PCBs (pg/L)
Belmont Creek	59	4,909
Borel Creek	74	8,671
Calabazas Creek	89	24,765
Ettie Street Pump Station	73	68,996
Glen Echo Creek	179	85,815
Lower Marsh Creek	200	4,136
Lower Penetencia Creek	19	1,851
Pulgas Creek Pump Station - North	27	84,490
Pulgas Creek Pump Station - South	28	53,894
San Leandro Creek	477	31,336
San Lorenzo Creek	77	20,421
San Pedro Storm Drain	499	No data
San Tomas Creek	129	4,372
Santa Fe Channel	217	467,696
Stevens Creek	121	22,554
Sunnyvale East Channel	151	67,462
Walnut Creek	181	24,396
Zone 5 Line M	1740	25,091

Table 8. Summary of PCB and Hg results in relation to suspended sediment or turbidity and organized by PCB/turbidity ratio.

Site	PCB/Turb Avg Ratio (pg/NTU)	HgT/SSC Avg Ratio (ng/mg)	PCB Rank	Hg Rank	Rank Sum	Feasibility Constraint?
Santa Fe	2882	0.68	1	4	5	Tidal
Ettie St	1097	0.78	2	3	5	Access time restricted
Pulgas North	822	0.47	3	5	8	Extremely flashy
Pulgas South	639	0.83	4	1	5	Extremely flashy
Glen Echo	443	0.38	5	7	12	Underground downstream
Sunnyvale Channel	369	0.34	6	8	14	Bridge narrow
San Leandro	98	0.8	7	2	9	
Z5LM	84	0.41	8	6	14	SSC > 1800 mg/L
San Lorenzo	74	0.28	9	9	18	
Stevens	33	0.26	10	11	21	
Calabazas	29	0.16	11	16	27	
Walnut	21	0.19	12	17	29	SSC > 1800 mg/L, 12-24 hour hydrograph – sample preservation
San Tomas	21	0.27	13	10	23	
Lower Penetencia	20	0.16	14	15	29	
Borel	17	0.17	15	14	29	
Belmont	15	0.24	16	12	28	
Lower Marsh	4	0.23	17	13	30	SSC > 1800 mg/L, Remote, access by Hwy 4, sample preservation

For the most part, sampling logistics at these sites were taken into account as part of the decisions made prior to the reconnaissance study. However, there were some additional lessons learned during the reconnaissance study about feasibility and potential sampling constraints that are worth noting in Table 8. The tidal nature of the Santa Fe channel, although it was sampled during low tide, will challenge the measurement of discharge if loads at this site are desired in the future; acoustic Doppler technology at a greater cost would be needed. Three locations (Zone 5 Line M, Walnut and Lower Marsh) had observed turbidities that exceed the use of the DTS12 turbidity sensors employed previously at Guadalupe and Zone 4 Line A; sensor technology that ranges to 4000 NTU is available but with some loss of sensitivity at the lower end of the range (<50 NTU). The narrow sampling platform at Sunnyvale East Channel adds challenges for manual sampling equipment and safety due to lack of space. Sampling locations at the base of large watersheds such as Walnut Creek and Guadalupe River, with storm hydrographs that can span a day or more, may add sample preservation challenges if ice melts before samples can be retrieved following storm events. Lower Marsh Creek is a challenging location due to travel time to the site and the same kinds of preservation challenges.

Criteria for watershed selection

In June 2011 the STLS WG reviewed characteristics of the candidate watersheds that it considered as priorities for the watershed monitoring:

- **Representative** for purposes of long-term trends monitoring. Watersheds selected have a station near the bottom of the watershed, and include a range of sizes and land uses, ranging from already urban to those expected to undergo significant additional urbanization over the next 20 -30 years.
- Containing **Management** opportunities for TMDL load reductions, especially of PCBs and mercury, that are likely to be explored through pilot projects or other targeted stormwater program activities during the next 5-10 years (see Appendix A). Since the first round of pilot management activities will be limited to a few local catchments, the STLS Work Group decided to focus the watershed selection for Phase 1 (WY 2011-12) on representative sites and defer potential selection of these watersheds until later in 2011, to plan for Phase 2.
- Named as a monitoring location for specific NPDES **Permit** requirements affecting Bay Area stormwater programs. This includes Lower Marsh Creek which is named in a parallel C.8.e provision in the municipal stormwater permit for eastern Contra Costa County. The Guadalupe River site previously monitored by the RMP is one of the 8 stations identified as default locations for POC Loads Monitoring in the MRP, and continued monitoring at this site is also required by a permit supporting the implementation of the mercury TMDL for that watershed.[9]
- **Feasibility** of monitoring for the desired Management Question. For example, many catchments with planned or potential management activities are heavily culverted and located in low-lying Bayside areas, so that monitoring stations downstream of the management areas are often subject to tidal inflow or inaccessible due to private property boundaries.

The four stations selected for Phase 1 start-up were:

- Lower Marsh Creek (Contra Costa County) operated with funding from Contra Costa Clean Water Program on behalf of BASMAA.
- Lower San Leandro Creek (Alameda County) operated in Year 1 by SFEI for RMP
- Sunnyvale East Channel (Santa Clara County) operated by SFEI for RMP
- Guadalupe River (Santa Clara County) operated with funding from Santa Clara Valley Urban Runoff Pollution Prevention Program on behalf of BASMAA.

[9] Both of these permits specify additional monitoring requirements which are not included in the scope of this STLS MYP, i.e. additional parameters for Lower Marsh Creek and additional sites and periodic intensified monitoring in the Guadalupe River watershed.

In March 2012 the STLS Work Group discussed criteria for selecting two additional stations to be initiated in 2012 for Phase 2

Analytes and Data Quality Objectives

Where applicable, the MRP specifies that default standards for monitoring data quality be consistent with the latest version of the Quality Assurance Program Plan (QAPrP; SWAMP 2008) adopted by the Surface Water Ambient Monitoring Program (SWAMP). The QAPrP adopts a performance-based approach with target Reporting Limits (RL) for a large list of analytes in water and sediment.

The RMP has not specified target Reporting Limits for most analytes; for the SPLWG monitoring studies SFEI has utilized laboratory services that provide much lower method detection limits (MDL) for some analytes than those that would be associated with the SWAMP Target RLs.

Table 9 summarizes the results of a review of detection frequency at Zone 4 Line A, indicating that the RMP laboratories have obtained much higher frequencies of detection with much lower detection levels for the organic compounds (see Appendix F).

MDLs are variable depending on the concentrations of the target analyte and similar compounds as well as potential interference from other constituents in the sampling matrix. While quality assurance considerations should be used in interpreting data near the MDL, accurate quantitative results at low range are important for developing load estimates.

For WY 2011-12, analyses were performed by the laboratories listed in Table 10[10]. Laboratory contracting and Quality Assurance procedures for laboratory data are being performed by SFEI for all four stations, through funding provided by the RMP and BASMAA.

[10] The STLS MYP does not include other analytes for which occasional sampling at some or all of the STLS watershed monitoring stations may occur, such as monitoring required by the municipal stormwater permit for eastern Contra Costa County issued by the Central Valley Regional Water Quality Control Board, or sampling for special studies initiated through other RMP strategy workgroups (e.g. nutrients and dioxins) that take advantage of the existing infrastructure for STLS monitoring stations while covering all incremental costs for sampling those analytes.

Table 9. Comparison of detection rates for selected analytes using SWAMP Reporting Limits vs. RMP-contracted lab results for storm water samples at Zone 4 Line A; see Appendix F for additional notes.

Analyte	SWAMP Target RL	Z4LA data, fraction > SWAMP RL	MDL range	Z4LA % detection	Sample Volume, Liters
Category 1					
Copper (Total)	0.01 µg/L	45/45		100%	0.12
Copper (Dissolved)	0.01 µg/L	11/11		100%	
Mercury (Total)	0.0002 µg/L	112/112		100%	0.25
Methylmercury	0.00005 µg/L	55/56		99%	0.25
PCB congeners	0.02 µg/L	20/77		(98%)	2.5
SSC	0.5 mg/L	392/392		99%	0.25
TOC	0.6 mg/L	40/40		100%	.25
Nitrate as N	0.01 mg/L	10/12		(NA)	(0.15)
Hardness (as CaCO3)	1 mg/L	NA		NA	NA
Category 2					
Selenium (Total) [e]	0.30 µg/L	15/30		36%	0.5
Selenium (Dissolved)	0.30 µg/L	0/5		66%	
PBDEs	NL - assume 0.02 µg/L	18/36		(75%)	2.5
PAHs [g]	10 µg/L	3/21		(99%)	2.5
DDTs	0.002 µg/L [h]	14/20		(100%)	
Chlordane [i]	0.002 µg/L	13/20		(100%)	
Dieldrin [i]	0.002 µg/L	3/20		(100%)	
Pyrethroids [j]	NL	NA		NA?	4
• Bifenthrin		--	NA		
• Delta/Trihalomethrin		--	NA		
• Permethrin, total		--	NA		
Carbaryl	NL	NA	NA	NA	NA
Fipronil	NL	NA	NA	NA	NA
Phosphorus (Total)	NL	NA	NA	NA	(with N)
Phosphorus (Diss.)	NL	NA	NA	NA	(0.17)

Watershed Monitoring Approach

The MRP requires POC loads monitoring effort that is equivalent to conventional flow weighted composite sampling at eight sites, with an annual average of four events sampled for Category 1 analytes and one event for Category 2. The MRP allows phased implementation: Phase 1 monitoring of at least four stations, or roughly half of the effort, must be initiated by October 2011 and Phase 2 monitoring of the remaining stations must start by October 2012.

After discussion of assumptions for the MRP default plan compared with alternative scenarios incorporating the recommendations for sampling frequency and laboratory data quality described above, the STLS work group agreed to pursue a watershed monitoring plan that would be roughly consistent with the MRP cost benchmark and include:

- A total of six watershed monitoring stations, with four to be deployed in Phase 1 (WY 2011-12) and an additional two stations in Phase 2 (WY 2012-13), subject to review after the first year to evaluate whether resources should be reallocated between watershed monitoring and EMC development elements.
- Continuous turbidity monitoring (not included in the MRP) at all stations to enable turbidity surrogate regression estimation of seasonal loads of particulate associated POCs and allow for the future inclusion of other analytes and the back calculation of loads using turbidity records.
- For best load estimation of mercury, PCBs and sediment at least 16 samples should be collected in a season; for planning purposes, this would be a minimum of 4 events with an average of 4 samples per event. Sampled events should target a first flush event and at least one of the larger storms of the year.
- Sample analyses for all stations would be performed by specific laboratories recommended on the basis of previous performance and reliability in achieving low MDLs for each parameter.

In March 2011 Water Board staff indicated that this STLS program with annual cost similar to the MRP benchmark of $800,000-$1,000,000[11] would meet the MRP requirement for an alternative monitoring approach that addresses the priority Management Questions, with the assumption that at least 2/3 of this cost would be supported by the storm water programs (see work plan below). At the SPLWG meeting on October 25, 2011, Water Board staff confirmed that the mobilization then in progress for Phase 1 watershed monitoring stations was in compliance with the MRP.

In July 2011 the STLS Work Group determined that all monitoring stations should use the same sampling methods for each parameter, and began developing a plan using automated sampling equipment (Model 6712 full size by Teledyne ISCO, hereafter "ISCO") for all parameters except methyl mercury. After further evaluation this was changed to a hybrid of several sampling methods as described above. Modifications were also made to the sampling plan to permit efficient use of ISCOs for composite sampling and to reflect evolving regulatory priorities for data on particular analytes. The revised STLS Work Group consensus plan for sampler configuration is shown in Table 10.

[11] Benchmark cost for default MRP monitoring (including ongoing project administration but excluding data management and reporting and contingency for false starts) was established as a range to express variation in labor costs among the participating agencies. Benchmark calculations distributed one-time start-up costs over 3 years of operation, although this assumption has limited value for actual project planning. No site-specific cost variations were assumed other than stage-discharge monitoring and calibration for sites not served by an existing USGS gauging station.

Annual number of samples per site is equal to or greater than the average annual frequency specified in the MRP for all analytes except organochlorine pesticides, for which recent data have suggested a reduced regulatory priority. Due a very dry WY 2011-12 rainy season, fewer than the planned number of storm events were sampled at 3 of the first 4 stations. With concurrence of Water Board staff, The STLS Work Group agreed that additional samples would be added to WY 2012-13 sampling plans so that over a 3- year period, a total of 12 representative storm events will be sampled at each site..

In June 2012 the STLS Work Group also discussed potential improvements to monitoring procedures for WY 2012-13 including:

- Collecting composite samples on a time-interval rather than flow-weighted basis.
- Re-evaluating guidelines for number of composite aliquots per storm event to balance needs for storm representation against variability in pumping capabilities of the auto samplers.
- Changing contract laboratories for Some analytes (pyrethroid as, SSC, TOC) to improve turnaround times, quality control and costs.

Updated methods will be finalized in late summer 2012 and incorporated in the Quality Assurance Project Plan and Field Manual as described below.

Table 10. Sample type and target frequency of STLS sampling by analyte.

MRP Category	Parameter	No. of Storms / year	No. of Samples/ storm	Frequency change from MRP	Sample Type	Recommended Lab*
1	PCBs (40 congener)	4	4	400%	Discrete	AXYS
1	Total Mercury	4	4	400%	Grab	MLML
1	Total methyl mercury	2[12]	4	400%	Grab	MLML
1	Dissolved Cu	4	1	0%	Composite	BRL
1	Total Cu	4	1	0%	Composite	BRL
1	Hardness	4	1	0%	Composite	BRL
1	SSC (GMA)	4	8	800%	Discrete	EBMUD
1	Nitrate as N and Total Phosphorous	4	4	400%	Discrete	EBMUD
2	Dissolved phosphorus	4	4	400%	Discrete	EBMUD
1	Total Organic Carbon	4	2.5	250%	Discrete	Delta
1	Toxicity – water column (3 species + *Hyalella azteca*)	4	1	0%	Composite	PER
2	Pyrethroids	4	4	1600%	Composite	AXYS
2	Carbaryl	4	4	1600%	Composite	DFG – WPCL
2	Fipronil	4	4	1600%	Discrete	DFG – WPCL
2	Chlordane, DDTs, Dieldrin	0	0	-100%	N/A	N/A
2	Dissolved Se (collect with Dissolved Cu)	4	1	400%	Composite	BRL
2	Total Se (collect with Total Cu)	4	1	400%	Composite	BRL
2	PBDE	2	1	200%	Discrete	AXYS
2	PAH	2	1	200%	Discrete	AXYS

* Laboratory abbreviations: AXYS - AXYS Analytical Services; MLML - Moss Landing Marine Laboratory; BRL – Brooks Rand Labs; EBMUD - East Bay Municipal Utility District; Delta – Delta Environmental Laboratories; PER – Pacific EcoRisk; DFG – WPCL – California Department of Fish and Game Water Pollution Control Laboratory.

[12] Two additional dry weather methyl mercury grab sampling events, required by the MRP, will occur during station set-up in September and shutdown in April or May.

Watershed Monitoring Plan

This section contains recommendations in two categories. The core plan is the minimum recommendation to meet the requirements for an alternative equivalent approach to the POC Loads Monitoring in the MRP. Additional plan options may be considered subject to the availability of additional resources, either for the current participants or by leveraging resources of additional programs or partners in the future.

The core plan comprises 6 sites as shown in Table 2, using the sampling frequencies and methods in Table 10.

In January 2012, STLS Work Group members noted that initiating field sampling for EMC development may be premature since we are still in the discovery phase of final model structures for the initial group of POCs, and evaluating GIS data quality in relation to pollutant specific land use/ source areas and the usefulness of existing data sets for back-calculation of EMCs.

The Quality Assurance Project Plan and Field Manual with Standard Operation Procedures will document details of equipment and methods, to be summarized in a 2012B revision of Appendix F. The first year of monitoring in WY 2011-12 involved some method variations that are being resolved along with recommendations for additional quality assurance/quality control procedures. .

Should additional resources become available, plan options could include:

- Accelerating Core Plan activities on an earlier schedule.
- Adding other analytes where compatible with the STLS autosampler configuration and grab sampling logistics described in the Field Manual and summarized in Table 10. MYP updates would not necessarily include short-term examples such as the RMP nutrient and dioxins strategies' separately funded studies involving supplemental nutrient and dioxins sampling and analysis at the two STLS sites operated by the RMP.

The STLS Work Group will not produce a detailed written interpretive report of WY 2011-12 results, but will provide a limited summary of the monitoring activities for purposes of the RMP and MRP. SFEI will present a preliminary review of the first year's data for discussion at STLS and SPLWG meetings to be scheduled in the second half of 2012. An integrative 2-year report will be prepared in late 2013, and will be incorporated in BASMAA's Integrated Monitoring Report for MRP reporting requirements.

Source Area Runoff Monitoring

The RWSM literature review identified several gaps in available information about EMCs. As an alternative to starting reconnaissance for source area monitoring sites, SFEI began exploratory work with an approach suggested at the May 2011 SPLWG meeting that uses available data from sediment samples collected in storm drain conveyances to back-calculate EMCs for the input side of the RWSM. Initial results of this exploration were unfruitful, but several refinements are being pursued as described in Appendix B and further results and potential implications for source area runoff monitoring will be provided in a 2013 version of the MYP Appendix G.

Adaptive Updates

This MYP is a working document and will require revisions as new information and data are reviewed for POCs on the existing priority list, or new pollutants are identified as regional priorities. Updated working versions of the MYP will be incorporated in BASMAA Monitoring Status Reports or Urban Creeks Monitoring Reports related to MRP requirements. The next future revision in version 2013A will cover the period through December 2012 and may incorporate:added or updated materials listed below:

- Updated Appendix F with details of watershed monitoring sampling procedures, & QA, with reference to QAPP, field Manual, and field training materials; also documentation of procedures for coordinating management, QA/QC of watershed monitoring data
- Review priorities for watershed monitoring data vs. EMC studies, document potential scenarios for future allocations of STLS effort
- Draft planning timeline for future data reviews (e.g. trends analyses, integration with spreadsheet modeling)
- Preliminary review of first year watershed monitoring data and experience, recommended changes to MYP watershed monitoring design, if applicable
- Updates on potential coordination with RMP Modeling Strategy, as applicable
- Update on Regional Watershed Spreadsheet Model development, study designs for preliminary load estimates for selected POCs and sediment,
- Updates to work plan and descriptions of future planned studies
- Update on preliminary EMC explorations and recommendations for EMC development studies
- Approach for preparing integrated monitoring report (draft in September 2013)
- Coordination with RMP monitoring strategy, as applicable
- Updates to work plan and descriptions of future studies
- Timeframe for next MYP version(s) and adaptive updates

As the primary stakeholder forum, the STLS Work Group will track these various needs and set priorities for further MYP updates. The SPLWG will review these updates, at least annually but ideally several times per year, to track progress according to the RMP Multi-Year Plan, or at milestones such as the following:

- Trends power analysis, after accumulation of appropriate minimum number of samples. Revisions of the MYP in 2012 will develop a provisions timeframe for trends analyses over the next 3-5 years.
- Bay Modeling milestones as they become established through Modeling Strategy

Workplan and Detailed RMP Task Descriptions

This section outlines the 5-year STLS workplan for both the RMP and stormwater programs acting collaboratively through the Bay Area Stormwater Management Agencies Association (BASMAA) (see Table 11), and presents capsule summaries of RMP workplan tasks for the same time period as guided by the RMP Multi-Year Plan which has committed $400,000 annually during 2012-2014[13]. The budgets and scopes shown below are as of spring 2011 and will be updated in version 2013A after the RMP develops its proposed budget for 2013. Detailed task scopes for future years will be prepared as part of the annual planning process with STLS and SPLWG oversight.

1A) Regional Watershed Spreadsheet Model Development and Support.

Objective: Develop and use GIS-based spreadsheet model for regional load estimation.

Deliverables: Load estimates for priority pollutants of concern and sediment; see 2012 study proposal for more details on near-term activities.

Milestones and Linkages to other Projects: [to be included in future Appendix B]

Project Participants: RMP

Due Date: [to be included in future Appendix B]

RMP Contributions and Years: 2011 approved $20,000; 2012 approved $20,000; 2013 approved $25,000; 2014-2015 TBD (Phase II).

BASMAA funding for sediment load estimation (Phase I, estimated) 2012: $28,000; 2013: $15,000/TBD; PBDE, chlordane, dieldrin, DDT (Phase II) 2012 $35,000; 2013-14 TBD.

Total Cost: TBD,

[13] RMP Master Planning Workshop, February 7. 2011

Table 11. Draft five-year STLS workplan. Numbers indicate budget allocations or planning projections in $1000s. Stormwater programs budgets interpolated from BASMAA Fiscal Year budgets (regional reporting budgets not shown). Budget numbers shown in parentheses for later years are projected, subject to annual authorization processes of the RMP and BASMAA.

Task ID	Funding Agency	Task Description	2011	2012	2013	2014	2015
1		**Watershed and Associated Bay Modeling**					
1A		Regional Watershed Spreadsheet Model					
1A.1	RMP	Phase I – Water, Sediment, PCBs and Mercury	20	20	25		
1A.1	BASMAA	Phase I – Sediment		28	15	TBD	
1A. 2	RMP	Phase II – Other Pollutants of Concern				TBD	
1A.2	BASMAA	Phase II– PBDE, DDT, chlordane, dieldrin		35	TBD	TBD	
1A.3	RMP	Phase III – Periodic Updates				TBD	TBD
1B	RMP	Coordination with Bay Margins Modeling				TBD	
1C	TBD	HSPF dynamic modeling					TBD
2	RMP	**Source Area Monitoring / EMC Development**	20	80	80	TBD	TBD
3		**Small Tributaries Monitoring**					
3.1	BASMAA	Multi-Year Plan Development	15				
3.2	BASMAA	Standard Operating and Quality Assurance Procedures	55				
3A	RMP	Monitor Two Representative Small Tributaries	300	328	343	300	TBD
3AB.1	BASMAA	Monitor Two to Four Representative Small Tributaries or Sites Downstream of Management Actions	255	510	(480)	(480)	TBD
3AB.2	BASMAA	Lab analyses, Quality Assurance, Data Management	183	316	(320)	(320)	TBD
4	RMP	**Reporting, Stakeholder Administration and Adaptive Updates**	41		20	TBD	
	BASMAA	**Data Analysis, Communications, Administration**	45	84	(85 est)	TBD	TBD
RMP Total			381	428	468	TBD	TBD
BASMAA Total		**Task 1**		63	15	TBD	
		Tasks 2-4	558	910	(885)	TBD	TBD
Total			934	1,401	(1368)	TBD	TBD

1B) Coordinate STLS with Bay Margins Modeling.

Objective: Identification of high-leverage watersheds contributing to POC impairment in S.F. Bay.

Deliverables: Timely coordination and exchange of information between STLS and Bay Margins modeling Work Groups.

Milestones and Linkages to other Projects: Depends on Modeling Strategy

Project Participants: RMP

Due Date: Depends on Modeling Strategy

RMP Contributions and Years: 2013-2015 TBD?

Total Cost: TBD

2) Land Use/Source Area Specific EMC Development and Monitoring.

Objective: Calibrate RWSM loading estimates to Bay Area specific conditions and POCs.

Deliverables: Refined EMCs or other modeling coefficients for RWSM; see 2012 study proposal for more details on near-term activities.

Milestones and Linkages to other Projects: Coordinate with 1A, RWSM Development.

Project Participants: RMP

Due Date: TBD

RMP Contributions and Years: 2011 approved $20,000; 2012 approved $80,000; 2013 approved $80,000; 2014-2015 TBD.

Total Cost: TBD

3.1) Development of STLS Multi-Year Plan

Objective: Develop alternative monitoring approach to POC Loads Monitoring that meets objectives of STLS and MRP; facilitate consistent implementation

Deliverables: Consensus STLS MYP document for timely implementation of required stormwater monitoring.

Milestones and Linkages to other Projects: To be coordinated with RMP 3A and MRP reporting requirements (initial Phase 1 results in late.2012)

Project Participants: BASMAA

Due Date: Selection of monitoring methods and Phase 1 sites by July 2011; sites for Phase 2 monitoring by January 2012

RMP Contributions and Years: (review using 2010 available funds).
BASMAA funding 2011: $15,000

Total Cost: BASMAA $15,000 one-time

3.2) Stormwater Programs - Monitoring, Standard Operating and Quality Assurance Procedures.

Objectives: Ensure that alternative monitoring methods in STLS meet MRP requirements for SWAMP comparability and reporting formats; provide documentation and facilitate consistent implementation

Deliverables: Quality Assurance Project Plan, Standard Operating Procedures

Milestones and Linkages to other Projects: To be coordinated with RMP 3A and MRP reporting requirements (initial Phase 1 results in late.2012)

Project Participants: BASMAA

Due Date: July 2012

RMP Contributions and Years: RMP N/A;
BASMAA funding 2011: $55,000

Total Cost: BASMAA $55,000 one-time
:

3A) Monitor Representative Small Tributaries.

Objective: Collect POC stormwater data to be used for tracking long-term trends in loading to S.F. Bay

Deliverables: small tributaries monitoring data

Milestones and Linkages to other Projects:

Project Participants: RMP, BASMAA

Due Date: Exploratory watershed characterization results by June 2011; Phase 1 monitoring begins October 2011; Phase 2 monitoring begins October 2012[14]

RMP Contributions and Years: 2011 approved $300,000; 2012 approved $328,000; 2013 approved $343,000; 2014 [$300,000/year projected in Multi-Year Plan].
BASMAA funding $2011: 255,000, TBD 2013-2015 (see 3A/B.1 below for 2012-2015)

Total Cost: RMP: [$300,000/year projected in RMP Multi-Year Plan?]

3A/B.1) Monitor Sites Downstream of Management Actions.

Objectives: Collect POC stormwater data to be used for tracking potential load reductions downstream of Management Actions.

Deliverables: Monitoring data.

Milestones and Linkages to other Projects:

Project Participants: BASMAA

Due Date: Phase 2 monitoring begins October 2012

RMP Contributions and Years: N/A.
BASMAA funding up to $510,000 for all monitoring including 3A and setup in 2012; estimated $480,000 in 2013; TBD 2014-2015

Total Cost: TBD.

[14] , RMP budgets include all project management, laboratory analyses and data management and Quality Assurance, while BASMAA scopes and budgets for those are shown separately under Task 3A/B.2 and a portion of Task 4.2)

3A/B.2) Stormwater Programs ongoing Quality Assurance and Data Management.

Objective: implement and document QA procedures and reporting for SWAMP comparability.

Deliverables: QA review and data management.

Milestones and Linkages to other Projects: To be coordinated with Task 3A/B.1 and MRP reporting requirements.

Project Participants: BASMAA

Due Date: Ongoing Quality Assurance and Data Management; BASMAA funding

RMP Contributions and Years: N/A;
BASMAA funding 2011: $183,000, 2012: $316,000, 2013: $320,000 estimated; 2014-2015 TBD

Total Cost: TBD,

- Phase 1 setup, station operation and laboratory analyses:
- Quality Assurance and Information Management on laboratory results, consistent with those for RMP-operated stations.:

4) Reporting, Stakeholder Administration and Adaptive Updates.

Objectives: Report results at agreed-upon intervals; support future STLS decision-making through facilitation of stakeholder processes and timely updates to STLS MYP.

Deliverables

Milestones and Linkages to other Projects

Project Participants: BASMAA (initial MYP draft); RMP (ongoing)

Due Date: WY 2011-12 Watershed Monitoring Plan complete by July 2011; other due dates TBD.

RMP Contributions and Years: 2011 special allocation approved: $41,000; 2012: $0; 2013 approved $20,000. [$50,000 projected for reporting in Multi-Year Plan]; 2014-2015 TBD.
BASMAA funding 2011: $45,000; 2012: $84,000 budgeted; 2013 $85,000 estimated; 2014-2015 TBD..

Total Cost: TBD

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List of Appendices

B4b

Regional Watershed Spreadsheet Model

Appendix B to Small Tributaries Loading Strategy Multi-Year Plan

Version 2012B PROGRESS

The Small Tributaries Loading Strategy's element for a Regional Watershed Spreadsheet Model (RWSM) was recommended as the primary tool for estimating regional scale loads to San Francisco Bay. Initial activities in 2010 included setup of the base hydrology model and initial contaminant models for testing. Details of the model construction and results of initial hydrologic calibrations are described in the Year 1 Progress Report recently finalized to incorporate review comments by the Sources Pathways Loadings Work Group move (SPLWG)[1]. The Year 1 progress report also discusses the concepts of varying sub-model architectures adapted to the properties of each contaminant, and the characterization of the distributions of various pollutants. This conceptual framework was applied in Year 1 to PCBs, mercury and copper, and will be extended to other contaminants or analytes in Years 3and 4.

This Appendix to the STLS MYP is a working update, composed of the following stand-alone documents:

- Workplan to "Develop and Update EMC Data and Spreadsheet Model – Year 3", including proposed Five-Year Plan for the RWSM, as provided for review to the STLS Work Group in February 2012. The planning matrix and task list show both RMP and BASMAA-funded tasks; the latter are based on the Workplan's "Appendix A" which has been updated provisionally as of August 2012.
- RWSM Year 2 Progress Report discussing improvements in the hydrology model and model documentation. This document is also available at http://www.sfei.org/sites/default/files/RWSM_EMC_Year2_report_FINAL.pdf

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[1] Lent, M.A. and McKee, L.J., 2011. Development of regional suspended sediment and pollutant load estimates for San Francisco Bay Area tributaries using the Regional Watershed Spreadsheet Model RWSM): Year 1 progress report. A technical report for the Regional Monitoring Program for Water Quality, Small Tributaries Loading Strategy. Contribution No. 666. San Francisco Estuary Institute, Richmond, CA. Available at http://www.sfei.org/sites/default/files/RWSM_EMC_Year1_report_FINAL.pdf

DEVELOP AND UPDATE EMC DATA AND SPREADSHEET MODEL – YEAR 3

BACKGROUND

Planning level watershed loading estimates were provided in the TMDLs for Hg and PCBs, however, the Water Board called for improvements of regional scale loads and for determining how these could be reduced. These needs are reflected in the municipal stormwater permit (MRP) (SFRWQCB, 2009), in the 2nd and 4th questions of the RMP Small Tributaries Loading Strategy (STLS), and refined more recently in the Multi-Year-Plan (MYP) version 2011 submitted to the Water Board last July (STLS, 2011). The strategy team recommended the use of a "Regional Watershed Spreadsheet Model" (RWSM) for estimating regional scale loads (STLS, 2011). Originally developed in MS Excel in the 80s with simple statistical input from land use and water quality data bases, these models are now commonly used for estimating contaminant loads from specific regions and for testing the potential improvement of management scenarios on hydro-modification and water quality. These models still use annual average runoff estimates as an algebraic function of rainfall and land characteristics (imperviousness and land use) as their basis, but now, within the GIS platform rather than in a spreadsheet, sophistication has increased to include generation of hydrology and water quality components with independent calibration in separate "layers" of the model, more sophisticated calibration and optimization procedures, and a separate land use / source area basis for each contaminant (especially important for our priority pollutants). The strategy group recommended that the hydrology model be developed first followed by sediment, PCBs, and Hg and then other contaminants as outlined in the MRP or by the dioxins or nutrients strategy teams.

FIVE-YEAR PLAN FOR THE SPREADSHEET MODEL

Developing a spreadsheet model for multiple analytes with a myriad of sources and/or land use relations is not a simple task. Beyond the development and calibration of the hydrology model (the basis for loading estimates for all pollutants), there are a number of steps that need to be taken for each analyte (Table 1). Here we briefly outline the overall plan in a step by step fashion but anticipate slight modifications each year hence as lessons are learned or if proposed uses are expanded.

Step 1: Develop factsheet/methodology: The first step for each analyte is to review what is known locally or internationally about the sources or use characteristics and processes of release and transport of the constituent of interest. This information is then put together with what is known about available GIS layers on the proposed most important sources and a model structure and generalized work plan is recommended. In the case of the hydrology model, much work had already been done on this topic and a model structure was available to adapt for our uses. For suspended sediment, similarly, several modeling efforts have already been completed for the Bay Area largely negating the need for developing a factsheet as the technical basis for the model structure and methodology.

Step 2: Develop GIS layers: Once the model structure has been identified (Step 1), the next step is to collate the appropriate spatial data bases of source areas and land uses specific to the constituent to be modeled. In the case of our test case model (copper) or some of the other conventional urban pollutants such as PAHs, these may be the conventional land use classes (open space, agriculture, low density urban, high density urban, commercial, light industrial, heavy industrial and transportation), but even for these conventional classifications, pollutant specific decisions have to be made on how to group the several hundred land use categories that are typical in city and county land use data bases. In addition, since transportation land use is usually a mixture of lines and polygons in raw GIS data bases, pollutant specific decisions have to be made on the buffer width and on what to include with regards to transportation categories (roads, airports, etc.).

Table 1. Long term work plan for developing and completing the Regional Watershed Spreadsheet model for each pollutant.

		Loads calculation analytes									
Step	**Description**	**Flow**	**SS**	**PCBs**	**Hg**	**Cu**	**Se**	**PBDE**	**OC pest**	**Dioxins**	**Nutrients**
1	Develop fact sheet / methodology	②									
1a	Collate local data	③	①	③	③	③	③	B-2012	B-2012	③	2014?
1b	Collate data from review of the world literature	③	①	③	③	③	③	B-2012	B-2012	③	2014?
1c	Develep source area / land use categorization conceptual model	③	①	③	③	③	③	B-2012	B-2012	③	2014?
2	Develop GIS layers	③	①	③	③	RMP-RWSM-2012	2013?	2013?	2013?	2014?	2014?
3	Collate input data and calibration data	③	①	③ ④	③ ④	③	2013?	2013?	2013?	2014?	2014?
4	Run version 1 model and compare with calibration data	③	① ③	WG presentation only		RMP-RWSM-2012	2013?	2013?	2013?	2014?	2014?
5	Improve input data and/ or model structure										
5a	Back-calculate RCs / EMCs / EFs from local or world data	④	B-2012	③ 2011 attempt not sucessful; RMP-EMC-2012	③ 2011 attempt not sucessful; RMP-EMC-2012	RMP-EMC-2012	2013?				
5b	Improve GIS layers	④	B-2012*	RMP-EMC-2012	RMP-EMC-2012	RMP-EMC-2012	2013?	PCB/Hg level of effort may not be needed depending on the level of accuracy needed for the watershed specific and regional loading estimates			
6	Run version 2 model and compare with calibration data	④	B-2012	RMP-EMC-2012	RMP-EMC-2012	RMP-EMC-2012	2013?				
7	Complete FINAL input data set										
7a	Further refine GIS layers if needed	RMP-RWSM-2013	-	RMP-EMC-2012?	RMP-EMC-2012?	RMP-EMC-2012?	2013?				2015?
7b	Further refine back-calculations if needed	-	-	RMP-EMC-2012?	RMP-EMC-2012?	RMP-EMC-2012?	2013?				2015?
7c	Perform wet weather field sampling if needed			RMP-EMC-WY 2013	RMP-EMC-WY 2013	RMP-EMC-WY 2013 TBT	RMP-EMC-WY 2013 TBT	RMP-EMC-WY 2013 TBT	RMP-EMC-WY 2013 TBT	RMP-EMC-WY 2013 TBT	2015?
8	Run version 3 (FINAL) model and complete calibration / varification	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	RMP-RWSM-2014	2016?
9	Complete model packaging and user manual	RMP-EMC-2012	RMP-EMC-2012	2013?	2013?	RMP-EMC-2012	2014?	2014?	2014?	2014?	2016?

	References
①	Lewicki, M., and McKee, L.J, 2009. Watershed specific and regional scale suspended sediment loads for Bay Area small tributaries. A technical report for the Sources Pathways and Loading Workgroup of the Regional Monitoring Program for Water Quality: SFEI Contribution #566. San Francisco Estuary Institute, Oakland, CA. 28 pp + Appendices
②	Ha, S.J., and Stenstrom, M.K., 2008. Predictive Modeling of storm-water runoff quantity and quality for a large urban watershed. Journal of Environmental Engineering 134, 703-711
③	Lent, M.A. and McKee, L.J., 2011. Development of regional contaminant load estimates for San Francisco Bay Area tributaries based on annual scale rainfall-runoff and volume-concentration models: Year 1 results. A technical report for the Regional Monitoring Program for Water Quality. San Francisco Estuary Institute, Oakland, CA
④	Lent et al 2012 RWSM y2 documentation memo
B	Funding from BASMAA via a contract with ACCWP
B	Funding from BASMAA via a contract with ACCWP
*	Note - the model resolution for sediment will vary from place to place given the need to use measured data where it exists and modeled data where it does not exist
RMP-RWSM	RMP funding ($20k/year) allocated to regional watershed spreadsheet model (RWSM) general development
RMP-EMC	RMP funding ($80k/year) allocated to EMC development + depending on modeling outcomes perhaps a further $80-100k

Step 3: Collate input data and calibration data: In the case of the rainfall-runoff model, this included rainfall data, land use specific runoff coefficients, soils and slope data, and runoff data for 18+ calibration watersheds. In the case of the sediment model, since we are modifying an existing model to address known weaknesses, this will only need to include local geology, classification, and relative erosion rates for each class or erosional province. Depending on the recommended model structure outlined in the fact sheet (Step 1) and the availability of spatial data sets (Step 2), for each of the pollutants, data on land use or source area specific event mean concentrations (EMCs) or soil concentrations would be collated along with available "bottom of the watershed" loadings information that has been collected in the past from Bay Area watersheds.

Step 4: Run version 1 of the model: Using the information and data developed in Steps 1, 2, and 3, the model will be run and compared to existing knowledge of loads from watersheds. This first run will be largely "proof of concept". Various forms of a sensitivity analysis can be run on v1 help to determine weaknesses in model structure, input and calibration data sets so that recommendations can be developed to guide future model versions.

Step 5: Improve model structure and/ or input data: Based on constituent specific recommendations from step 4, further spatial data base development could occur or exploration of other sources of coefficients or land use classifications. In addition, in this task more effort can be put into developing EMC data for model input including EMC back-calculations upon either water concentration or sediment concentration data or combinations of both data types either locally available or from elsewhere.

Step 6: Run version 2 of the model: Using the information and data developed in Steps 1, 2, 3, 4, and 5, the model will be run and compared to existing knowledge of loads from watersheds. This second run will necessarily incorporate a detailed sensitivity analysis and or/ Monte Carlo techniques to determine weaknesses in model structure, input and calibration data sets. Very specific recommendations will be developed to prepare for decisions on further GIS layer development or consolidation, back-calculation techniques, or a need for specific field data collections to support model improvements.

Step 7: Complete FINAL input data set: Based on constituent specific recommendations and decisions from step 6, further spatial data base development could occur or exploration of other sources of coefficients or land use classifications. In addition, more effort can be put into back-calculation techniques. Pollutant specific EMC data or reconnaissance bottom of the watershed data in combination with back-calculation techniques may be collected in the field or specific watersheds may be targeted for bottom of the watershed loads data to be used for model calibration.

Step 8: Run version 3 (likely FINAL) of the model: Using the information and data developed this in Steps 1, 2, 3, 4, 5, 6, and 7, the model will be run and compared to existing knowledge of loads from watersheds. This "FINAL" version will include documentation of model weaknesses for specific land uses or source areas. In addition, the model accuracy and precision will be analyzed for each constituent at scales of specific watersheds, Bay margin segments, and the Bay as a whole.

Step 9: Complete model packaging and user manual: Model packaging and documentation will be completed to ensure complete transparency between the model development group (SFEI staff, STLS team) and information users, and that the model results are repeatable, the model is expandable as appropriate, and that the model is not used for purposes it is not designed for. Such an open source model will mean that those who are not the originators of the model can run the model, however an open source model will require that, from 2012 forward, appropriate model structure and suitable user documentation is considered at each step of model development.

PROGRESS TO-DATE

During the RMP 2010 calendar year (year 1 of this project), version 1 of the hydrology component of the regional watershed spreadsheet model (RWSM) was developed. Two base hydrology model approaches were investigated: one using runoff coefficients based on land use and the other based on impervious cover. Initial versions of each model were calibrated to local hydrology data from 18 local watersheds with a wide variety of imperviousness, soil, and slope. Recommendations were made to address hydrology model weaknesses. The year 1 report also presented a review of land use and source areas in relation to PCBs, Hg, dioxins, Cu, and Se and provided recommendations for steps to develop event mean concentration (EMC) data to support the input side of the model. The report recommended the model structure for each pollutant, methods to fill data gaps, and priorities (Lent and McKee 2011).

During RMP 2011 calendar year (year 2 of this project), version 2 of the GIS-based model was developed following Y1 recommendations. In v2, several more calibration watersheds were added to increase the range of watershed characteristics including %imperviousness character. In addition, gauge records with incongruent land use / impervious data were removed and land use categories were refined. For Y3, a focus on the sediment and pollutant models was recommended (Lent et al., 2012).

In parallel, the BASMAA Monitoring / Pollutants of Concern (POC) Committee has been discussing and prioritizing work products in relation to the MRP. During 2011, project profiles were developed for addressing MRP provisions C.8.e.vi (sediment delivery estimate / budget) and C.14 (PBDEs and OC pesticides). Subsequently, BASMAA has asked SFEI to complete work outlined in these project profiles. Since all these tasks are components of what is envisioned to be a single model developed over three years and final report in 2014, this work plan reflects all recommendations and BASMAA work requests in relation to the RWSM that can be accurately budgeted at this time. However, we are careful to explicitly describe products and deliverables in relation to the specific resources allocated by either the RMP or BASMAA.

OBJECTIVES FOR YEAR 3

Step*	**Task**	**Objective**	**Funding source**
2, 3, 4	Cu-2 Cu-3 Cu-4 Cu-9	Complete a copper RWSM as a test case for calibration procedures and to set reasonable expectations for other contaminants and document outcomes and recommendations	RMP 2012 RWSM base model funds
5, 6	SS-5 SS-6 SS-9	Complete an updated version of the sediment RWSM (hybrid), refinement of the existing model (Lewicki and McKee, 2009) per BASMAA sediment project profile and document outcomes and recommendations	BASMAA funds via ACCWP contract
2	PCB-2 Hg-2	Complete GIS layer development for PCBs and Hg per recommendations from the Y1 report (Lent and McKee 2011) including meta data documentation	RMP 2012 EMC development funds
5	PCB-5 Hg-5	Complete back-calculations of PCB and Hg EMC data using available local (focus where possible) and literature data per recommendations from the Y1 report (Lent and McKee 2011) and document outcomes and recommendations	RMP 2012 EMC development funds
6	PCB-6 Hg-6 PCB-9 Hg-9	Complete next versions of the PCB and Hg RWSMs and document outcomes and recommendations	RMP 2012 AND 2013 RWSM base funds; RMP 2012 EMC development funds
1	PBDE-1 OCPest-1	Complete contaminant profiles and model workplan recommendations for PBDE, PBDE, DDT, chlordane, dieldrin per BASMAA project profile	BASMAA funds via ACCWP contract
0	Mgmt-0	STLS EMC spreadsheet model communication and coordination	RMP 2012 EMC development funds and BASMAA POC Monitoring Contract

***Refers to steps in Table 1**

WORK PLAN FOR YEAR 3

Develop Copper test case Model for RWSM: Copper represents a data rich urban contaminant that follows classical source, build-up, and wash off processes in relation to urban land uses in a similar fashion to PAHs and pesticides and parts of the mercury model process. It therefore represents an ideal test case as a step toward model development for other contaminants that are of more interest. There is abundant local land use specific data on copper EMCs (BASMAA, 1995) and abundant bottom of the watershed calibration data (BASMAA, 1995; RMP loading studies, recent BASMAA/ BACWA studies; other SFEI studies). In addition, there is SPLWG experience and published papers from SoCal (Stenstrom, Stein and coauthors).

Task Cu-2 Refine GIS data to include transportation land uses.
Deliverable: Transportation GIS data layer

Task Cu-3 Compile EMC data with a focus on local data sets, filling in any data gaps firstly from SoCal data (compiled by Stein and Stenstrom and coauthors) and lastly by world data (should not be needed). Budget assumes BASMAA data base is “model ready”.
Deliverable: Copper EMC Database

Task Cu-4a Complete RWSM v1 and refine based on a sensitivity analysis to each of the input parameters (land use choices, lumping v splitting land uses, upper and lower bounds of EMC etc.), Calibration with local bottom-of-the-watershed data including Guadalupe River, Zone 4 Line A, and possibly Ettie St and Cerrito Creek and BASMAA 1995 data sets. Comparison of model output to results of Brake Pad Partnership.
Deliverable: Model calibration and output

Task Cu-4b Complete a short concise report section outlining methods, results and recommendations briefly (5 pages total). Develop framework for documentation of hydrology model, document data inventory and metadata for hydrology model. Example questions to be explored:

- Are the data available from 4 watersheds enough for model calibration?
- Are the appropriate land uses represented in the calibration watersheds?
- Was input data representative of land uses/source areas?

Deliverable: Short technical memo – 5 pages

Task Cu-9 Develop and package a user manual for the Cu model with documentation for external users of the model including assumptions and recommended uses. Not budgeted.

Estimated cost: $12,200

Update version of the suspended sediment RWSM: Suspended sediment (SS) is an important vector for many pollutants. In 2008/09 the RMP completed a detailed analysis of SS flowing to SF Bay from local tributaries in the 9-counties adjacent to the Bay (Lewicki and McKee, 2009). During 2011, the first versions of the SS RWSM was developed using local land use based SSC EMC data (BASMAA, 1995). The results were questionable but informative. The outcomes of the SS RWSM differed substantially and non-systematically from Lewicki and McKee (2009) leading us to recommend improving the Lewicki and McKee (2009) model as the best path. Weakness in the Lewicki and McKee (2009) analysis included the treatment of urban upland land use categories without regard for base geology (known to have highly variable erosivity in the Bay Area). SFEI and many Bay Area consulting firms have completed geomorphic studies that describe either quantitatively or qualitatively landscape erosion in relation to land use and geology/soils.

Task SS-5a Complete a status review (of previous Bay Area sediment estimates) and provide rationale for improvements or modifications to RWSM in a 1-2 page memo to BASMAA (will become the introduction section in the documented outcomes)
Deliverable: 1 page memo on recommended RWSM improvements, proposed tasks budgets and schedules (Appendix A; S1)

Task SS-5b Compile local geology GIS layers, literature and reports, and professional judgments/ opinions on geological / terrain classes / erosional provinces, and relative erosion rates. Interpret and complete a classification scheme for Bay Area urban uplands (values/ ranges/ distributions of sediment-related coefficients) and route to local professionals for review and input (about 3 local erosion experts)
Deliverable: Erosion rates classification scheme (Appendix A; S2)

Task SS-6a Migration of Lewicki and McKee (2009) model into compatible format with RWSM. Complete sediment RWSM v2 testing and calibration, sensitivity analysis and make any obvious or within budget improvements (Appendix A; S2)
Deliverable: Model calibration and output

Task SS-6b Complete model documentation (<10 page memo on methods and results) including a discussion of uncertainty and data limitations and recommendations regarding potential improvements and/or data collection, and relevance to potential use scenarios by Water Board or BASMAA
Deliverable: 10 page technical memo including methods, results and any recommended phase II improvements (Appendix A; S2)

Task SS-7, 8 PHASE II model improvements and final technical memo for inclusion into MYP v2013. Scope and budget TBD. (Appendix A; S3)

Task SS-9 Develop and package a user manual for the sediment portion of the model with documentation for external users of the model including assumptions and recommended uses. Not budgeted.

Estimated cost: labor $29,250; sub-contracts: $3,000 “data input/ review” from local erosion experts

<u>GIS layer development for PCBs and Hg:</u> Although Hg and PCB concentrations and loads in urban landscapes do correlate positively increasing urban land use density/intensity, this is less likely due to rainfall-wash off processes of pollutant behavior (like Cu or Zn for instance), but rather due to a greater density of polluted source areas in relation to land use intensification. A better model for Hg and PCBs is a combination of land use and source areas emission factors (Lent and McKee, 2011). Based on the review of local and international information, PCBs and Hg are likely associated with the manufacture, repair, testing, storage, and use of electrical transformer and capacitor equipment, military areas, drum, metals, and auto recycling yards, oil refineries and petrochemical industrial areas, manufacture of steel or metals, and transport including rail and shipping. In addition, Hg is also associated with cement production and cremation. This task will generate the basal land use and source area geospatial data set to support the Hg and PCB RWSM. There are a range

of challenges including lack of existing published data on some of the proposed layers and the conversion of line data for form transportation and other land use / source area categories in to shape files.

Task PCB&Hg-2a Coordinate with BASMAA by holding 3-3 hour in person meetings to plan scope of task, level of effort for each land use, and align this effort with other BASMAA work, prep, and follow-up to meetings. Compile or generate GIS shape files (polygon or point depending on source type) and associated metadata in the following order of importance (through a lens of sensible level of effort):

1. Electrical transformer / capacitor (manufacture/repair/testing/storage/use)
2. Military = Recycling (drum)
3. Cement production
4. Cremation
5. Oil refineries / petrochemicals = Manufacture (steel or metals)
6. Transport (rail) = Transport (ship)
7. Recycling (metals) = Recycling (auto)

Deliverable: GIS data layers (prioritized by STLS)

Task PCB&Hg-2b Devise a QA method, apply it across the layers, and revise / complete meta data.

Deliverable: Develop QA Methodology and Meta-Data

Task PCB&Hg-2c Prepare a short documentation memo (5 pages) that briefly discusses data sources, data quality, and potential for improvements. Present results to SPLWG (1 meeting) and STLS (monthly phone calls during development and face-to-face).

Deliverable: 5 page technical memo

Estimated cost: $25,850

<u>Back-calculations of PCB and Hg EMC data:</u> During 2011, an unsuccessful attempt was made to back-calculate EMC data for Hg and PCBs in relation to basic land use categories using data generated from the 16-watershed reconnaissance loadings study. Success was limited by too few concentration data in relation to the number of land uses, a situation that may be rectified through further reconnaissance. In the meantime, Lent and McKee (2011) recommended the exploration of EMC back-calculation using a number of other data sets including land use specific ranges indicated by local data (preferably) augmented with data from published literature on water and soil concentrations for water. They proposed a number of methods (which might require further discussion and refinement) which generally use combinations of either soils or water data or both to either use matrix algebra or statistical distribution to determine reasonable ranges in concentration associated with land uses and source areas. The challenge with methods using soils data is the potential for underestimation due to a lack of knowledge about concentration factors between in-situ soil concentrations and those found in stormwater.

Task PCB&Hg-5a Compile local and international data on soils and water concentrations in relation to land use and source areas for Hg and PCBs (from task 3) ensuring the resulting data base is well documented

Deliverable: PCB and Mercury EMC database and documentation

Task PCB&Hg-5b Research various back-calculation methods, including inverse optimization methods.
Deliverable: Methods for calculating EMCs

Task PCB&Hg-5c Provide regular updates and feedback opportunities to STLS, including discussion of proposed back-calculation methods.
Deliverable: Project updates at up to 3 STLS meetings

Task PCB&Hg-5d Complete back-calculations, perform sensitivity analysis, and develop error bars around results (or professional judgment to assign errors or ranges)
Deliverable: EMC back calculation results

Task PCB&Hg-5e Prepare a short (<5 page) summary of methods and results for inclusion in the model documentation.

Deliverable: 5 page technical memo summarizing methods and results
Estimated cost: $19,500

<u>PCB and Hg Regional Watershed Spreadsheet models (RWSMs):</u> During 2011, the first versions of the Hg and PCB RWSMs were developed using combinations of SoCal EMC data (Hg only) and world soils data (Hg and PCBs) combined with local SSC EMC data (BASMAA, 1995). The Hg load results were consistent with existing estimates at a regional scale but questionable at the scale of individual land uses. For PCBs, the loads were 20x higher than expected on a regional scale and, relatively from one land use to another, in the right order.

Task PCB&Hg-6a Review modeling options (more or less land use / source area classes, hybrid sediment/water based models) and prepare a short memo (will be a component of the methods section of the Y3 documentation) that provides the rationale for each model structure - present model options to STLS.
Deliverable: Short memo of possible modeling options

Task PCB&Hg-6b Refine RWSM to incorporate spatial data created in Task 3 and back calculations completed in Task 4 into the input data sets. Revise and complete Hg and PCB RWSM v2 testing and calibration. This will include re-tooling the model, for speed in use and efficiency in structure, and build a tool interface in Arc-GIS that can handle both iterative (loop over multiple watersheds) and single inputs. Evaluate model weaknesses through a sensitivity analysis (combinations of more and less source area classes and reasonable ranges of EMCs for each source class, hybrid models) and make any obvious or within budget improvements. Assumption: The model and documentation will not be developed for external users. Such documentation may be a prioritized further step.
Deliverable: Model calibration and output

Task PCB&Hg-6c Complete model documentation (10 page report section on methods and results) including a discussion of uncertainty and data limitations and recommendations regarding potential improvements and/or data collection, and relevance to potential use scenarios by Water Board or BASMAA.
Deliverable: 10 page technical memo

Task PCB&Hg-9 Develop and package a user manual with documentation for external users of the PCB and Hg models including assumptions and recommended uses. Not budgeted.

Estimated cost: $43,000

Contaminant profiles and model workplan recommendations for PBDE, DDT, chlordane, and dieldrin: During 2010 and 2011, SFEI completed contaminant profiles and model workplan recommendations for PCBs, Hg, Dioxins, Cu, and Se (Lent and McKee, 2011). Five components went into developing each profile: 1. A review of known uses for each substance (Hg, PCBs, Cu, Dioxins, and Se), 2. a review of regulatory data bases on contaminated sites/ spills (Hg, PCBs, and Cu), 3. a review of local and world soils literature (Hg, PCBs, Se), 4. A review of concentrations in stormwater (Hg, PCBs, Cu, Dioxins, and Se), and 5. A general commentary on presently known GIS layers in relation to the recommended land use / source area categories resulting from the first four components. The outcome of this task will be contaminant profiles and model workplan recommendations for PBDE, DDT, chlordane, and dieldrin based on a selection of these steps.

Task PBDE/OCP-1a Review existing contaminant profile structures for Hg, PCBs, Cu, Dioxins, and Se (Lent and McKee, 2011) and the CMIA reports for PBDEs (Werme et al., 2007) and OC Pesticides (Connor et al., 2004). Prepare a short (<3 page) memo (note, will become the introduction sections in the contaminant profiles for each POC) outlining known uses for each substance (note, we would lump the OC pesticides to reduce the level of text redundancy), knowledge gaps in previous CMIA reports in relation to RWSM development, and propose/estimate level of detail for PBDE, DDT, chlordane, and dieldrin contaminant profiles. Present proposal to STLS for discussion and decisions.

Deliverable: 3 page technical memo (Appendix A; P1)

Task PBDE/OCP-1b Prepare contaminant profiles and model workplan recommendations for PBDE, DDT, chlordane, and dieldrin. Base the recommendations on information gaps or uncertainties for each POC and clarifications from WB staff regarding potential/desired uses and data quality needs. Document the outcomes in a short concise technical memo (subsuming the previous effort for Se (Lent and McKee, 2011)) that addresses the following questions:

1. Is the POC present in urban runoff?
2. Is the POC distributed fairly uniformly in urban areas?
3. Are storm drain systems a generalized source or are there specific source locations or types?

Present findings and work plan rationale to the STLS for discussion and decisions on next steps.

Deliverable: Contaminant profiles for PBDEs and OC pesticides (Appendix A; P2)

Estimated cost (6a-6b): $35,000

Task PBDE/OCP-2a If needed, generate GIS layers to support the RWSM structure for each POC.

Deliverable: GIS layers for PBDEs and OC pesticides

Estimated cost: Not Budgeted – Year 4 (Appendix A; P3)

Task PBDE/OCP-2b Perform preliminary setup of RWSM to estimate annual loads of PBDE, DDT, chlordane, dieldrin. Perform preliminary model runs for selected POCs, depending on available resources and WB interest. Document findings (<5 pages) with a focus on recommendations that result from initial model runs appending the previous memo.

Deliverable: 5 page technical memo on model results
Estimated cost: Not Budgeted – Year 4 (Appendix A; P3)

STLS EMC spreadsheet model communication and coordination: In previous years, the RMP provided separate budget for maintaining communications between STLS team members. In 2012, budget for communications is assumed to be a component of the RMP STLS projects.

Task Mgmt-0 Conduct up to 8 STLS phone conferences to update STLS members on progress, coordinate tasks, solicit feedback and direction, and present findings. Hold 4 quarterly in-person meetings for discussion and decision making on WY 2013 additional monitoring activities and review of WY 2012 monitoring activities. Review Multiyear Plan and QAPP draft documents.

Estimated cost: $24,000

PROJECT BUDGET AND SCHEDULE

The estimated budget (Table 2) is a not-to-exceed amount based on the anticipated time and materials needed by SFEI to complete the project tasks described in the previous section. The completion of some of the tasks within the preliminary schedule provided in Table 2 is dependent upon the timely discussion and agreements by the Water Board and BASMAA.

Table 2. Cost estimates and schedule for completing RWSM components as described in the workplan above.

Old Task No	**New Task No**	**Description**	**RMP base model funds**		**BASMAA sediment funds via ACCWP contract**		**BASMAA PBDE/ OC pest funds via ACCWP contract**		**RMP EMC development funds**		**BASMAA POC Monitoring via ACCWP contract**	**Estimated Completion Date**
			2012	2013	2012	2013	2012	2013	2012	2013	2012	
1	Cu-2, 3, 4	Copper test case RWSM	$9,700						$2,500			March-July 2012
2	SS-5, 6	Updated version of the suspended sediment RWSM			$32,250							April-November 2012
3	PCB-2 Hg-2	GIS layer development for PCBs and Hg							$25,850			March-July 2012
4	PCB-5 Hg-5	Back-calculations of PCB and Hg EMC data							$19,500			July-September 2012
5	PCB-6 Hg-6	PCB and Hg Regional Watershed Spreadsheet models (RWSMs):	$10,300	$20,000					$12,700			March-July 2013
6	PBDE-1 OCPest-1	Contaminant profiles and model workplan recommendations for PBDEs, DDT, chlordane, and dieldrin					$35,000					OC Pest March-September 2012; PBDE September-December 2012
7	Mgmt-0	STLS EMC spreadsheet model communication and coordination:							$17,200		$6,800	Ongoing
		Total Cost	**$20,000**	**$20,000**	**$32,250**		**$35,000**		**$77,750**		**$6,800**	
		Funds Available	**$20,000**	**$20,000**	**?**	**?**	**?**	**?**	**$80,000**	**$80,000**	**$6,800**	

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Appendix A

Sediment and MRP C.14 Contaminants Regional Loads Estimation: Revised August 2012
Multi-year Deliverables List

The table below lists the key SFEI deliverables for Sediment Estimate (S prefix) and Permit-specific Contaminants (P prefix) regional projects to be implemented through ACCWP Action Plans starting with C14-1-12. The right hand column describes, for planning purposes, assumed interim steps or products that will inform or be incorporated into each deliverable. There can be some flexibility in the alignment of these interim steps with key deliverable dates, e.g. degree of finalization of individual contaminant profiles for Deliverable P-2.

The ACCWP Action Plans will be based on the S and P workplans which should be integrated with each other and also with updates to the STLS and Regional Watershed Spreadsheet Model Multi-year Plans. It is assumed that SPLWG review or comment will be solicited and incorporated at each stage, especially for sediment deliverables. The Sediment and Permit-specific Contaminants interim schedules should be coordinated with other scheduling considerations for SPLWG but preference is for early review or feedback on presentation of interim results/products rather than commenting on draft final deliverables.

Item	Target	Deliverable	Interim steps or products
S-1	Final draft for MPC 2/9/12 Final 3/1/12	Workplan, detailed through 2012 and draft through 2013 (add text, tables to STLS MYP V2012A, or else reference as stand-alone appendix to STLS MYP and BASMAA Monitoring Status Report)	• Status review (vs. previous Bay Area estimates) • Rationale for improvements or modifications to RWSM • Proposed tasks, budget and schedule through 2013
S-2	Final draft for MPC 11/2/12	Status memo for update to STLS Work Group	• Propose modifications to RWSM • Develop values/ranges/distributions of sediment-related coefficients • Clarification from WB staff re potential/desired uses for estimates, e.g. data quality needs, for which other contaminants is sediment likely to be used as a surrogate?
S-3	Final draft for MPC 1/2/ Final 1/25/13	Summary memo on initial sediment estimates, with appended “sediment profile” (incorporate as stand-alone appendix in STLS MYP V2013, and in BASMAA Urban Creeks Monitoring Report)	• Model testing, calibration • Coordination with RMP-funded POC model testing (i.e. PCBs) • Model refinements, testing, (limited?) sensitivity analysis • discussion of uncertainty and data limitations • recommendations re potential improvements and/or data collection, and relevance to potential use scenarios by WB or BASMAA

Appendix A continued

Sediment and MRP C.14 Contaminants Regional Loads Estimation: Revised August 2012
Multi-year Deliverables List

P-1	Final draft for MPC 2/9/12 Final 3/1/12	Workplan, detailed through 2012 and draft through 2013 (add text, tables to STLS MYP V2012A, or else reference as stand-alone appendix to STLS MYP and BASMAA Monitoring Status Report)	• Reference previous CMIA reports by CEP, other potential info sources • Reference RMP-funded RWSM contaminant profile & modeling workplan for Se • Propose/estimate level of detail to be used in contaminant profiles for PBDE, DDT, chlordane, dieldrin
P-2	Final draft for MPC 11/20/12 Final 1/25/13	Memo on characterization of PBDEs, legacy pesticides and Se addressing MRP questions: • Is it present in urban runoff? • Is it distributed fairly uniformly in urban areas? • Are storm drain systems a generalized source or are there specific source locations or types?	• Working, draft or final draft Contaminant profiles for PBDE, DDT, chlordane, dieldrin (BASMAA funded) and Se (RMP funded) • Evaluate information gaps or uncertainties for each POC • Clarification from WB staff re potential/desired uses and DQ needs for estimating loads of each POC
P-3	Final draft for MPC 5/31/13 Final 7/26/13	Report with information required to compute regional loads to SF Bay from urban runoff conveyance systems	• Contaminant profiles for PBDE, DDT, chlordane, dieldrin (BASMAA funded) and Se (RMP funded) • Preliminary setup of RWSM to estimate annual loads of PBDE, DDT, chlordane, dieldrin • (Preliminary model runs for selected POCs may be added, depending on available resources and WB interest)
P-4	Workplan Oct 2012 Final draft May 2013	Review and comment on report identifying control measures and/or management practices	(workplan, reports by others)

Development of Regional Suspended Sediment and Pollutant Load Estimates for San Francisco Bay Area Tributaries using the Regional Watershed Spreadsheet Model (RWSM): Year 2 Progress Report

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Introduction, context and objectives

The RMP is providing direct support for answering specific Management Questions through multi-year Strategies consisting of coordinated activities centered on particular pollutants of concern (POCs) or processes. The Small Tributaries Loading Strategy (STLS, SFEI, 2009) presented an initial outline of the general strategy and activities to address four key Management Questions:

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.

Since then, a Multi-Year-Plan (MYP) (STLS, 2011) has been written that provides a more comprehensive description of activities that will be included in the STLS over the next 5-10 years in order to provide information in compliance with the municipal regional stormwater permit (MRP; Water Board 2009). The MYP provides detailed rationale for the methods and locations of proposed activities, including loads monitoring of local tributaries. The MYP, which will be updated at least once a year to reflect evolving information, recommended the development of the Regional Watershed Spreadsheet Model (RWSM) as a tool for estimating regional loads. Point-source loads, though covered in TMDLs or other potential regulatory activities, are not included in this model.

The first phase of the project (Year 1) served to develop a GIS-based regional rainfall-runoff model, calibrate the hydrology, collate land use / source specific concentration data for pollutants of interest, and perform initial forays into sediment and pollutant models (Lent and McKee, 2011). The RWSM Year 1 report concluded that there were concerns with the hydrologic calibration data set and with the underlying land use data set, and that the immediate next steps should be to refine hydrology model by:

- Adding several calibration watersheds to ensure watershed characteristics spanned a wider range of imperviousness including more of the higher %IC character
- Removing any gage records incongruent with land use / impervious data
- Refining land use categories and re-calibrating model

This write-up serves to document these model refinements performed during year 2 of the RWSM development. At the end of year 2, no further hydrologic model refinement was recommended as a priority in year 3; focus should now shift to the sediment and contaminant models. However, development and calibration of a selection of water quality models in year 3 may highlight weaknesses in the hydrological model that may need to be addressed in year 4 in concert with other priorities identified at that time.

Improved calibration data set

The original calibration data set used in the RWSM Y1 model (Lent and McKee, 2011) lacked representation at the high end of the imperviousness range. This was was problematic because highly impervious areas contribute disproportionately to runoff and because San Francisco Bay is ringed by highly developed flatlands. Only one of the original watersheds had greater than 50% impervious surface (Figure 1). To better represent the range of development conditions present in the Bay Area, we added three high imperviousness watersheds to the calibration data set: Ettie Street Pump Station (79% impervious), Victor-Nelo Pump Station (88%) and Laurelwood Pump Station (74%) (Figure 1, right side). In keeping with Bay Area development patterns, all of the high imperviousness watersheds added were in the highly developed lowlands. Additionally, the sites added were all pump stations due to the lack of flow monitoring in highly urban watersheds. The added advantage of including these watersheds is they might also include some of the source areas proposed for structuring the PCB and Hg model components.

The data sets for all of the pump stations were derived from pump run logs, which were converted to estimated flow using the maximum pump capacity for each station. This assumption of instantaneous pump "run-up" and maximum rated capacity introduces errors, but they are likely small relative to the overall magnitude of flow volume passed by the pumps. To check if the pump data logs seemed reasonable, we plotted monthly rainfall versus estimated flow volume using the 5 months of data available for each station (Figure 2). The pump data showed a good correlation with rainfall for the two South Bay pump stations. Based on 41 months of data, Ettie Street pump station records exhibited a strong relationship with rainfall as well (R^2 = 0.98, data not shown).

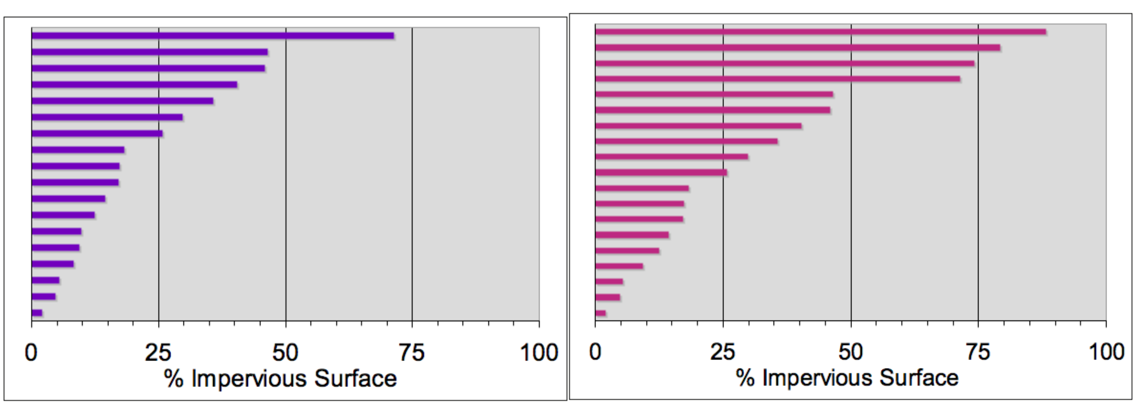

Figure 1 - Percent imperviousness in the original (Left) and updated (Right) calibration watershed data set. The left panel shows the RWSM Y1 calibration data with only one watershed with >50% impervious surface.

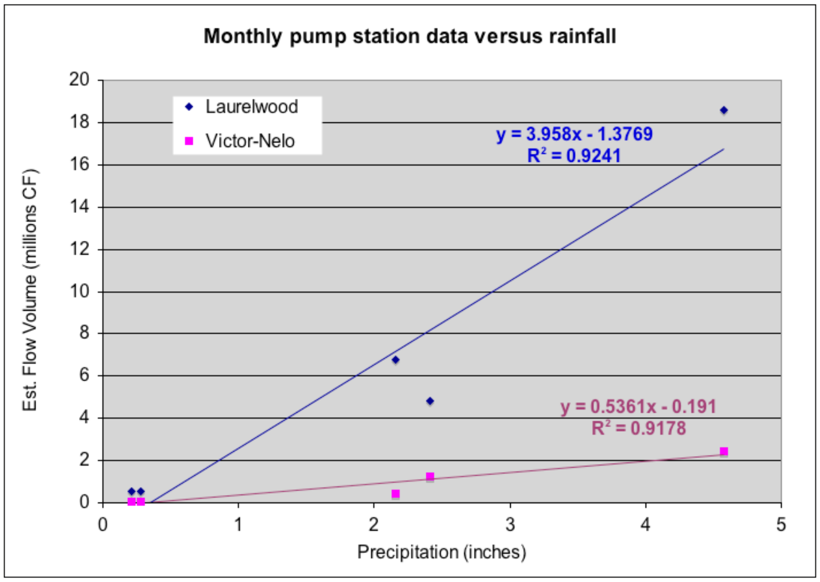

Figure 2 - Correlation between flow obtained by conversion of the pump data logs (using assumptions about pump capacity) and rainfall.

Aside from the lack of representation at the high end of the imperviousness range in the original calibration data set, we were also concerned about potential incongruence between disparate non stationary data that represents differing time periods. Given that we were using a land use and impervious surface data set from the 1990-2000s to estimate runoff coefficients, some of the older gage records potentially were not representative of more recent hydrological behavior in some of the calibration watersheds, especially if significant development had occurred in the watershed between the start of the gage data record and the 1990s. We checked the older (pre-1990s) gage records for watersheds with ≥5% built impervious surface for changes in runoff behavior over time. In some watersheds, a distinct development signal was shown by the increase in runoff coefficient by decade; a prime example is Colma Creek, which underwent massive development over the period of flow monitoring (Figure 3). As a result of this analysis, we removed earlier portions of several gage records (Colma Creek, Matadero Creek, and Walnut Creek). Additionally we completely removed two records which ended too early to properly evaluate hydrologic changes relative to more recent conditions: Arroyo Corte Madera (1966-1986) and Wildcat Creek at Richmond (1965-1975).

Watersheds in our calibration data set span the entire spatial geography of the Bay Area and incorporate watersheds that represent a wide range of imperviousness (Table 1). A flow record actually exists for Sunnyvale East Channel, but unfortunately it is of poor quality (pers. comm., Ken Stumpf, SCVWD), which was apparent when the record was regressed against rainfall (R^2 = 0.58). Upon further analysis, based on regression with rainfall data, data quality was found to be good before 2001. This subset of data was initially used in the calibration but Sunnyvale Creek was found to be the worst performer in the model amongst all the calibration watersheds again casting dispersion on data quality. We decided to reject incorporating it at this time but may include it in the future once data generated by SFEI monitoring efforts can be used to verify quality. Our basic check of data quality revealed very

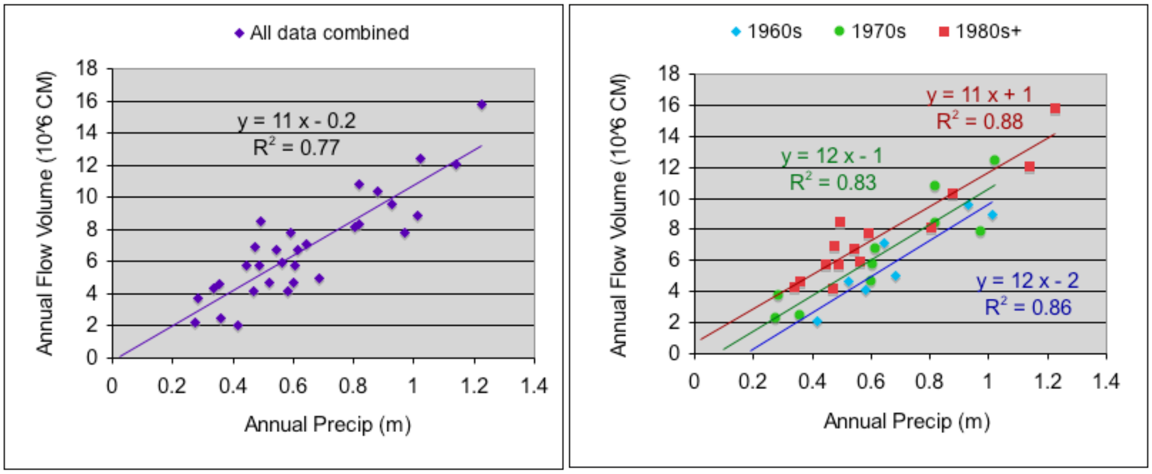

Figure 3 - Colma Creek rainfall-runoff relationship changing over time.

Table 1 - Updated calibration watershed set.

Watershed	County	Agency / Gage ID	Gage Record Used	% Built Imp. c.2000
Canoas Creek	Santa Clara	SCVWD 1485	1995-2007	46
Castro Valley Creek	Alameda	USGS 11181008	1972-2009	46
Colma Creek	San Mateo	USGS 11162720	(REVISED) 1981-1994	38
Dry Creek	Napa	USGS 11458500	1952-1966	0.1
Matadero Creek	Santa Clara	USGS 11166000	(REVISED) 1981-2009	17
Novato Creek	Marin	USGS 11459500	1947-2009	3
Pinole Creek	Contra Costa	USGS 11182100	1940-1977	0.3
Corte Madera Creek	Marin	USGS 11460000	1952-1993	5
Ross Creek	Santa Clara	SCVWD 2058	1995-2007	36
San Ramon Creek	Contra Costa	USGS 11182500	1953-2009	3
San Tomas Creek	Santa Clara	SCVWD 2050	1973-2009	30
Sonoma Creek	Sonoma	USGS 11458500	1956-1981; 2002-2009	2
Upper Napa River	Napa	USGS 11456000	1940-1995; 2001-2009	2
Walnut Creek	Contra Costa	USGS 11183600	(REVISED) 1981--1992	13
Wildcat Creek - Vale	Contra Costa	USGS 11181390	1976-1995	4
Zone 4 Line A Channel	Alameda	SFEI (no ID)	2007-2010	71
San Leandro Creek	Alameda	SFEI (no ID)	To be monitored WY2012	38
Sunnyvale East Channel	Santa Clara	SFEI (no ID)	To be monitored WY2012	59
Victor-Nelo Pump Station	Santa Clara	City of Santa Clara	2009-2010	88
Laurelwood Pump Station	Santa Clara	City of Santa Clara	2009-2010	74
Ettie St. Pump Station	Alameda	ACFCD	2005-2008	79

strong relationships between a local representative rainfall data set and the annual runoff ranging between r^2=0.78 to r^2=0.98 (Table 2).

The model was rerun using the reevaluated watershed calibration data sets that included dropping some watersheds and picking up others (Table 3). Unfortunately, the model performance worsened with the updated calibration data set. The two worst performers in the revised data set were the South Bay pump stations: Laurelwood being under-simulated by 95% and Victor-Nelo being over-simulated by 60%. This may reflect the very short records and the conversion of pump logs to estimated flow not providing an accurate target volume for calibration. But this poor performance may also reflect the model being over-calibrated to the new calibration data set being skewed towards less impervious areas. Without longer, higher quality flow records in highly impervious watersheds, it's hard to know. Ettie Street Pump Station has a longer record (albeit with the pump log-to-flow conversion issues), and is also one of the worst performers (under-simulated by 86%), suggesting that at least part of the problem is over-calibration to a data set lacking representation of high impervious areas.

Table 2 - Rainfall-runoff regression equations for updated calibration set.

Watershed	PRISM Annual Prec. (m)	Rainfall gage	Scale rainfall?	Regression			Est. Annual Volume (10^6 CM)
				Slope	Y-int.	R^2	
Canoas Creek	0.48	Alamitos	No	17	-1.8	0.87	6.6
Castro Valley Creek	0.58	Upper San Leandro	Yes	7.8	-1.4	0.93	3.2
Colma Creek (REVISED time period: WY1981-1994)	0.66	SFO Airport	Yes	11	+0.73	0.88	7.9
Dry Creek	1.05	St. Helena	Yes	34	-19	0.94	17
Matadero Creek (REVISED time period: WY1981-2009)	0.55	Palo Alto	Yes	9.6	-2.2	0.85	3.2
Novato Creek	1.04	Petaluma	Yes	28	-16	0.88	11
Pinole Creek	0.63	Berkeley	Yes	16	-5.7	0.88	4.1
Corte Madera Creek	1.08	San Rafael	Yes	36	-16	0.86	55
Ross Creek	0.59	Johnson Ranch	No	7.5	-0.98	0.87	3.4
San Ramon Creek	0.67	Berkeley	Yes	10	-3.9	0.86	2.9
San Tomas Creek	0.62	Palo Alto	Yes	19	-5.5	0.78	6.4
Sonoma Creek	1.08	Sonoma	Yes	111	-45	0.86	75
Upper Napa River	1.05	St. Helena	Yes	143	-69	0.95	81
Walnut Creek (REVISED time period: WY1981-1992)	0.60	Berkeley	Yes	155	-43	0.94	50
Wildcat Creek - Vale	0.66	Richmond	Yes	13	-3.9	0.92	5.0
Zone 4 Line A Channel	0.49	Hayward 541A	No	1.8	-0.013	0.93	0.86
Victor-Nelo Pump Station	0.38	San Jose	Yes	0.59	-0.0054	0.92	0.22
Laurelwood Pump Station	0.39	San Jose	Yes	4.3	-0.039	0.92	1.6
Ettie St. Pump Station	0.54	Oakland Museum	Yes	10	0.070	0.98	5.7

Table 3 - Model performance (% difference between simulated and observed values).

Calibration set	Mean	Median	Minimum	Maximum
Original	+2%	+3%	-42%	+46%
Updated	+1%	+9%	-95%	+60%

Another possibility is the assumption of linearity in the relationship between imperviousness and the resulting runoff coefficient. For example, in the LA region (even more arid than the Bay Area), a curvilinear function has been applied (Figure 4) (Peter Mangarella, GeoSyntec Consultants, Oakland, personal communication, February 2012). In addition another problem with runoff coefficient modeling method is that contribution from both impervious and pervious areas can vary depending on storm size and season (soil moisture content and evapotranspiration). This has been discussed extensively in science literature and was documented by M.I Budyko in 1974. The "Budyko curve", as it came to be referred to, describes the relationship between climate, evapotranspiration and runoff (Donohue et al., 2006; Gerrits et al., 2009). The explicit outcome of the curve is that watersheds of differing rainfall and heat should have differing inter-annual rainfall -runoff functions. Thus, the centrality of the medium or mean relative to the runoff extremes in reaction to rainfall extremes will be a function of aridity. This is presently not incorporated into the year 2 version of the RWSM but could be in future versions. This appears consistent with experience in Wisconsin, where runoff coefficients have been defined as a function of both land use and percent connected imperviousness and rainfall depth (Roger Bannerman, personal communication, December 2011).

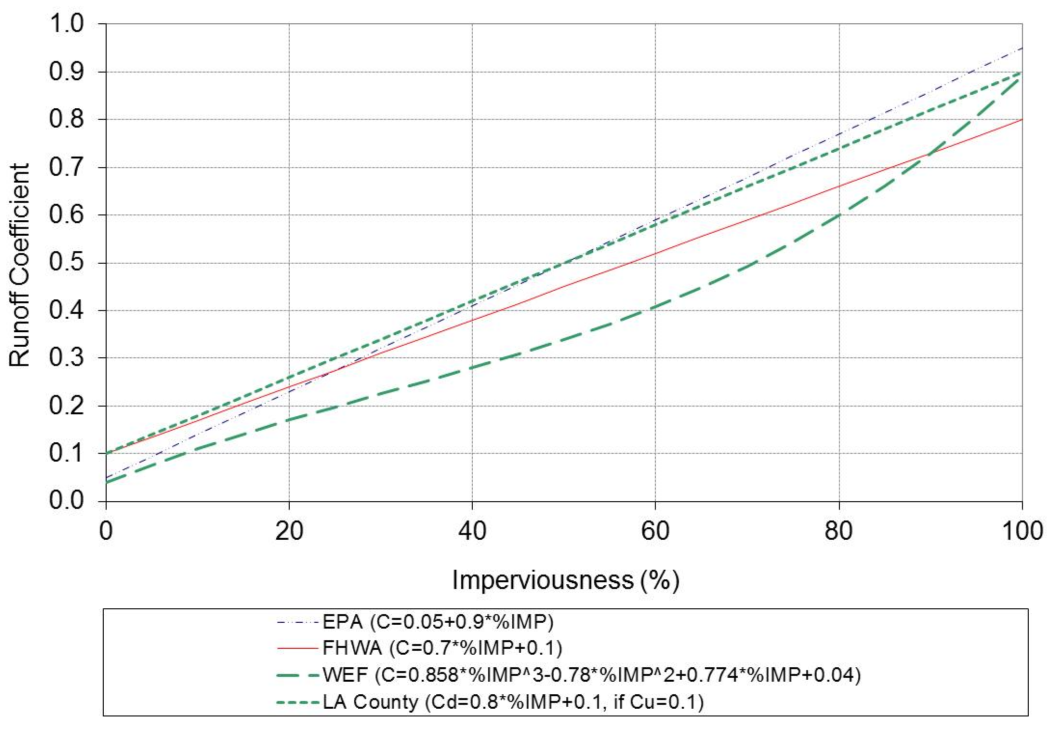

Figure 4. Runoff coefficients as a function of imperviousness. Source: Peter Mangarella, GeoSyntec Consultants, Oakland.

Refined land use input data

During development of the base hydrology model, we noticed that the land use layer (ABAG 2000) contained discrepancies related to transportation land use. Specifically, for Alameda and Santa Clara counties, local roads were not broken out into their own category (Figure 5) as they had been for the other Bay Area counties. Upon close inspection, it was noted that the land use resolution varied dramatically between counties (Figure 6). These discrepancies were corrected in the updated land use layer (ABAG 2005). Accordingly the model was re-developed using the improved ABAG 2005 land use data set.

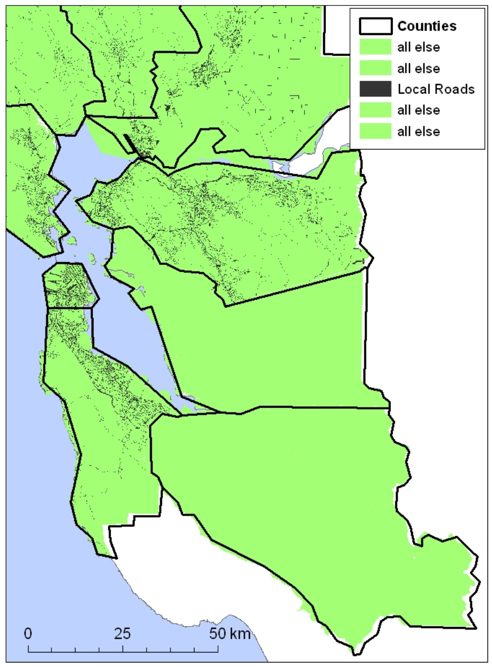

Figure 5 - Discrepancies in ABAG 2000 data set for transportation land use.

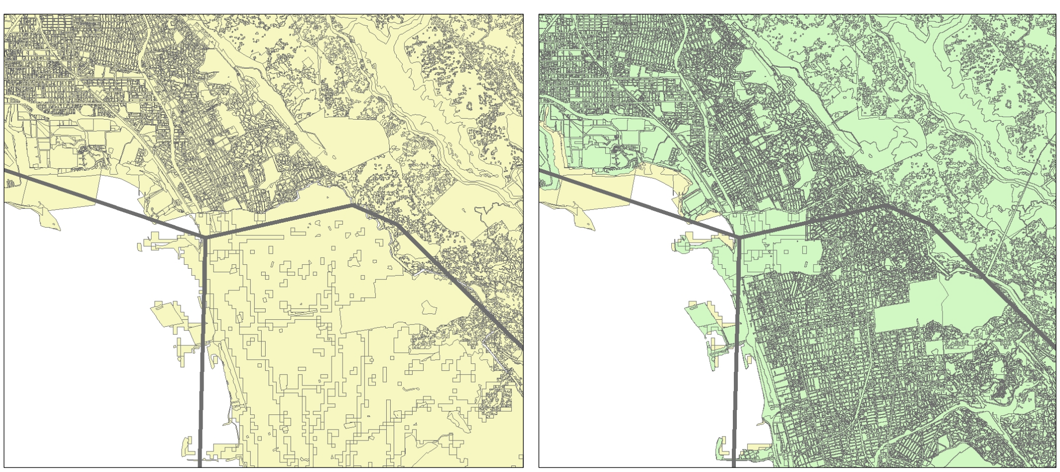

Figure 6 – ABAG 2000 versus ABAG 2005 (zoomed to border of Contra Costa and Alameda Counties).

The revised treatment of transportation land use in Alameda and Santa Clara counties between ABAG 2000 and ABAG 2005 (Figure 7) resulted in more area being assigned very high runoff coefficients (since transportation RC = 0.8). As a result, the modeled runoff increased fairly dramatically and the overall performance shifted towards over-simulation (Table 4). This performance change adds further support to the hypothesis that the previous version of the model was over-calibrated to previous input parameters.

For the development of the base hydrology model, most land use categories were treated as a single land category (as in Davis et al., 2000). However, land use categories can encompass a large range of runoff behavior, either through variable imperviousness or dirt compaction. To improve the treatment of runoff, we used the imperviousness underlying the different land use categories to reclassify some of the land use descriptions and to create higher resolution categories (Figure 8; Table 5). For the example shown in Figure 8, approximately 40 land use descriptions that make up the commercial land use category (e.g., Offices, Hospitals, etc) were reclassified into “High density commercial” and “Low density commercial” based on their average percent imperviousness.

The open land use category was split into two categories based on expected hydrologic behavior. Areas such as forests and rangelands were assigned to the “Infiltrative open” category and areas such as golf courses and cemeteries were assigned to “Compacted open” since we expect a greater fraction of rainfall will runoff compacted ground compared to less disturbed soil.

The revised land use categories were applied to the model (Figure 9) and we re-calibrated the runoff coefficients. The results of the re-calibration (Table 6) do not look as good as version 1 of the model, but we have reduced bias in the calibration data set. Unfortunately, while reducing bias through introducing the high impervious pump station watersheds, we probably have increased the errors associated with the target calibration volumes by using short records with known flaws. To do a better job of calibrating the high imperviousness areas we need high quality, multi-year flow records from highly developed watersheds. Without this type of data, we are limited in our ability to calibrate this portion of the model.

Conclusion

The tasks performed in year 2 of the Regional Watershed Spreadsheet Model (RWSM) served to correct or reduce errors and biases in the hydrological model that were noted in the year 1 report. The hydrologic model will need to be re-visited, for example, in the context of calibrating the sediment model (the development of which is one of the next steps) or the contaminant models. When the hydrologic model is next re-calibrated, to reduce the possibility of over-calibration, the calibration watershed data set should be split into two sets and calibrate to one set and then verify the calibration on the other (Mike Strenstrom, personal communication, October, 2011). In addition next versions of the hydrologic portions of the model may be improved by incorporating runoff coefficients that have either a curvilinear function with imperiousness alone (Peter Mangarella, GeoSyntec Consultants, Oakland, personal communication, February 2012 or runoff coefficients defined as a function of both land use and percent connected imperviousness and rainfall depth (Roger Bannerman, personal communication, December 2011).

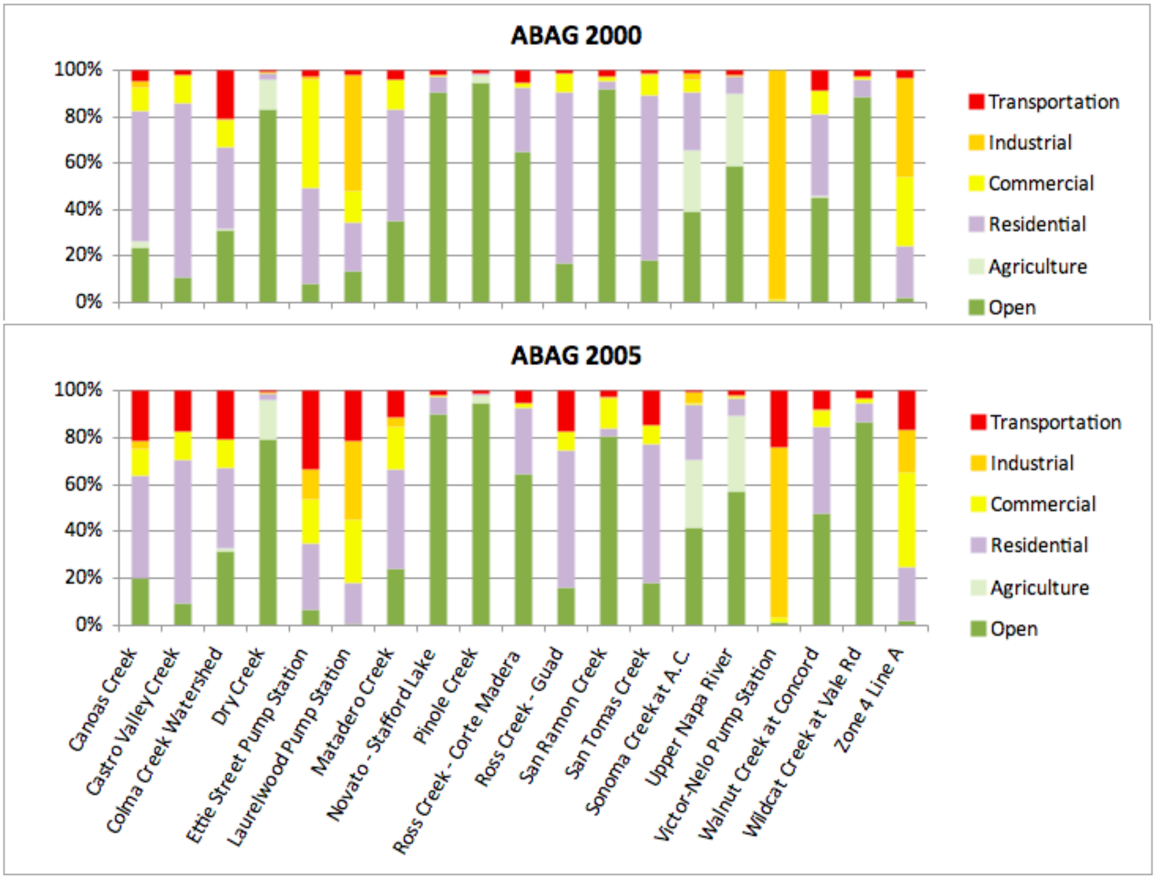

Figure 7 - Changes in land use classification from ABAG 2000 to ABAG 2005 for calibration watersheds.

Table 4 - Model performance for different land use data sets (using updated watershed set).

Land use data set	Mean	Median	Minimum	Maximum
ABAG 2000	+1%	+9%	-95%	+60%
ABAG 2005	+13%	+17%	-78%	+79%

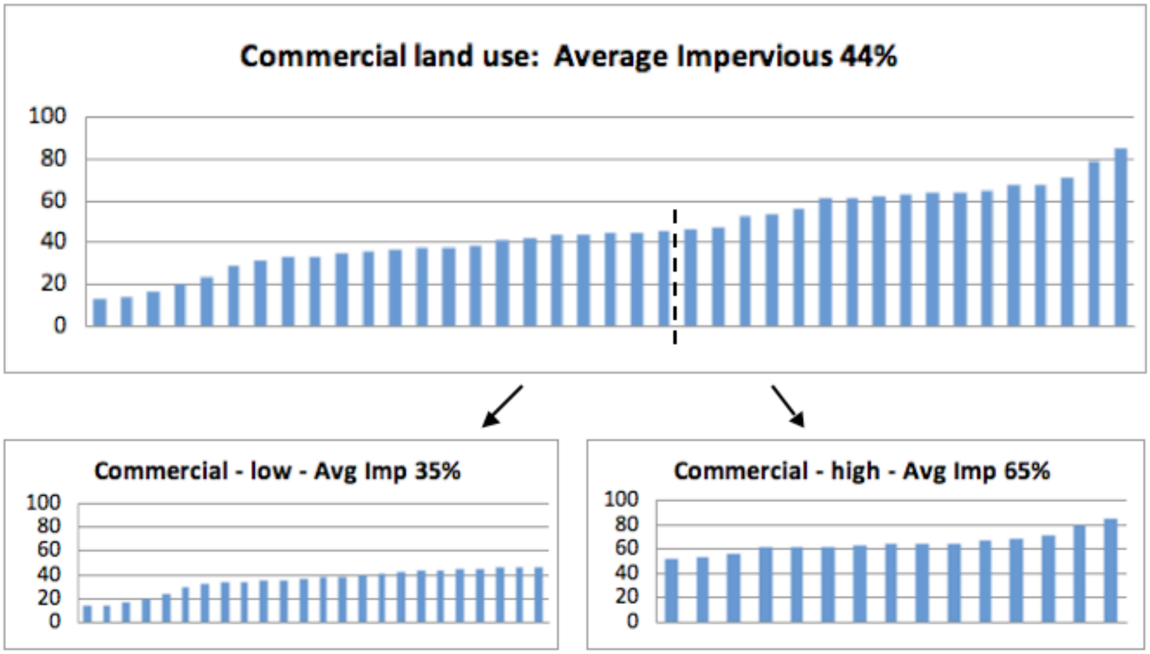

Figure 8 – An example of using imperviousness to reclassify land use descriptions into categories that more accurately group runoff behavior

Table 5 – Revised higher resolution categories for assignment of runoff coefficients. Note the full listing of land use descriptions with assigned categories and average percent impervious is presented in the Appendix.

Original Categories	Revised Categories
Agriculture	Agriculture
Open	Open
	Open – compacted
Residential	Residential – rural
	Residential – low
	Residential – med
	Residential – high
Commercial	Commercial – low
	Commercial – high
Industrial	Industrial
Transportation	Transportation
Water	Water
	Water – runoff

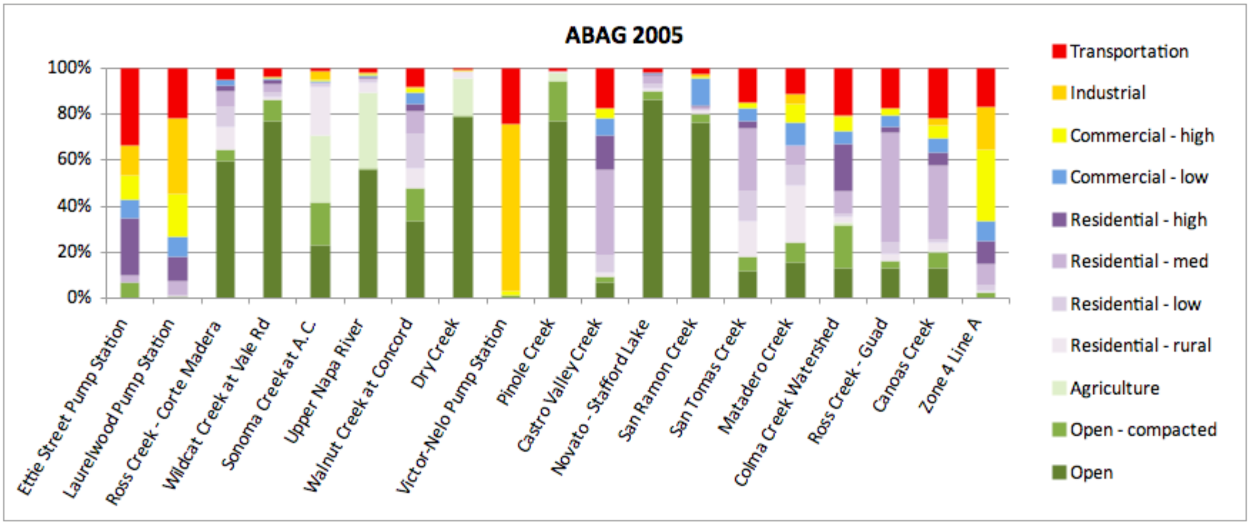

Figure 9 - Distribution of revised land use categories in calibration watershed set.

Table 6 - Model performance.

Model	Mean	Median	Minimum	Maximum
Uncalibrated ABAG 2005	+13%	+17%	-78%	+79%
Calibrated ABAG 2005 (rev. cat.)	+1%	+3%	-75%	+70%

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Appendix - Revised land use classification for runoff coefficients.

Land Use Description	Original Reclassification	New Reclassification	Mean % Imp.
Cropland & Pasture	Agriculture	Agriculture	1
Cropland	Agriculture	Agriculture	1
Confined Feeding (Including Feed Lots)	Agriculture	Agriculture	3
Small Grains	Agriculture	Agriculture	3
Pasture	Agriculture	Agriculture	4
Orchards, Groves, Vineyards, And Nurseries	Agriculture	Agriculture	6
Row Crops	Agriculture	Agriculture	6
Vineyards And Kiwi Fruit	Agriculture	Agriculture	11
Farmsteads And Agricultural Buildings	Agriculture	Agriculture	13
Orchards Or Groves	Agriculture	Agriculture	13
Military Installations	Commercial	Commercial - low	13
Military Hospital	Commercial	Commercial - low	14
Transitional Or Mixed Use Of Land Areas	Commercial	Commercial - low	17
Medical Clinics	Commercial	Commercial - low	20
Colleges & Universities	Commercial	Commercial - low	24
Greenhouses And Floriculture	Agriculture	Commercial - low	29
Stadiums	Commercial	Commercial - low	32
Local Gov't Jails And Rehab Centers	Commercial	Commercial - low	33
Extensive Recreation	Open	Commercial - low	33
State Prisons	Commercial	Commercial - low	35
Medical Long-Term Care Facilities	Commercial	Commercial - low	36
Transitional Areas	Open	Commercial - low	37
City Halls & Co., State, Fed. Govt. Facilities	Commercial	Commercial - low	38
Education	Commercial	Commercial - low	38
Elementary & Secondary Schools	Commercial	Commercial - low	39
Mixed Commercial & Industrial Complexes	Commercial	Commercial - low	41
Other Transitional	Open	Commercial - low	42
Commercial Or Services Vacant	Open	Commercial - low	44
Museums And Libraries	Commercial	Commercial - low	44
Commercial	Commercial	Commercial - low	45
Closed Military Facilities	Commercial	Commercial - low	45
Communications Facilities	Commercial	Commercial - low	46
Local Government And Other Public Facilities	Commercial	Commercial - low	47
Churches, Synagogues, And Mosques	Commercial	Commercial - low	47
Community Hospitals	Commercial	Commercial - high	52
Convention Centers	Commercial	Commercial - high	54
Daycare Facilities	Commercial	Commercial - high	56
Hospitals, Rehab, Health, & State Prisons	Commercial	Commercial - high	61
Hotels And Motels	Commercial	Commercial - high	62
Stadium	Commercial	Commercial - high	62
Research Centers	Commercial	Commercial - high	64
Offices	Commercial	Commercial - high	64
Hosptals - Designated Trauma Centers	Commercial	Commercial - high	64
Fire Station	Commercial	Commercial - high	65
Mixed Use In Buildings	Commercial	Commercial - high	67
Retail And Wholesale	Commercial	Commercial - high	68
Police Station	Commercial	Commercial - high	71
Warehousing	Commercial	Commercial - high	79
Out-Patient Surgery Centers	Commercial	Commercial - high	85
Strip Mines & Quarries, Commercial Opera	Industrial	Industrial	23
Water Storage (Covered)	Industrial	Industrial	26

Land Use Description	Original Reclassification	New Reclassification	Mean % Imp.
Food Processing	Industrial	Industrial	26
Municipal Water Supply Facilities	Industrial	Industrial	32
Wastewater Treatment Plant	Industrial	Industrial	34
Water Treatment (Filtration) Plant	Industrial	Industrial	35
Earth Works Not Part Of Commercial Extra	Open	Industrial	36
Industrial Vacant	Open	Industrial	39
Electric, Other	Industrial	Industrial	40
Electric Substation	Industrial	Industrial	47
Heavy Industrial	Industrial	Industrial	52
Wastewater Storage	Industrial	Industrial	54
Light Industrial	Industrial	Industrial	55
Wastewater Pumping Station	Industrial	Industrial	57
Industrial	Industrial	Industrial	69
Electric Power Plant	Industrial	Industrial	72
Media Broadcast Towers And Facilities	Industrial	Industrial	84
State Psychiatric Facilities	Commercial	Open - Compacted	0
Camps And Campgrounds	Open	Open - Compacted	1
State Mental Health And Devel. Disabled	Commercial	Open - Compacted	2
Military Open Areas	Open	Open - Compacted	4
Golf Courses	Open	Open - Compacted	7
Military - General Use	Commercial	Open - Compacted	9
Urban Open Space - Slated For Redevelopment	Open	Open - Compacted	10
Racetracks	Open	Open - Compacted	11
Bare Exposed Rock	Open	Open - Compacted	14
Cemeteries	Open	Open - Compacted	14
Residential Vacant	Open	Open - Compacted	14
Urban Parks	Open	Open - Compacted	17
Commonly Owned Residential, No Du	Residential	Open - Compacted	18
Other Urban And Built-Up Land	Open	Open - Compacted	20
Sanitary Landfills	Open	Open - Compacted	23
Commercial Intensive Outdoor Recreation	Open	Open - Compacted	24
Urban Vacant Undeveloped Land	Open	Open - Compacted	25
Nonforested Wetlands	Open	Open	2
Mixed Forest - Protected As Park	Open	Open	3
Evergreen Forest - Protected As Park	Open	Open	3
Salt Evaporation Ponds	Open	Open	4
Shrubland - Protected As Park	Open	Open	6
Herbaceous Rangeland - Protected As Park	Open	Open	6
Beaches	Open	Open	7
Herbaceous Rangeland	Open	Open	7
Mixed Forest	Open	Open	8
Mixed Rangeland	Open	Open	9
Mixed Rangeland - Protected As Park	Open	Open	10
Forested Wetlands	Open	Open	11
Deciduous Forest - Protected As Park	Open	Open	11
Sedimentation Ponds	Open	Open	12
Land On Usgs Topo Maps, Water On Other Maps	Open	Open	13
Deciduous Forest	Open	Open	14
Evergreen Forest	Open	Open	14
Mixed Sparsely Vegetated Land	Open	Open	17
Quarries, Strip Mines, And Gravel Pits	Open	Open	19
Shrub And Brush Rangeland	Open	Open	21

Land Use Description	Original Reclassification	New Reclassification	Mean % Imp.
Dune Or Other Sand (Not Beaches)	Open	Open	54
Very Low Density: < 1 & >= 0.2 Du Per Acre	Resid-rural/low	Resid-rural	11
Residential	Residential	Resid-low	16
Low Density: >= 1 Du/Acre And <3 Du/Acre	Resid-rural/low	Resid-low	22
Military Residential	Residential	Resid-med	33
University Housing	Commercial	Resid-med	35
Medium Density: >= 3 Du/Acre And <8 Du/Acre	Resid-low/med	Resid-med	42
Mixed Residential & Commercial Use	Residential	Resid-high	49
Group Quarters Residential	Residential	Resid-high	52
Mobile Homes And Mobile Home Parks	Residential	Resid-high	55
High Density: >= 8 Du/ Acre	Resid-med/high	Resid-high	57
Road Transportation Facilities	Transportation	Transportation	12
Inspection And Weighing Stations	Transportation	Transportation	14
Transportation, Communication, And Utilities	Transportation	Transportation	25
Rail Transportation Facilities	Transportation	Transportation	29
Private Airfield	Transportation	Transportation	30
Military Airport	Transportation	Transportation	33
General Aviation (Public) Airfield	Transportation	Transportation	37
Airports	Transportation	Transportation	42
Truck Or Bus Maintenance Yards	Transportation	Transportation	49
Highways And Interchanges	Transportation	Transportation	50
Local Roads And Streets	Transportation	Transportation	50
Marina	Transportation	Transportation	55
Commercial Port Passenger Terminal	Transportation	Transportation	62
Park And Ride Lots	Transportation	Transportation	63
Commercial Port Other Terminals and Ship	Transportation	Transportation	63
Parking Garages	Transportation	Transportation	63
Rail Yards	Transportation	Transportation	65
Commercial Port Oil & Liquid Bulk Terminal	Transportation	Transportation	65
Commercial Airport Runway	Transportation	Transportation	66
Commercial Airport - General Facilities	Transportation	Transportation	69
Rail Passenger Stations	Transportation	Transportation	70
City, County Or Utility Corporation Yard	Transportation	Transportation	71
Ferry Terminal	Transportation	Transportation	74
Marine Transportation Facilities	Transportation	Transportation	75
Commercial Port Storage & Warehousing	Transportation	Transportation	80
Tow Boat (Tug) Facility	Transportation	Transportation	80
Commercial Port Container Terminal	Transportation	Transportation	85
Military Port	Transportation	Transportation	87
Commercial Airport Passenger Terminal	Transportation	Transportation	90
Commercial Airport Airline Maintenance	Transportation	Transportation	92
Commercial Airport Utilities	Transportation	Transportation	93
Commercial Airport Air Cargo Facility	Transportation	Transportation	96
Bays & Estuaries	Water	Water	5
Lakes	Water	Water	9
Reservoirs	Water	Water	9
Unclassified Water	Water	Water	6
Water - Industrial Ports And Piers Over	Water	Water	67
Water - Residential (Arks) Over Water	Water	Water	38
Water On Usgs Topo Maps, Land On Other Maps	Water	Water	52
Water Storage (Open)	Water	Water	27

B5

PS/SS: Updating RMP Emerging Contaminants Strategy

Estimated Cost: $20,000
Oversight Group: Emerging Contaminant Work Group
Proposed by: Susan Klosterhaus, SFEI

Background

The RMP has just completed a synthesis document summarizing the occurrence of contaminants of emerging concern (CECs) in San Francisco Bay (Klosterhaus et al. 2012). In addition to RMP funding, many of the CECs studies to date have been the result of pro bono work conducted as a result of collaborations with universities, government agencies, and commercial laboratories. These opportunities were identified by RMP staff through professional contacts and literature reviews. These studies have allowed for prioritization of these CECs using occurrence and toxicity data to determine the level of concern for individual contaminants in the Bay. The RMP strategy document currently being developed articulates three approaches for identifying CECs for monitoring. These approaches are based on:

- Existing information (known or suspected use, occurrence or toxicity from other locations, best professional judgment),
- Effects (i.e., bioassays), and
- Occurrence (non-target analyses such as the RMP-funded project with NIST or fate modeling).

This will be an iterative process as new information, new analytical methods, and new collaborations become available. In order to keep the CEC Strategy document relevant and timely, funds are needed to review new results, track relevant work being conducted elsewhere, and develop potential collaborations.

Study Objective and Applicable RMP Management Question

The objective of this effort is to insure the RMP is keeping up with the state of the science regarding CECs by tracking new information as it becomes available and communicating relevant information to the ECWG. This study would address the following RMP management question (MQ):

MQ1. Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?

- A: Which chemicals have the potential to impact humans and aquatic life and should be monitored?
- B: What potential for impacts on humans and aquatic life exists due to contaminants in the Estuary ecosystem?

Approach

This effort will involve the review of key information sources throughout the year. These sources include:

- Abstracts of newly published articles in key peer-reviewed journals (e.g., Environmental Science and Technology, Environmental Toxicology and Chemistry, Environment International),
- Documents produced by other programs (e.g., USEPA, Environment Canada, European Chemicals Agency, Great Lakes CEC Program),
- Abstracts and proceedings from relevant conferences (e.g., Society of Environmental Toxicology and Chemistry, International Symposium on Halogenate Persistent Organic Pollutants (Dioxin), International Symposium on Brominated Flame Retardants)

The major outcome of this effort will be to provide updates on relevant information to the ECWG each year. More specifically, this information will be used to:

- Propose updates to the tiered risk-management action framework for San Francisco Bay (Klosterhaus et al. 2012),
- Propose additions or removal of CECs on the 'Unmonitored CEC Candidate List' discussed at the May 2012 ECWG meeting, and
- Propose special studies for monitoring new CECs.

It is anticipated that this special study will be conducted each year to insure the RMP is incorporating the most recent scientific findings regarding the monitoring of CECs in the Bay.

Budget

Information gathering from a variety of sources throughout the year	$20,000
Total	**$20,000**

References

Klosterhaus, S., Yee, D., Sedlak, M, Wong, A. 2012. Contaminants of Emerging Concern in San Francisco Bay: A Summary of Occurrence Data and Identification of Data Gaps. RMP draft report. San Francisco Estuary Institute, Richmond, CA.